2011 Hanford Lifecycle Scope, Schedule and Cost Report




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2011 Hanford Lifecycle Scope, Schedule and Cost Report

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EXECUTIVE SUMMARY

Purpose

This *Hanford Lifecycle Scope, Schedule and Cost Report* (Lifecycle Report) describes the scope, schedule, and cost for Hanford Site cleanup. This Lifecycle Report reflects all cleanup work that is to be completed by the U.S. Department of Energy (DOE), including the Richland Operations Office (DOE-RL) and Office of River Protection (DOE-ORP).

With the exception of this initial 2011 Lifecycle Report, the report will be prepared and submitted to Hanford Site regulators, the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) annually by January 31, in time to support DOE's annual budget process and to help inform decision makers about schedule and prioritization.

This report will serve as an agreed upon foundation for preparing budget requests and for informational briefings to affected Tribal Governments, the State of Oregon, and Hanford stakeholders. The report supports continued discussions with EPA and Ecology on how and when DOE-RL and DOE-ORP will complete cleanup, and how milestone changes and adjustments will affect lifecycle scope, schedule, and cost.

While it is important to understand what this report can and will do, it is just as important to understand what it does not do. This report does not make or replace any cleanup decisions, nor is it a *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* or *Resource Conservation and Recovery Act of 1976* document. This report does not substitute for, nor preempt, the cleanup decision processes as set forth in the *Hanford Federal Facility Agreement and Consent Order*[1] (commonly referred to as the Tri-Party Agreement or TPA) and other legal requirements.

Background

On October 25, 2010, DOE, EPA, and Ecology (the TPA agencies) agreed to modify the TPA to incorporate a new milestone, M-036-01, requiring annual submittal of a Lifecycle Report. The Lifecycle Report reflects all actions necessary for DOE to meet all applicable environmental obligations.

The 2011 Lifecycle Report reflects:
- Actual budget for FY 2011.
- President's budget for FY 2012.
- The unconstrained compliance budget for FY 2013 and beyond.

DOE has developed the 2011 Lifecycle Report working with EPA and Ecology, with input from Tribal Governments, the State of Oregon, and the Hanford Advisory Board.

The 2011 Lifecycle Report is based on scope, schedule, and cost estimate information and

[1] Ecology, EPA, and DOE, 1989, *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, as amended.

incorporates regulatory milestones from the Consent Decree and TPA Settlement Package that became effective October 25, 2010.[2] The costs shown are 2010 dollars, which have been escalated for inflation.

Public Involvement Process

The TPA agencies will make the 2011 Lifecycle Report available to all interested parties. Feedback regarding the 2011 Lifecycle Report will be used to develop future reports.

Milestone Requirements

TPA Milestone M-036-01 requires that the Lifecycle Report include all cleanup, monitoring, and related actions necessary to complete cleanup, and that it takes critical resource availability and the practical limits of project acceleration into consideration. Information in the Lifecycle Report is to be presented at the project baseline summary (PBS) level, with costs to be provided at one level below the PBS, and at levels below that for the next 2 to 5 years (near term). The appendices of this report provide details to explain the preparation of the Lifecycle Report in addition to detailed cost and schedule information.

TPA Milestone M-036-01 also requires that, where final cleanup decisions have not yet been made, the Lifecycle Report be based on the reasonable upper bound of the range of plausible alternatives, or a range of alternative costs, including a reasonable upper bound. By considering potential future decisions, events, contingencies, and cost and/or schedule uncertainties, a reasonable upper bound for future cleanup work is described.

Summary of Lifecycle Scope, Schedule, and Cost

Hanford Site cleanup consists of three major components: River Corridor Cleanup, Central Plateau Cleanup, and Tank Waste Cleanup (located geographically within the Central Plateau). The cleanup also includes activities that provide essential infrastructure and services to Hanford Site cleanup. The Hanford Site's remaining cleanup schedule covers activities for cleanup and waste management, leading to transition of portions of the Hanford Site to long-term stewardship. The cleanup schedule is from FY 2011 to FY 2090.

The Hanford “to-go” or remaining estimated cleanup costs have an upper bound cost estimate of approximately $115 billion (Figure ES-1). This includes the estimated cost to complete cleanup within the River Corridor, Central Plateau, Tank Waste, and Mission Support components, as well as reasonable allowances for cost and schedule uncertainties (e.g., for activities where cleanup decisions have not been made). Table ES-1 provides a summary of total costs by PBS. Costs are updated each year to reflect work completion, recent decision making, and other changes affecting the cleanup scope (e.g., upgrades or infrastructure modernization to support major projects).

[2] Consent Decree and Tri-Party Agreement Settlement Package, order signed October 25, 2010, settling *State of Washington v. Chu*, United States District Court, Eastern District of Washington, Case No. CV-08-5085-FVS.

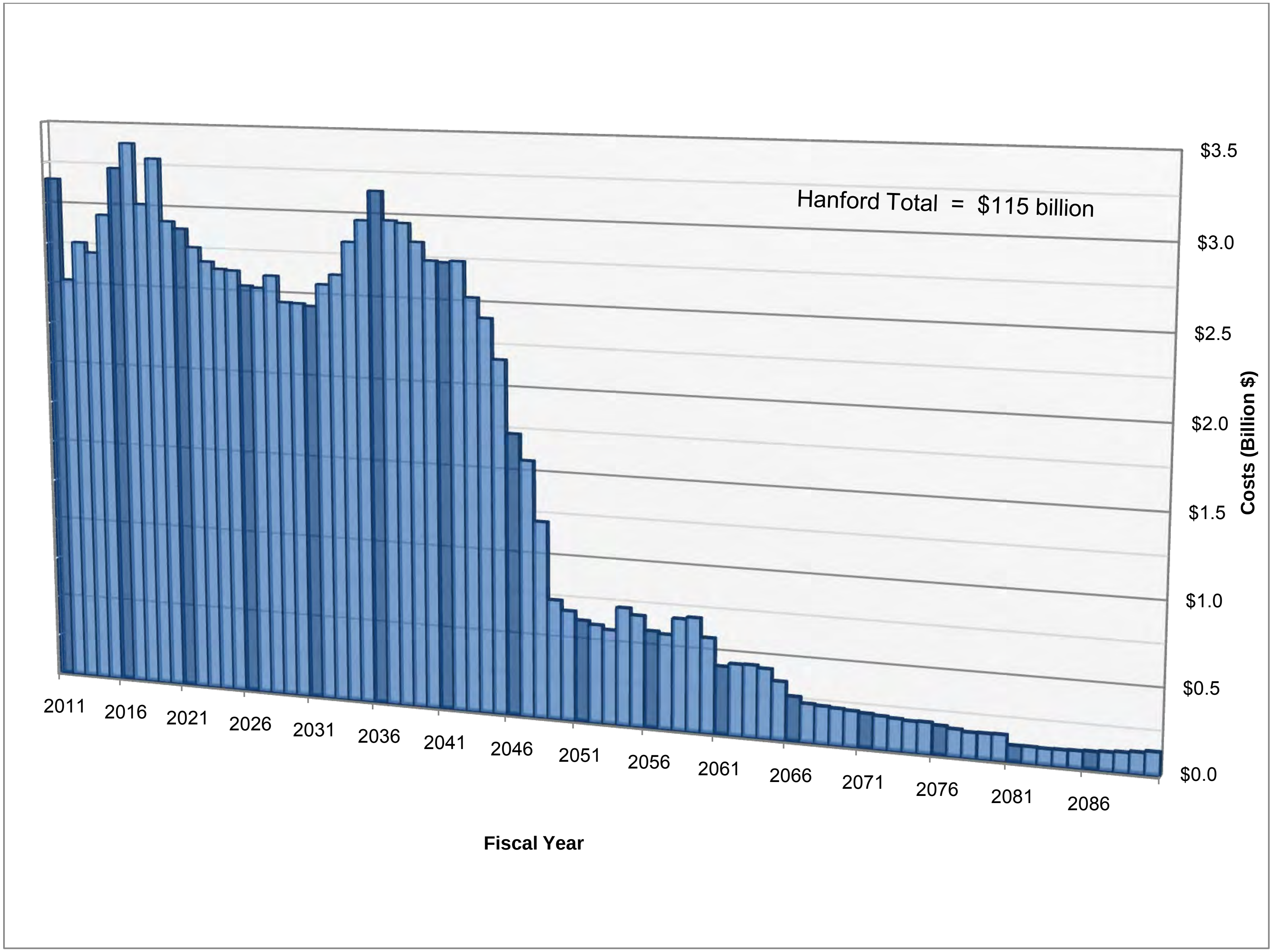

Figure ES-1. Hanford Site Remaining Estimated Cleanup Costs by Fiscal Year.

Table ES-1. Hanford Site Remaining Cleanup Cost Estimates by PBS.

Project Work Scope	Estimated Cleanup Cost[1] (Billion $)
NM Stabilization and Disposition – PFP (PBS RL-0011)	$0.8
SNF Stabilization and Disposition (PBS RL-0012)	$0.5 - $0.6
Solid Waste Stabilization and Disposition - 200 Area (PBS RL-0013C)	$9.0 - $9.2
Safeguards and Security (PBS RL-0020)	$3.3
Soil and Water Remediation - Groundwater/Vadose Zone (PBS RL-0030)	$8.0 - $8.3
Nuclear Facility D&D - Remainder of Hanford (PBS RL-0040)	$13.9 - $17.6
Infrastructure and Services (PBS RL-0040)	$2.3
Nuclear Facility D&D - River Corridor Closure Project (PBS RL-0041)	$2.1 - $2.2
Nuclear Facility D&D - Fast Flux Test Facility Project (PBS RL-0042)	$1.1
Richland Community and Regulatory Support (PBS RL-0100)	$1.0
Long-Term Stewardship (PBS RL-LTS)	$5.4
Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014)	$50.4 - $56.6
Major Construction - Waste Treatment Plant (PBS ORP-0060)	$6.1
Hanford Site Total Remaining Estimated Cleanup Costs	**$103.9 - $115**

[1] Cost ranges have been shown in this table to reflect cost and schedule uncertainty where available, and the higher number is used throughout this report.

D&D= decontamination and decommissioning.
NM = nuclear materials.
PBS = project baseline summary.
PFP = Plutonium Finishing Plant.
SNF = spent nuclear fuel.

Cost Estimate Alternative Analyses for Two Selected Cleanup Actions

The TPA agencies have agreed that the Lifecycle Report should include additional in-depth information and cost estimates for selected cleanup actions (for which final decisions have not been made). For the 2011 Lifecycle Report, the TPA agencies identified 39 cleanup actions for which final cleanup decisions are still needed. Two of the 39 were selected for in-depth cost estimate alternative analysis in the 2011 Lifecycle Report in response to Tribal Government, State of Oregon, and stakeholder views and values. The Lifecycle Report proposes a schedule (Appendix A, Table A-5) for preparing additional detailed cost analyses for the remaining cleanup actions.

The cleanup actions analyzed for the 2011 Lifecycle Report are:

- Disposition of 100 Area Reactors (except B Reactor).
- Remediation of the 200-SW-2 Operable Unit.

<u>Alternative Analysis for 100 Area Reactors</u>

The lower bound cleanup alternative analyzed for the eight 100 Area Reactors is to maintain them in interim safe storage (excluding B Reactor, which is a National Historic Landmark being preserved for future public tours) followed by one piece removal of the reactors to be completed by 2068 after a maximum 75-year storage period. The alternative identified as the reasonable upper bound analyzed in the Lifecycle Report maintains the eight reactors in interim safe storage, followed by deferred dismantlement, which includes piece-by-piece dismantlement of the reactor blocks and demolition of the reactor buildings.

Alternative Analysis for 200-SW-2 Operable Unit

A reasonable alternative for the 200-SW-2 Operable Unit (which consists of 25 separate trenches formerly used for solid waste burial) leaves all or most of the waste in place. Grout injection would be used to fill void spaces within trenches to control future subsidence and stabilize high contamination areas within the trenches. Barriers would be placed over the trenches to limit water and biota intrusion.

The reasonable upper bound for the Lifecycle Report is based on removal of all but one of the waste trenches (after confirming that it never received any waste) from the surface to the bottom of each trench, separating and preparing the retrieved waste for disposal, and placing the waste in approved disposal facilities.

Table ES-2 summarizes the cost estimates for the two cleanup action alternatives in the 2011 Lifecycle Report. The reasonable upper bound costs are provided as a sensitivity analysis and have not been added into estimated cleanup costs presented throughout this report.

Table ES-2. Summary of Cost Estimates for Cleanup Action Alternatives Analyzed in the 2011 Lifecycle Report.

Cleanup Action Alternative	Reactors Remain in Place (Million $)	Remove Reactors (Million $)
Disposition of 100 Area Reactors (Except B Reactor)	$0	$676
Cleanup Action Alternative	**Barriers (Million $)**	**Remove, Treat, and Dispose of Waste (Million $)**
Remediation of the 200-SW-2 Operable Unit	$823	$16,614

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TERMS

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CH	contact-handled
CSB	Canister Storage Building
D&D	decontamination and decommissioning
D4	deactivation, decontamination, decommissioning, and demolition
DOE	U.S. Department of Energy
DOE-EM	U.S. Department of Energy, Office of Environmental Management
DOE-HQ	U.S. Department of Energy, Headquarters
DOE-ORP	U.S. Department of Energy, Office of River Protection
DOE-RL	U.S. Department of Energy, Richland Operations Office
DQO	data quality objectives
DST	double-shell tank
Ecology	Washington State Department of Ecology
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESH&Q	Environment, Safety, Health, and Quality
ETF	Effluent Treatment Facility
FFTF	Fast Flux Test Facility
FY	fiscal year
HAB	Hanford Advisory Board
HAMMER	Hazardous Materials Management and Emergency Response; also known as the Volpentest HAMMER Training and Education Center
HFFACO	*Hanford Federal Facility Agreement and Consent Order*
HLW	high-level waste
HWMA	*Hazardous Waste Management Act* (Washington State)
IDF	Integrated Disposal Facility
IHLW	immobilized high-level waste
ILAW	immobilized low-activity waste
ISS	interim safe storage
LAW	low-activity waste
LDR	Land Disposal Restrictions
LERF	Liquid Effluent Retention Facility
LTS	long-term stewardship
MLLW	mixed low-level waste
NEPA	*National Environmental Policy Act*
NM	nuclear materials
O&M	operations and maintenance
OMB	Office of Management and Budget
PBS	project baseline summary
PFP	Plutonium Finishing Plant

PNNL	Pacific Northwest National Laboratory
PUREX	Plutonium Uranium Extraction (Plant)
R&D	research and development
RCRA	*Resource Conservation and Recovery Act of 1976*
REDOX	Reduction-Oxidation Facility (S Plant)
RH	remote-handled
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RPP	River Protection Project
RTD	remove, treat, and dispose
S&M	surveillance and maintenance
SNF	spent nuclear fuel
SST	single-shell tank
TBD	to be determined
TEDF	Treated Effluent Disposal Facility
TPA	Tri-Party Agreement
TRU	transuranic
TRUM	transuranic mixed (waste)
TRUPACT	Transuranic Packaging Transporter
TSD	treatment, storage, and disposal
WBS	work breakdown structure
WESF	Waste Encapsulation and Storage Facility
WIPP	Waste Isolation Pilot Plant
WMA	waste management area
WRAP	Waste Receiving and Processing (Facility)
WTP	Waste Treatment and Immobilization Plant

1.0 INTRODUCTION

In October 2010, the U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and Washington State Department of Ecology (Ecology) added a new milestone to the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989), commonly referred to as the Tri-Party Agreement (TPA). The TPA Milestone M-036-01 requires that DOE submit a *Hanford Lifecycle Scope, Schedule and Cost Report* (Lifecycle Report) to EPA and Ecology each year.

This document is the Lifecycle Report for 2011. Chapters 1.0 and 2.0 discuss the basis for the Lifecycle Report and how information provided in this document has been developed. Chapters 3.0 through 7.0 describe the work needed to complete Hanford Site cleanup and reflect all applicable environmental obligations. Chapter 8.0 discusses limitations of this report and Chapter 9.0 identifies opportunities for improvement. Appendices to this Lifecycle Report provide important details and backup information.

Unless noted otherwise in the text, this report reflects scope, schedule, and cost estimate information from FY 2011 to FY 2090, and incorporates regulatory milestones from the TPA settlement package that became effective October 25, 2010.

1.1 PURPOSE OF THE LIFECYCLE REPORT

To plan for the future and make the best use of each year's funding, DOE, EPA, and Ecology (the TPA agencies) work together and share information about the scope, schedule, and costs of cleaning up the Hanford Site. TPA Milestone M-036-01 cites that the Lifecycle Report should serve:

> The Lifecycle Report includes the remaining scope, schedule, and cost required for Hanford Site cleanup. The report will be used to inform affected parties and will help the TPA agencies make decisions about how best to complete Hanford cleanup.

"…as an agreed upon foundation for preparing budget requests and for informational briefings of affected Tribal Governments and Hanford stakeholders.

"…as the basis for annual discussions among USDOE, EPA, and Ecology on how and when the USDOE will complete cleanup, how Congressional appropriations for the Hanford Site for that year may affect assumptions presented in the report, and how milestone changes and adjustments will affect lifecycle scope, schedule and cost."

1.2 PREPARING THE LIFECYCLE REPORT

A Lifecycle Report Work Group was formed by the TPA agencies in December 2009. This group met on an as-needed basis until the TPA milestone was adopted. The group helped to develop the report structure, identify and resolve issues, and collaborate on an approach to

> The TPA agencies worked together to define processes and agree on the path forward to prepare the Lifecycle Report in compliance with milestone language.

account for cleanup decisions that had not yet been made, and to ensure the process reflected Tribal Government, State of Oregon, and Hanford stakeholder values and the views of EPA and Ecology.

In May and June of 2010, the TPA agencies conducted a series of working sessions that included managers and technical staff. The outcome of the working sessions is detailed in Appendix A, and includes:

1. Identification of remaining and necessary cleanup actions for which final cleanup decisions have not yet been made under applicable regulatory decision-making processes. Approximately 39 future cleanup actions were identified.
2. Identification of a range of plausible alternatives for the non-final cleanup actions.
3. Preparation of a schedule for completing cost estimate alternative analyses for future cleanup actions. In 2011, two cleanup actions were identified for analysis:
   - Disposition of the 100 Area Reactors
   - Remediation of the 200-SW-2 Operable Unit (OU).

The Lifecycle Report will be prepared each year, on a schedule that supports the Federal budget process as specified in TPA Milestone M-036-01. Following submittal of the report to EPA and Ecology, the TPA agencies will provide the report to Tribal Governments, the State of Oregon, and the public, and will seek input on opportunities to improve the report.

1.2.1 Tribal Involvement

Four Tribal Governments are involved in the Hanford Site cleanup:

- The Confederated Tribes of the Umatilla Indian Reservation is made up of the Cayuse, Umatilla, and Walla Walla people, and is federally recognized under the *Treaty with the Walla Walla, Cayuse and Umatilla, 1855*.
- The Confederated Tribes and Bands of the Yakama Nation are descendants of 14 tribes and bands that were federally recognized under the *Treaty with the Yakama, 1855*.
- The Nez Perce Tribe is federally recognized under the *Treaty with the Nez Perces, 1855*.
- The Wanapum Band is a non-federally recognized tribe that historically resided on Hanford lands, and participates in discussions regarding Hanford cleanup.

Representatives from the Tribal Governments work in a government-to-government relationship with DOE officials on decisions affecting cleanup of the Hanford Site and protection of the land. Information that summarizes general tribal values has been provided by two of the Tribal Governments to DOE-RL and is included in Appendix B. DOE consults with the Tribal Governments on a regular basis and will continue to update information about their values relevant to this Lifecycle Report.

1.2.2 Oregon Office of Energy

DOE recognizes the state of Oregon's interests in Hanford Site cleanup and protection of the Columbia River and its uses. Consistent with legal and other agreements, DOE has committed to share information and sustain an active dialogue with Oregon representatives about decisions and activities affecting cleanup at the Hanford Site.

1.2.3 Hanford Advisory Board

The Hanford Advisory Board (HAB) is an independent, non-partisan, and broadly representative body consisting of a balanced mix of the diverse interests that are affected by Hanford Site cleanup issues. The primary mission of the HAB is to provide informed recommendations and advice to DOE, EPA, and Ecology on selected major policy issues related to cleanup. The HAB is a DOE Office of Environmental Management (DOE-EM) Site-Specific Advisory Board, a stakeholder board that provides DOE's Assistant Secretary for DOE-EM and designees with independent advice, information, and recommendations on issues affecting the DOE-EM program at the various Hanford sites.

Hanford Advisory Board Chair Susan Leckband (left), with facilitators Susan Hayman and Cathy McCague.

The HAB recommended that DOE prepare information similar to the Lifecycle Report. HAB Consensus Advice No. 223, ―Lifecycle Cost and Schedule Report of the Proposed Consent Decree and the Tri-Party Agreement (TPA) Modifications," was issued in November 2009. Full text of the HAB Consensus Advice No. 223 is included in Appendix B.

The HAB has prepared advice that relates to cleanup decisions throughout the Hanford Site. The HAB advice and the TPA agencies' responses to advice can be found on DOE's website at www.hanford.gov/?page=453. That advice was considered in the development of this report.

The 2011 Lifecycle Report begins with the FY 2011 budget and extends through FY 2090. Data from the 2011 Lifecycle Report will help support development of the FY 2013 budget.

1.3 LIFECYCLE REPORT AND HANFORD BUDGET SCHEDULE

In developing the Lifecycle Report milestone, the TPA agencies sought to align submittal of the report with the annual Federal budget planning process. For most fiscal years, Federal planning begins about 2 years before the funded work is executed (Figure 1-1). The cycle begins when DOE field offices receive fiscal year budget planning guidance from the President of the United States, DOE-Headquarters (DOE-HQ), and the Office of Management and Budget (OMB). During the next 12 to 15 months, the DOE field budgets are developed, submitted to DOE-HQ and OMB for review, and then provided as part of the President's budget that is submitted annually to Congress. Approximately 8 months later, under normal circumstances, before the start of the new Federal fiscal year (October 1), Congress approves a budget, funding is made available, and DOE begins executing work to the approved budget.

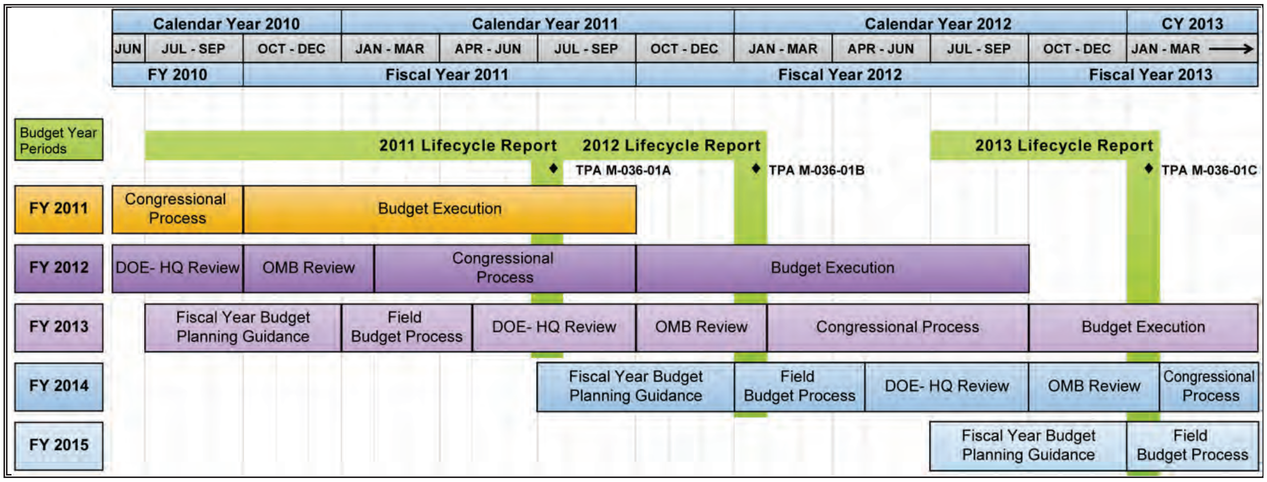

Figure 1-1. Relationship Between U.S. Department of Energy Budget Planning and Lifecycle Report Schedule.

As shown in Figure 1-1, the TPA agencies scheduled the Lifecycle Report to be completed in time to support the field budget planning process each year. Each Lifecycle Report will have the latest information available when planning begins for the next 2-year budget cycle. In addition, the period of time for developing the Lifecycle Report each year overlaps with the funding approval process for the current budget execution year and with the DOE-HQ and OMB review of funding requests for the next fiscal year. This overlap will enable the Lifecycle Report to include useful information about national priorities, events at other DOE sites, emerging technologies and best practices, and other circumstances that may affect the Hanford Site.

1.4 HANFORD SITE CLEANUP OVERVIEW

The 586-square-mile Hanford Site is located along the Columbia River in southeastern Washington State (Figure 1-2). Beginning in the 1940s with the Manhattan Project, the Hanford Site played a pivotal role in the Nation's defense, eventually producing approximately 74 tons of plutonium — nearly two-thirds of all the plutonium recovered for government purposes in the United States. Today, the Hanford Site includes numerous former nuclear material production areas, active and closed research facilities, waste storage and disposal sites, and large areas of natural habitat and buffer zones all underlain by groundwater. Under the direction of DOE, the Hanford Site workforce is now engaged in the environmental cleanup of contaminated facilities, groundwater, and soil. The Hanford cleanup is further described in *Hanford Site Cleanup Completion Framework* (DOE/RL-2009-10) dated July 2010.

1.4.1 U.S. Department of Energy Strategic and Cleanup Goals

The *Roadmap for EM's Journey to Excellence* (DOE 2010a) identifies seven strategic goals to guide DOE in accomplishing cleanup across the DOE complex, including the Hanford Site, as described in Table 1-1.

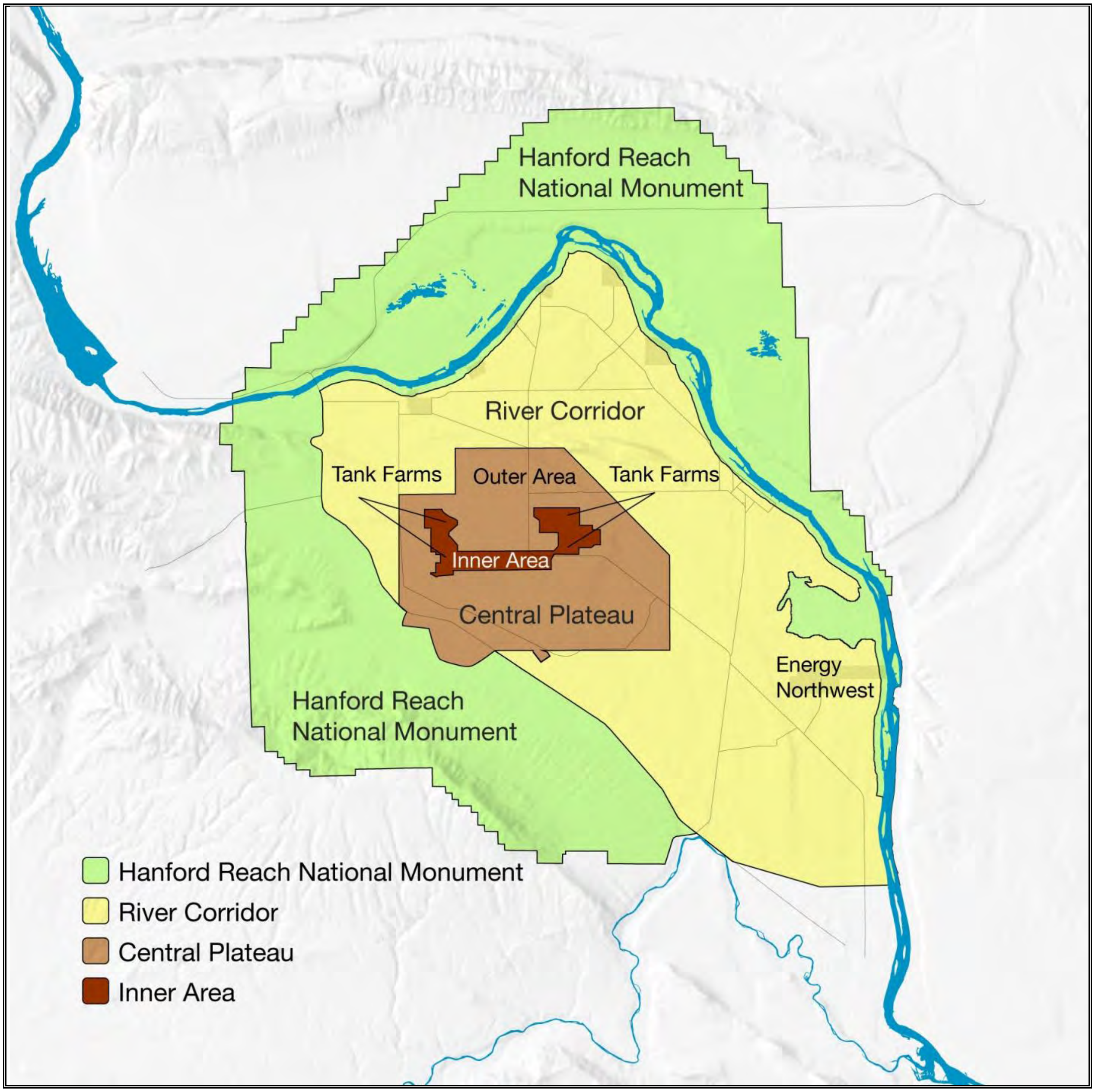

Figure 1-2. Hanford Site Map Showing Hanford's Principal Areas Designated for Cleanup Purposes.

Table 1-1. U.S. Department of Energy Environmental Management Strategic Goals (All Sites). (3 pages)

Journey to Excellence Strategic Goal	Key Strategies to Reach the Goal
Goal 1. Complete the three major tank waste treatment construction projects within the approved baselines.	• Work with the Federal staff, contractors, and union representatives to ensure that the projects have the necessary tools (e.g., technology resources, innovative tools to maintain motivation, a strong owner's presence) to succeed in the most efficient manner. • Partner with national laboratories, industry, academia, and the Corps of Engineers to ensure the best scientific and engineering resources are used, so that the technologies selected for development and deployment and the design and construction approaches used will help reduce risk, lower cost, and accelerate project completion. • Establish an integrated design/engineering testing and commissioning framework across the DOE-EM complex to support project teams and enhance technical decision making. • Use the code of record concept to only make project changes that are essential to project success. (Code of record refers to the set of requirements in effect at the time a facility or item of equipment was designed and accepted by DOE.) • Use construction project reviews to identify and assist in resolution of key project issues related to scope, cost, schedule, project risk management, and technical approach. • Ensure the contract fee is aligned with completion of each capital asset.
Goal 2. Reduce the lifecycle costs and accelerate the cleanup of the Cold War environmental legacy.	• Develop an R&D roadmap for the development and application of advanced modeling and simulation tools to accelerate progress on DOE-EM challenges in 2011. • Engage the Department's basic and applied research capabilities to develop novel methods for addressing high-level waste that can accelerate progress and reduce costs of this multi-decadal program. • Integrate and manage the technology development and deployment investment and insert technologies at appropriate maturity. • Continue to use the National Academy of Sciences, Environmental Management Advisory Board, DOE-EM Technical Experts Group, and the expertise of DOE-EM Federal staff to inform us on how best to achieve reductions in the lifecycle cost for the tank waste mission. • Use appropriate system planning models to demonstrate the benefit of deploying state-of-the-art technologies and/or more effective strategies in order to reduce the lifecycle cost of the tank waste cleanup mission.
Goal 3. Complete disposition of 90 percent of the legacy TRU waste by the end of 2015.	• Utilize shielded canisters to accelerate transportation and disposal of remote-handled TRU wastes. • Process and dispose of Large Box TRU, utilizing the TRUPACT-III. • Align contract incentives at WIPP and TRU generator sites to support specific legacy TRU disposition targets each year.

Table 1-1. U.S. Department of Energy Environmental Management Strategic Goals (All Sites). (3 pages)

Journey to Excellence Strategic Goal	Key Strategies to Reach the Goal
Goal 4. Reduce the DOE-EM legacy footprint by 40 percent by the end of 2011, leading to approximately 90 percent reduction by 2015.	• Utilize Hanford's portion from the *American Recovery and Reinvestment Act*. • Work with regulators and stakeholders to ensure compliance and timely implementation of required cleanup actions. • Focus on safe completion of DOE-EM activities (TRU waste, low-level waste, soil and groundwater, and D&D) resulting in reduced environmental risks to the community.
Goal 5. Improve safety, security and quality assurance towards a goal of zero accidents, incidents, and defects.	• Ensure that DOE-EM sites and projects integrate safety, security, and quality, and evaluate performance indicators that measure these functions throughout the applicable lifecycle, including procurement, design, engineering, construction, commissioning, operation, deactivation/decommissioning, and environmental restoration. • Use sound science and engineering along with developing a proactive relationship with the Defense Nuclear Facilities Safety Board to expeditiously resolve Board concerns and issues. • Ensure DOE-EM Headquarters and field elements continue to identify and deploy strategies and approaches that guarantee strong safety and security cultures are in place, such as Human Performance Improvement, performance and vulnerability assessments, and enhancement of the self-assessment process, focusing improvement efforts on areas of poorest performance. • Employ a risk-based decision-making process for operation and decommissioning of DOE-EM facilities.
Goal 6. Improve contract and project management with the objective of delivering results on time and within cost.	• Use the DOE-EM Contract and Project Management Corrective Action Plan as a starting point and create an internal quality assurance process that will lead to successful and sustained execution of DOE-EM contract and project management improvements. • Improve and expand the use of independent contract and project reviews, construction project reviews, peer reviews, and external independent reviews to keep contracts and projects aligned and on track. Conduct verification and validation reviews to ensure that performance data is credible and reliable. • Strengthen the integration of acquisition and project management processes so that contract statements of work and deliverables are based on clear project requirements, robust front-end planning and risk analysis, ensuring that nuclear safety requirements are addressed early, and changes to contract and project baseline and the contract are managed through strict and timely change control processes.

Table 1-1. U.S. Department of Energy Environmental Management Strategic Goals (All Sites). (3 pages)

Journey to Excellence Strategic Goal	Key Strategies to Reach the Goal
	• Become a stronger owner by holding contractors accountable and pursue partnering relationships to create win-win scenarios, where both the Federal staff and contractor staff understand and respect the rules of engagement and build better business relationships. Also, build stronger relationships with oversight organizations to improve communications and demonstrate transparency and accountability in DOE-EM's contract and project management. • Develop DOE-EM-specific cost estimating policy, guidance, historical cost databases, and expertise to improve our ability to perform independent government cost estimates as well as independent cost reviews and validation of contractor-generated cost estimates. • Invest in personnel development by providing training and career development in contract and project management. • Make effective use of small and minority owned businesses.
Goal 7. Achieve excellence in management and leadership, making DOE-EM one of the best places to work in the Federal Government.	• Benchmark best-in-class agencies (the Nuclear Regulatory Commission ranked number one in this year's Partnership for Public Service survey) and develop improvement plans in the areas of leadership, planning, performance tracking, work/business processes, customer service/relations, and accountability. • Establish sustainability goal targets. • Support DOE corporate management improvement initiatives.

From DOE 2010a, *Roadmap for EM's Journey to Excellence*, U.S. Department of Energy, Washington, D.C.

D&D	=	decontamination and decommissioning.	R&D	=	research and development.
DOE	=	U.S. Department of Energy.	TRU	=	transuranic.
DOE-EM	=	U.S. Department of Energy, Office of Environmental Management.	TRUPACT	=	Transuranic Packaging Transporter.
			WIPP	=	Waste Isolation Pilot Plant.

The overarching goals for Hanford Site cleanup are stated in Table 1-2. These goals embody more than 20 years of dialogue among the TPA agencies, Tribal Governments, State of Oregon, stakeholders, and the public. They carry forward key values captured in earlier forums such as the Hanford Future Site Uses Working Group, Tank Waste Task Force, Hanford Summits, and HAB Exposure Scenario Workshops. These goals help guide all aspects of Hanford Site cleanup. Cleanup activities at various Hanford Site areas support the achievement of one or more of these goals. These goals help set priorities to apply resources and sequence cleanup efforts for the greatest benefit.

These goals reflect DOE's recognition that the Columbia River is a critical resource for the people and ecology of the Pacific Northwest. The 50-mile stretch of the river known as the Hanford Reach is the last free-flowing section of the Columbia River in the United States. As one of the largest rivers in North America, its waters support a multitude of uses that are vital to the economic and environmental well being of the region and it is particularly important in sustaining Native American culture. The Hanford cleanup must protect this river.

Table 1-2. Cleanup Goals Identified for the Hanford Site.[1]

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:	Clean up 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, tank farms, and facilities to: • Protect groundwater. • Minimize the footprint of areas requiring long-term waste management activities. • Support anticipated future land uses.
Goal 5:	Safely manage and transfer legacy materials scheduled for off-site disposition, including special nuclear material (including plutonium), spent nuclear fuel, transuranic waste, and immobilized high-level waste.
Goal 6:	Consolidate waste treatment, storage, and disposal operations on the Central Plateau.
Goal 7:	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 completed.

[1] DOE/RL-2009-10, 2010, *Hanford Site Cleanup Completion Framework*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

1.4.2 Hanford Site Cleanup and Management Areas

The Hanford Site cleanup focuses on two broad geographic areas: the River Corridor and the Central Plateau. Tank Waste is a separate cleanup component located within the Central Plateau area.

The River Corridor includes approximately 220 square miles of the Hanford Site, encompassing the 100 Area and 300 Area along the south shore of the Columbia River, portions of the 400 and 600 Areas, and the contiguous lands that extend to the Central Plateau boundaries. The 100 Area contains nine retired plutonium production reactors, numerous support facilities, solid and liquid waste disposal sites, contaminated groundwater, and uncontaminated areas. The 300 Area, located north of the city of Richland, contains fuel fabrication facilities, nuclear research and development facilities, associated solid and liquid waste disposal sites, and contaminated groundwater.

The Central Plateau includes approximately 75 square miles in the central portion of the Hanford Site. This region contains the 200-East and 200-West Areas, where plutonium and uranium were separated from irradiated fuel rods in large chemical separation process facilities. When the separation facilities were operating, large quantities of liquid waste containing radionuclides and chemicals were discharged to the soil column and percolated into the vadose zone and groundwater. The Central Plateau has a large inventory of processing and support facilities, tank systems, liquid and solid waste disposal and storage facilities, utility systems, and contaminated groundwater.

The Tank Waste Cleanup component focuses on retrieving and treating Hanford's tank waste, and closing or remediating tank farms. The tank farms are comprised of 18 distinct waste storage units that include a total of 177 underground storage tanks (149 single-shell tanks [SSTs] and 28 double-shell tanks [DSTs]) located in the 200-East and 200-West Areas. The storage tanks range in capacity from 55,000 to 1,247,000 gallons and contain approximately 53 million gallons of chemically hazardous radioactive waste from past processing operations. Sixty-seven of the Hanford Site's SSTs are confirmed or presumed to have collectively leaked up to 1 million gallons of contamination into the ground. A number of associated tank waste facilities, including dozens of inactive underground storage tanks, miles of waste transfer lines, the 242-A Evaporator, and the Waste Treatment and Immobilization Plant (WTP) (under construction) are associated with the Tank Waste Cleanup component.

Significant portions of the Hanford Site have been designated and preserved as part of the Hanford Reach National Monument (Figure 1-2). Much cleanup work has been accomplished within the designated monument area, and remaining work is expected to be completed within the next few years either as part of the River Corridor or Central Plateau cleanup projects. DOE is coordinating with the U.S. Department of Interior, U.S. Fish and Wildlife Service, and other agencies to provide care and maintenance of the clean national monument lands.

DOE leases Hanford Site land to several non-DOE entities, such as the Laser Interferometer Gravitational Wave Observatory and the State of Washington, which in turn leases land to US Ecology, Inc., a private firm that operates burial grounds for commercial radioactive low-level waste. DOE leases land to Energy Northwest (a consortium of public utility companies), which operates Washington and Oregon's only operating commercial nuclear power reactor, the Columbia Generating Station. These operations are not part of cleanup at the Hanford Site and are not included in the Lifecycle Report.

Hanford Site cleanup is overseen at DOE-HQ by the DOE-EM, and is directed and implemented locally by two DOE field offices: the DOE Richland Operations Office (DOE-RL) and the DOE Office of River Protection (DOE-ORP).[3] DOE-RL manages cleanup of most of the Hanford Site, and provides human resource, administration, and security services, as well as physical infrastructure necessary to perform the cleanup. DOE-ORP was established in response to Section 3139 of the *Strom Thurmond National Defense Authorization Act for Fiscal Year 1999* to manage the River Protection Project (RPP). The RPP is responsible for the safe storage, retrieval, and transfer of tank waste currently stored in the 200 Area Tank Farms; construction of the WTP to process and immobilize the tank waste in a process known as vitrification; and associated tank farm operation, maintenance, engineering, and construction activities.

[3] In addition to the ongoing cleanup mission, numerous research and environmental support activities are conducted at Hanford by the Pacific Northwest National Laboratory, which is overseen by DOE's Office of Science, Pacific Northwest Site Office.

1.5 LIFECYCLE REPORT MILESTONE REQUIREMENTS

TPA Milestone M-036-01 includes a number of requirements for the Lifecycle Report. In December 2009, the TPA agencies began working together to ensure a common understanding of the milestone requirements. Table 1-3 provides the full text of the approved TPA Milestone M-036-01.

The following restates the most important requirements from the milestone (cited in **bold text** in the following paragraphs) and briefly explains how DOE, in consultation with EPA and Ecology, applied each requirement during development of this Lifecycle Report.

The TPA agencies also found that they needed to clarify direction on issues encountered during Lifecycle Report development. The TPA agencies communicated extensively about these aspects of the milestone, and Appendix C documents how the Lifecycle Report has addressed them.

> **“The report will include all other cleanup and monitoring activities (including post-closure activities) and all related actions necessary to complete the cleanup mission to provide a complete understanding of the resources necessary for the Hanford cleanup mission.”**

This requirement recognizes that cleanup often extends beyond the major demolition and construction activities needed to close and remediate contaminated facilities and sites. Hanford Site cleanup will be protective of future uses consistent with the land-use designations adopted and implemented by DOE. Radioactive and hazardous substances are likely to remain in areas of the Hanford Site, even after cleanup. Over time, some of these substances will degrade or decay in place. DOE will perform post-cleanup activities to maintain protective features (e.g., barriers, run-on and run-off diversion, fencing) and to monitor Hanford Site conditions (e.g., air quality, groundwater quality). Some activities will go on for decades after the primary cleanup activities are completed. The milestone language cited above reinforces that the Hanford Site cleanup includes, and the Lifecycle Report will address, future work needed to protect human health and the environment.

> **“This report shall take into account circumstances existing as of the end of the fiscal year preceding the month of the report, including funds appropriated by Congress for the Hanford cleanup, but shall not assume any limitation on funding for future years.”**

The Federal fiscal year covers the calendar period from October 1 to September 30. The Lifecycle Report is required to be submitted by January 31 each year, with the exception of the initial Lifecycle Report.

Each Lifecycle Report will take into account a combination of the actual expenditures for the preceding fiscal year (i.e., the ―circumstances existing as of the end of the fiscal year preceding the month of the report”), and the budget approved for the current fiscal year (i.e., the ―funds appropriated by Congress for the Hanford cleanup”).

Table 1-3. Tri-Party Agreement Milestone M-036-01.

M-036-01A (Subsequent Annual Milestones to be Lettered B, C, D, etc.) Due date to submit the report to be January 31 and annually thereafter, except that the first report to be due no sooner than 9 months after incorporation of this milestone in TPA.
The USDOE shall prepare and submit to EPA and Ecology a report setting out the lifecycle scope, schedule, and cost for completion of the Hanford Site cleanup mission. The report shall reflect all of those actions necessary for the USDOE to fully meet all applicable environmental obligations including those under the HFFACO, the consent decree in State of Washington V. Chu, Case No. 08-5085-FVS, and the Hanford RCRA/HWMA Permit. The report shall include scope, schedule and cost for completing work at each of the operable units and RCRA TSD groups/units that are listed in Appendixes B and C of the HFFACO, in the consent decree in State of Washington V. Chu, Case No. 08-5085-FVS and in the Hanford RCRA/HWMA Permit, including the Hanford Waste Treatment and Immobilization Plant. The report will include all other cleanup and monitoring activities (including post-closure activities) and all related actions necessary to complete the cleanup mission to provide a complete understanding of the resources necessary for the Hanford cleanup mission. This report shall take into account circumstances existing as of the end of the fiscal year preceding the month of the report, including funds appropriated by Congress for the Hanford cleanup, but shall not assume any limitation on funding for future years. However, the report will take into consideration critical resource availability not based upon assumed future funding limitations and the practical limits of project acceleration when developing an executable plan. USDOE may also include costs other than those directly related to environmental obligations (such as security costs) but shall clearly distinguish expenditures for environmental obligations from other expenditures. Costs shall be displayed by program baseline summary. Additional levels of detail will appear in appendixes to the report. Cost information will provide sufficient detail to validate consistency with the scope and schedule for individual cleanup projects. Reporting in the appendixes will typically be one level below the PBS for the lifecycle, and at levels below that for the next two to five years beyond the execution year (usually at the activity level within the budget assigned to a specific project, e.g., RL-0011, WBS element 011.04.01, Nuclear Material Stabilization and Disposition – PFP, Disposition PFP, Transition 234 5Z). EPA and Ecology project managers may request additional levels of detail be provided by their DOE counterparts. In circumstances where final cleanup decisions have not yet been made, the report shall be based upon the reasonable upper bound of the range of plausible alternatives or may set forth a range of alternative costs including such a reasonable upper bound. In making assumptions for the purpose of preparing the initial report, USDOE shall take into account the views of EPA and Ecology and shall also take into account the values expressed by the affected Tribal Governments and Hanford stakeholders regarding work scope, priorities and schedule. The report shall include the scope, schedule and cost for each such PBS level two element and shall set forth the bases and assumptions for each cleanup activity. After USDOE submits the report, the USDOE will revise the report based upon EPA and Ecology comments to reflect a common vision of the scope, schedule and budget for the remainder of the cleanup mission. If the agencies are unable to reach resolution on specific aspects of the scope of cleanup actions, the revised document will present a range of potential actions with the associated schedule and budget, thereby completing the milestone. DOE, EPA and Ecology shall attempt to reach agreement on the report so it can serve as an agreed upon foundation for preparing budget requests and for informational briefings of affected Tribal Governments and Hanford stakeholders. The report shall also serve as the basis for annual discussions among USDOE, EPA and Ecology on how and when the USDOE will complete cleanup, how Congressional appropriations for the Hanford Site for that year may affect assumptions presented in the report, and how milestone changes and adjustments will affect lifecycle scope, schedule and cost. Without limiting any DOE obligation under any other provisions of this agreement, and without limiting any DOE obligation to disclose information that is otherwise publicly available, nothing in this milestone shall be construed, either alone or in combination with any other provision of the HFFACO, to require disclosures related to internal federal budget deliberations.

For example, the Lifecycle Report submitted on January 31, 2012 (about 4 months after Fiscal Year [FY] 2012 begins), will take into account what cleanup actions were performed using the FY 2011 authorized budget (covering the period from October 1, 2010 to September 30, 2011), and the cleanup actions planned based on the approved FY 2012 budget (covering the period from October 1, 2011 to September 30, 2012).

The milestone language acknowledges that DOE must work within the budgets authorized by Congress. The Lifecycle Report includes scope, schedule, or cost information for cleanup actions that are already constrained by Congressional appropriations for the fiscal year in which the report is submitted. However, the milestone does require that for future years (i.e., after the current fiscal year), the Lifecycle Report will be developed without assuming that future funding is limited.

> **"…The report will take into consideration critical resource availability not based upon assumed future funding limitations and the practical limits of project acceleration when developing an executable plan."**

Performance of Hanford Site cleanup activities can depend on specialized expertise, personnel, equipment, and materials that are in limited supply. For example, the availability of trained and qualified radiation control specialists at the Hanford Site is limited. If resources are unavailable, DOE's ability to complete work can be constrained. In addition, the ability to perform work quickly can be constrained by a variety of practical limits, such as how many loads of contaminated soil can be physically placed and covered at a disposal site in a given amount of time. As a result, planning for the execution of work must account for the availability of critical resources and the practical limits that time, space, and other factors impose.

> **"USDOE may also include costs other than those directly related to environmental obligations (such as security costs) but shall clearly distinguish expenditures for environmental obligations from other expenditures."**

DOE has financial responsibilities for maintaining a safe and secure Hanford Site, and meeting the needs of the associated workforce. Examples include security forces that guard nuclear materials, employee insurance premiums and pension benefits, and public participation grants to public interest groups. The milestone language gives DOE the option to include non-environmental costs in the Lifecycle Report, but requires that where this occurs, DOE will show which costs are required for meeting environmental obligations.

> **"Costs shall be displayed by program baseline summary. Additional levels of detail will appear in appendixes to the report.… Reporting in the appendixes will typically be one level below the PBS for the lifecycle, and at levels below that for the next two to five years beyond the execution year…."**

This milestone language specifies the level of detail DOE is required to provide when presenting cost data in the Lifecycle Report. The project baseline summary (PBS) summarizes information about each major Hanford Site cleanup project. Projects that have common attributes (e.g., a common assumed geographic location or activity type) typically are grouped within a single PBS. There are 12 PBSs that cover Hanford Site cleanup.

The milestone requires DOE to provide cost information by PBS, requires that near-term costs (covering the next 2 to 5 years) be presented at two or more levels of additional detail below the top-level PBS, and requires that costs for the entire lifecycle be presented at one level of additional detail below the top-level PBS. This distinction reflects the maturity of planning that is possible in the DOE budget. Activities in the near term, and where regulatory decisions have been made, are better defined and generally have more detailed cost information, whereas activities beyond the near term, or where regulatory decisions have not been made, are less well defined with less detailed cost estimates.

> **"In circumstances where final cleanup decisions have not yet been made, the report shall be based upon the reasonable upper bound of the range of plausible alternatives or may set forth a range of alternative costs including such a reasonable upper bound."**

This milestone language describes what DOE is required to do when providing information about cleanup activities for which final decisions have not yet been made. Section 1.6 provides additional discussion of this requirement and how it has been applied.

> **"The report shall include the scope, schedule and costs for each such PBS level two element and shall set forth the bases and assumptions for each cleanup activity."**

The TPA agencies have chosen to apply this provision broadly, and DOE has taken the approach in this Lifecycle Report to provide information about the bases and assumptions underlying all cleanup actions as presented down to PBS Level 2 and at further levels, if needed, depending on the particular cleanup action.

1.6 CLEANUP DECISIONS AND ALTERNATIVES INCLUDED IN LIFECYCLE REPORT

Hanford Site cleanup is achieved through an ongoing process for making and then implementing cleanup decisions in accordance with approved work plans and procedures, which are the bases for performing cleanup actions. When making cleanup decisions, the TPA agencies follow procedures to ensure compliance with applicable laws and regulations, compare various cleanup alternatives, consider the interests of the public and other affected parties, consult with Tribal Governments, and document selected cleanup actions in legally binding records.

In portions of the cleanup, the TPA agencies have agreed to schedule final cleanup decisions to be made at a time when more information and experience can be gained, or after certain facilities are no longer needed. For example, decisions on cleaning up the T Plant Canyon Building in the Central Plateau will not be made until the TPA agencies have determined when the T Plant will not be needed to support Hanford Site cleanup.

The Lifecycle Report is required to include scope, schedule, and cost information across the entire Hanford Site regardless of whether the cleanup decision has been made. Where cleanup decisions are not known or only partially defined (i.e., not final), the Lifecycle Report is based on the reasonable upper bound for the range of plausible alternatives, or a range of alternative costs, including a reasonable upper bound. These requirements introduce several concepts that are not fully defined in TPA Milestone M-036-01:

- **Cleanup decisions.** How are cleanup decisions made and when are they considered to be final decisions?
- **Alternatives.** How are alternatives considered when making cleanup decisions and defining what cleanup actions should be performed?
- **Reasonable upper bound.** How is a reasonable upper bound defined for a range of alternatives and how are an upper bound cost and schedule calculated?

Appendix D describes the multiple kinds of cleanup decisions to be made at the Hanford Site and identifies decisions that are considered to be final for the Hanford Site. Appendix A describes future actions required to complete Hanford cleanup and presents information on plausible alternatives for the future cleanup actions. Table 1-4 lists the Hanford Site cleanup actions for which final cleanup decisions have not yet been made.

The Lifecycle Report includes numerous assumptions about future cleanup actions and decisions. Assumptions take into consideration the ranges of plausible alternatives for specific cleanup actions, and what would be reasonable upper bounds for the ranges of alternatives.
The alternatives and upper bounds for future cleanup actions contemplate potential decisions, events, contingencies, and cost and/or schedule uncertainties, and take into account the views and values of regulators, Tribal Governments, and stakeholders.

The TPA agencies have agreed the Lifecycle Report should develop more in-depth information about selected cleanup actions (for which final decisions have not been made). For the 2011 Lifecycle Report, the TPA agencies identified approximately 39 cleanup actions for which final cleanup decisions are still needed (Table 1-4), and Appendix A proposes a schedule for preparing in-depth cost estimate alternative analyses for these cleanup actions. Section 1.7 provides additional information about this process.

A cost estimate alternative analyses for the two cleanup actions are shown in Table 1-5 for this 2011 Lifecycle Report. The cleanup actions were selected in response to Tribal Government, State of Oregon, and stakeholder values.

The scope, schedule, and cost information and any cost estimate alternative analyses are for informational purposes only and cannot replace the full analysis of a *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) feasibility study or *Resource Conservation and Recovery Act of 1976* (RCRA) corrective measures study or closure plan. The information and analyses presented here will be used to inform the public and to support budget requests. All cleanup decisions will follow the applicable decision-making process (e.g., CERCLA, RCRA). The Lifecycle Report will be updated to reflect these decisions as they are made.

Table 1-4. List of Hanford Site Cleanup Actions for which Final Decisions Have Not Been Made.

River Corridor Cleanup Actions	
• Disposition 100 Area Reactors. • Disposition 100 Area KW Basin. • Remediate 100 Area Contaminated Soil Sites. • Restore 100-BC-5 Groundwater OU to Beneficial Use. • Restore 100-KR-4 Groundwater OU to Beneficial Use. • Restore 100-NR-2 Groundwater OU to Beneficial Use.	• Restore 100-HR-3 Groundwater OU to Beneficial Use. • Restore 100-FR-3 Groundwater OU to Beneficial Use. • Disposition 300 Area Facilities Retained by PNNL. • Remediate 300 Area Contaminated Soil Sites. • Restore 300 Area Groundwater to Beneficial Use.
Central Plateau Cleanup Actions	
• Disposition Remaining Outer Area Buildings and Facilities (200-OA-1 OU). • Remediate Remaining Outer Area Contaminated Soil Sites (200-OA-1, 200-CW-1, and 200-CW-3 OUs). • Disposition Below-Grade Portions of Plutonium Finishing Plant. • Disposition B Plant Canyon Building/Associated Waste Sites (200-CB-1 OU). • Disposition PUREX Canyon Building/Associated Waste Sites (200-CP-1 OU). • Disposition PUREX Storage Tunnels (200-CP-1 OU). • Disposition REDOX Canyon Building/Associated Waste Sites (200-CR-1 OU). • Disposition T Plant Canyon Building/Associated Waste Sites. • Disposition Cesium/Strontium Capsules. • Remediate 200-SW-1 OU. • Disposition Remaining Liquid Waste Disposal Facilities. • Disposition Remaining Waste Treatment, Storage, and Disposal Facilities.	• Remediate 200-IS-1 OU. • Remediate 200-PW-1/3/6 and CW-5 OUs. • Remediate 200-SW-2 OU. • Remediate Remaining 200-West Inner Area Contaminated Soil Sites (200-WA-1 OU). • Remediate Remaining 200-East Inner Area Contaminated Soil Sites (200-EA-1 OU). • Disposition FFTF Complex. • Disposition Remaining Buildings and Facilities within FFTF Complex. • Disposition Remaining Inner Area Buildings and Facilities. • Remediate Contaminated Deep Vadose Zone (200-DV-1 OU). • Restore 200-West Groundwater (200-ZP-1/200-UP-1 OUs) to Beneficial Use. • Restore 200-East Groundwater (200-PO-1/200-BP-5 OUs) to Beneficial Use.
Tank Waste Cleanup Actions	
• Tank Retrieval and Single-Shell Tank Farm Closure. • Tank Waste Treatment. • Secondary Waste Treatment.	• Double-Shell Tank Closure. • Waste Treatment and Immobilization Plant Closure.
FFTF = Fast Flux Test Facility. OU = operable unit. PNNL = Pacific Northwest National Laboratory.	PUREX = Plutonium Uranium Extraction (Plant). REDOX = Reduction-Oxidation Facility (S Plant).

Table 1-5. Hanford Site Cleanup Actions and Reasons for Performing Cost Estimate Alternative Analyses in 2011 Lifecycle Report.

Cleanup Action	Reasons for Analysis in This Year's Lifecycle Report
Disposition of the 100 Area Reactors	Substantial historical information exists that provides a useful body of scope, schedule, and cost data for analyzing cleanup action alternatives for the 100 Area reactors, and for devising and testing an effective first time approach to performing alternatives analyses. In addition, a number of recent developments (e.g., potential early removal of KE Reactor, preparation of a draft supplemental environmental impact statement) present an opportunity to support near-future negotiations and budget planning. The in-depth cost estimate alternative analysis for this cleanup action is presented in Section 4.4 of this Lifecycle Report.
Remediation of the 200-SW-2 Operable Unit	The regulatory agencies, Tribal Governments, State of Oregon, and Hanford stakeholders have a high degree of interest in the cleanup of the 200-SW-2 Operable Unit. Information continues to improve about the work and estimated costs to remediate these complex burial grounds. Decisions about the 200-SW-2 Operable Unit will not be made for several years, so this opportunity to provide insight into costs of varying alternatives will provide information to help inform decision making. The in-depth cost estimate alternative analysis for this cleanup action is presented in Section 5.7 of this Lifecycle Report.

1.7 COST ESTIMATE ALTERNATIVE ANALYSIS PROCESS

In-depth analysis and cost estimating of alternatives will be performed for selected cleanup actions in each annual Lifecycle Report. This approach is described below and is depicted in Figure 1-3, and is explained further in Appendix A.

The approach to developing alternatives and determining the reasonable upper bound for a range of plausible alternatives includes the following steps:

1. Identify and screen for decisions affecting Hanford Site cleanup; determine which decisions are considered to be final (see Appendix D).
2. Identify non-final cleanup actions for which alternatives will be analyzed further (see Appendix A).
3. Prioritize and schedule cleanup actions for in-depth analysis of alternatives to be prepared for each annual report (see Appendix A).
4. Develop a range of plausible alternatives for the cleanup actions and describe a reasonable upper bound for the alternatives being analyzed (see Appendix A).

Scope and cost estimates are provided as a sensitivity analysis for the reasonable upper bound of cleanup action alternatives and scheduled for the current year's Lifecycle Report (Table 1-5).

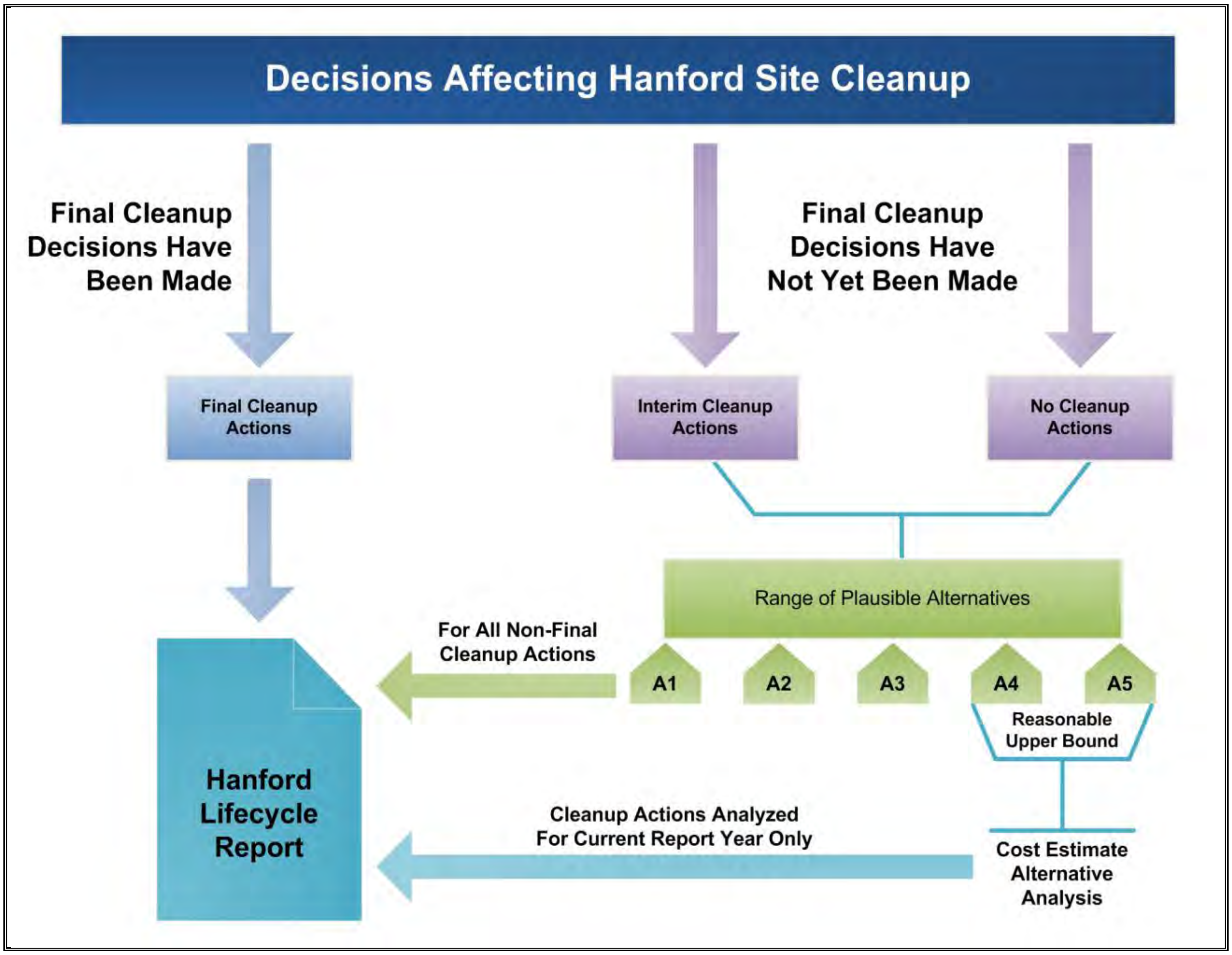

Figure 1-3. Approach to Developing Alternatives and Analyzing the Reasonable Upper Bound in the Lifecycle Report.

1.8 CHANGES FROM PREVIOUS REPORT

Reserved for future use.

2.0 HANFORD SITE CLEANUP PLANNING AND INTEGRATION

This chapter provides background information on DOE's work planning, budget preparation, and integration of activities to implement Hanford Site cleanup. This section also discusses the level of cost detail provided in the Lifecycle Report, consistent with TPA milestone direction.

2.1 PLANNING AND INTEGRATION OVERVIEW

This section introduces the Federal budget formulation process and DOE's overall planning and budget development practices. A general understanding of common terms and methodology will be useful later in this Lifecycle Report, particularly where information about project costs is presented.

2.1.1 Annual Budget Formulation Process

Each year, DOE formulates its budget requests for Congressional appropriations. This annual planning cycle begins between December and January, nearly 2 years before the start of a budgeted fiscal year. The process begins with the budget formulation stage where funding requirements are analyzed, prioritized, requested, and received. This process results in submission of budget requests by the field offices to DOE-HQ in early spring. The process continues with post-formulation monitoring and responding to questions to estimate impacts of actual or potential changes to budget requests. The process ends with receipt of Congressional appropriations. DOE's budget process occurs in four distinct phases:

1. **Field Budget Process.** The field budget process is the first phase of DOE's annual budget formulation process. The Hanford Site offices (DOE-RL and DOE-ORP) prepare and submit field budget data to DOE-HQ for use in the corporate review budget process.
2. **DOE-HQ Corporate Review Budget Process.** The DOE-HQ organizations use field budget data and spring planning decisions to develop initial organizational budget requests that are jointly evaluated and considered in DOE's internal budget review.
3. **OMB Budget Review Process.** The OMB budget review process is the principal mechanism for preparing DOE's annual budget submission to the OMB, which is responsible for assembling the President's annual budget request to Congress.
4. **Congressional Budget Review Process.** The Congressional budget review process determines DOE's final appropriations for the next Federal fiscal year, based on final Presidential funding and policy determinations in conjunction with Federal budget deliberations by Congress.

The annual budgets developed by DOE and appropriated for spending by Congress are allocated to the responsible DOE projects. Congressional budgets commonly provide different allocations, include additional requirements, or provide other directions that can affect project planning. If adjustments are required, DOE goes through a scheduling and resource-leveling process to adjust plans and accommodate the authorized budget. In some cases, this can result in cost and schedule changes to reconfigure activities resulting from budget or other constraints. DOE also must determine the appropriations that will be used to fund each task to comply with applicable budget direction.

Based on final Congressional appropriations, budget formulation, project planning, and re-planning are intertwined and involve iterative processes with similar steps. The main steps, and DOE's process for defining and managing projects and their baseline summaries, are described below.

2.1.2 U.S. Department of Energy Project Formulation Process

DOE follows a structured approach that organizes all environmental management activities into discrete projects. The following information summarizes key components of DOE's cleanup project management approach. Additional details and more in-depth explanations are provided in DOE G 413.3-8, *Environmental Management (EM) Cleanup Projects*.

Project Baseline Summary. DOE-EM projects that have common attributes, such as a common geographic location or activity type, typically are grouped as a PBS. Congressional funding authorizations typically are also allocated by PBS. Each PBS contains a logical grouping of work activities organized in discrete projects or activities by establishing technical scope, cost, and schedule baselines; defining performance metrics; and providing financial history, budget request justification, and other information such as programmatic risk and compliance drivers. DOE may define a cleanup project as the entire PBS, or a project may be a portion of a single or multiple PBSs. A PBS or project may include operations and facility support activities such as surveillance and maintenance (S&M).

Work Breakdown Structure (WBS). The work scope associated with each PBS is further organized into discrete WBS elements. The WBS provides a product/activities-oriented system to arrange, define, and depict all work in a structured framework. This step is essential to developing comprehensive bases for planning and managing project-specific scope, schedule, and cost. Whether the government or a contractor performs the elements, the structure must be compatible with cost estimating and scheduling requirements.

Resource Allocation. The next step is to define the resources necessary to execute each WBS element. Resources include labor, materials, and equipment. These resources are a part of work packages, which define the work for each WBS element. Planning packages are used when the work has not been completely defined. Budget is assigned to planning packages based on a mature estimate, until such time as a work package can be developed.

Project Master Schedule. With a solid WBS and well-developed work packages in place, DOE can develop a master schedule that contains a reliable estimate of the total time required to accomplish each task and the sequence of execution. The master schedule should reveal tasks that must be completed or partially completed before other tasks begin. These interrelationships help define the project's critical path (the sequence of activities that must be completed on schedule for the entire project to be completed on schedule). Task schedules evolve by balancing the work to be done against the required completion date to achieve project milestones.

Resource Leveling. All resources are finite and not all work can be accomplished simultaneously, so work must be organized to ensure existing resources are not overtaxed or underutilized. For example, an engineering or craft labor individual cannot be scheduled to accomplish more than one work package simultaneously, and the same piece of equipment cannot be operated in more than one location at a time. The sequencing of tasks, therefore, addresses not only the order of things to be accomplished, but the availability and optimal use of resources. Resource leveling may result in the need to revise or update a project's master schedule.

Cost Uncertainty and Programmatic Risk. Project management requires that uncertainties be included in planning to address the risk of work not going as planned. Risk dollars are included as part of most cost estimates and are reserved to accommodate additional work scope, conditions and events that were not known during project planning, and other unanticipated changes or uncertainties. Cost information provided in this Lifecycle Report includes estimates for uncertainty based on standard engineering and construction practices and considers the inherent unknowns regarding the nature and extent of contamination within the Hanford Site cleanup projects. Cost uncertainty can accommodate cost change due to discovery as the cleanup proceeds (e.g., conditions during environmental sampling and characterization of newly discovered sites).

Cost Values. In a budget request, cost is represented in escalated dollars. Escalation is the provision in a cost estimate for increases in the cost of equipment, material, labor, etc., due to continuing price changes over time. Escalation is used to estimate the future cost of a project or to bring historical costs to the present. Most cost estimating is done in “current” dollars and then escalated to the time when the project will be accomplished. In general, an escalation rate between 2.0 and 4.0 percent per year is used.

2.2 SCOPE, SCHEDULE, AND COST DEFINITION FOR HANFORD SITE CLEANUP

Consistent with the cleanup project management approach outlined in Section 2.1.2, DOE-RL and DOE-ORP have organized their work into PBSs, which include more detailed work breakdowns to describe in greater context the scope of DOE's projects and operations at the Hanford Site. Hanford Site cleanup currently encompasses 12 PBSs, 10 of which are managed by DOE-RL and 2 of which are managed by DOE-ORP, as shown in Table 2-1.

Further breakdowns exist for the PBSs shown in Table 2-1, and these are discussed in more detail in other chapters of this Lifecycle Report. Table 2-2 shows an example of Level 2 and Level 3 work breakdown associated with a single PBS. This example presents a typical environmental management cleanup project, down to a third tier of planning detail. Most of the work at the Hanford Site has been similarly broken down to at least Level 3.

Depending on complexity of work scope, project maturity, contract period of performance, and other needs, DOE's contractors typically plan their near-term work down to Level 6 and further to manage and schedule the designs, approvals, and resources needed for their projects. This scope, schedule, and cost information rolls up and is incorporated into the upper tier planning information. Table 2-3 depicts an example of work planning down to Level 6 and how it rolls up through Levels 1 through 5.

Table 2-1. Hanford Site Cleanup Project Baseline Summary.

PBS	Title
RL-0011	NM Stabilization and Disposition–PFP
RL-0012	SNF Stabilization and Disposition
RL-0013C	Solid Waste Stabilization and Disposition–200 Area
RL-0020	Safeguards and Security
RL-0030	Soil and Water Remediation–Groundwater/Vadose Zone
RL-0040	Nuclear Facility D&D–Remainder of Hanford and Infrastructure and Services
RL-0041	Nuclear Facility D&D–River Corridor Closure Project
RL-0042	Nuclear Facility D&D–Fast Flux Test Facility Project
RL-0100	Richland Community and Regulatory Support
RL-LTS	Long-Term Stewardship
ORP-0014	Radioactive Liquid Tank Waste Stabilization and Disposition
ORP-0060	Major Construction–Waste Treatment Plant

D&D = decontamination and decommissioning.
LTS = Long-Term Stewardship.
NM = nuclear materials.
PBS = project baseline summary.
PFP = Plutonium Finishing Plant.
SNF = spent nuclear fuel.

Table 2-2. Example Cleanup Project Baseline Summary and Work Breakdown to Level 3.

PBS (Level 1)	**RL-0012 SNF Stabilization and Disposition**
Level 2	RL-12.12 K Basins Closure Project
Level 3	RL-12.12.01 100–K Safe and Compliant
	RL-12.12.02 K Basins Operations and Maintenance
	RL-12.12.03 Facility Operations
	RL-12.12.11 100-K Facilities Deactivation
	RL-12.12.15 105-K West Basin Deactivation and Demolition
	RL-12.12.16 Sludge Treatment Project

PBS = project baseline summary.
SNF = spent nuclear fuel.

Table 2-3. Example of a Level 6 Work Breakdown Structure.

Level 1	RL-0040 Nuclear Facility D&D–Remainder of Hanford
Level 2	040.03 Surveillance and Maintenance and Min-Safe for Facilities and Waste Sites
Level 3	040.03.01 100 Area Surveillance and Maintenance
Level 4	040.03.01.01 100 Area Facility Surveillance and Maintenance
Level 5	040.03.01.01.03 100 Area Reactor Inspection
Level 6	040.03.01.01.03.01 Preparation for Inspection - Work Plan 040.03.01.01.03.03 Remove weld from doors 040.03.01.01.03.04 Blow Fresh Air Into Reactor Area and Check Air Quality 040.03.01.01.03.05 Survey Reactor Interior 040.03.01.01.03.06 Inspection Team Inspection Walk Down 040.03.01.01.03.07 Weld Doors Closed 040.03.01.01.03.08 Demobilize Site 040.03.01.01.03.09 Inspection Report
D&D = decontamination and decommissioning.	

For years beyond the contractor's near-term work, DOE maintains out-year planning estimates for the remaining Hanford Site cleanup. Out-year planning estimates are not as fully developed as near-term planning (typically no further than Level 3 or Level 4). Out-year planning information that DOE maintains beyond the contract terms, along with rolled up near-term information, is further elaborated in Chapters 4.0 through 7.0, and in Appendix E of this Lifecycle Report. Cost information will be updated each year to reflect work completion, recent decision making, and other changes affecting the lifecycle scope (e.g., upgrades or infrastructure modernization to support major projects).

Chapters 4.0 through 7.0 summarize information at PBS Level 2, and include the work breakdown for each PBS, descriptions of the lifecycle work scope and associated work elements, and schedules for completing each of the work elements. Each chapter provides estimated cleanup cost information for corresponding work elements, and includes costs that are not work elements directly performed under the respective PBS. For example, Site-wide Services is not a work element directly performed in each PBS, but rather an estimated oversight cost for the entire lifecycle. Appendix E of this Lifecycle Report provides additional details at Level 3 for near-term work, and at Level 2 for the entire Hanford Site cleanup.

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3.0 HANFORD SITE INTEGRATED LIFECYCLE SUMMARY

This chapter presents the overall Hanford Site cleanup scope, schedule, and cost. Chapters 4.0 through 7.0 and Appendix E present additional details on the PBSs that cover the lifecycle cleanup work scope in the three major cleanup components and Mission Support.

3.1 HANFORD SITE LIFECYCLE SCOPE

The Hanford Site cleanup consists of three major scope components: River Corridor, Central Plateau, and Tank Waste (the Tank Waste component is contained geographically within the Central Plateau). The cleanup includes Mission Support activities that provide key infrastructure and services for the Hanford Site. Hanford Site cleanup is a complex task that involves multiple contractors performing discrete yet interdependent scopes of work. The scope of Hanford Site cleanup work is broken down into a series of PBSs, shown in Table 3-1. Table 3-1 also describes the general scope of each PBS and where in the Lifecycle Report each PBS is addressed.

Table 3-1. Hanford Site Project Baseline Summaries – Richland Operations Office and Office of River Protection. (2 pages)

Lifecycle Report Section	PBS	Official Title	Alternate Titles	General Scope
CHAPTER 4.0 – RIVER CORRIDOR CLEANUP				
River Corridor (Section 4.1)	RL-0041	Nuclear Facility D&D–River Corridor Closure Project	None	Cleanup of the River Corridor waste sites and facilities, including placing the reactors in interim safe storage (this scope excludes groundwater remediation, which is addressed through PBS RL-0030).
River Corridor (Section 4.2)	RL-0012	SNF Stabilization and Disposition	K Basins Closure Project	Removal of K Basins sludge and demolition of the basins and associated facilities.
CHAPTER 5.0 – CENTRAL PLATEAU CLEANUP				
Central Plateau (Section 5.1)	RL-0011	NM Stabilization and Disposition–PFP	PFP Closure Project	Demolition of aboveground facilities and structures at PFP.
Central Plateau (Section 5.2)	RL-0030	Soil and Water Remediation–Groundwater/Vadose Zone	Groundwater Project	Decision-making process for groundwater and waste sites and Hanford Site-wide groundwater remediation.

Table 3-1. Hanford Site Project Baseline Summaries – Richland Operations Office and Office of River Protection. (2 pages)

Lifecycle Report Section	PBS	Official Title	Alternate Titles	General Scope
Central Plateau (Section 5.3) and Mission Support (Section 7.3)	RL-0040	Nuclear Facility D&D–Remainder of Hanford	This PBS has two parts: 1. RL-0040 Central Plateau Remediation 2. RL-0040 Infrastructure and Services or Mission Support	Cleanup of the Central Plateau waste sites and facilities, including canyon facilities. Scope activities directly managed by the U.S. Department of Energy, Richland Operations Office and the management, repair, and capital upgrades to infrastructure.
Central Plateau (Section 5.4)	RL-0042	Nuclear Facility D&D–Fast Flux Test Facility Project	None	Demolition of the Fast Flux Test Facility and associated waste sites and structures.
Central Plateau (Section 5.5)	RL-0013C	Solid Waste Stabilization and Disposition–200 Area	Solid and Liquid Waste Disposition Project	Waste management operations, including storage, treatment, and disposal of Hanford Site waste streams and off-site wastes.
CHAPTER 6.0 – TANK WASTE CLEANUP				
Tank Waste Cleanup (Section 6.1)	ORP-0014	Radioactive Liquid Tank Waste Stabilization and Disposition	None	Operations, retrieval, treatment, and closure of the single-shell and double-shell tanks.
Tank Waste Cleanup (Section 6.2)	ORP-0060	Major Construction–Waste Treatment Plant	None	Construction of the Waste Treatment and Immobilization Plant.
CHAPTER 7.0 – MISSION SUPPORT				
Mission Support (Section 7.1)	RL-0020	Safeguards and Security	None	Protection of the Hanford Site, special materials, resources, and workers.
Mission Support (Section 7.2)	RL-0100	Richland Community and Regulatory Support	None	Support for community and regulatory interaction, including the Hanford Advisory Board, the Natural Resource Trustee Council, the Oregon Department of Energy, and the Washington State Department of Ecology.
Mission Support (Section 7.4)	RL-LTS	Long-Term Stewardship (LTS)	Post-cleanup LTS	Infrastructure support, surveillance and maintenance, community support, and management activities following completion of cleanup activities.

D&D = decontamination and decommissioning.
NM = nuclear materials.
PBS = project baseline summary.
PFP = Plutonium Finishing Plant.
SNF = spent nuclear fuel.

3.2 HANFORD SITE CLEANUP SCHEDULE

The Hanford Site's remaining cleanup schedule covers activities for waste cleanup and waste management, leading to transition of portions of the Hanford Site to long-term stewardship (LTS). Figure 3-1 depicts the remaining schedule for the primary cleanup components. Chapters 4.0 through 7.0 and Appendix E of this Lifecycle Report present additional schedule details for the River Corridor, Central Plateau, Tank Waste, and Mission Support activities. Figure 3-1 shows River Corridor Cleanup complete by FY 2024 (River Corridor Closure Project in 2014, 100-K Area in 2024), Tank Waste Cleanup complete by FY 2050, Central Plateau Cleanup complete by FY 2066, and FY 2060 through 2066 is to address closure of the Environmental Restoration Disposal Facility (ERDF).

To support the cleanup, DOE-RL also has responsibility for Mission Support activities related to safeguards and security, community and regulatory support, Hanford Site infrastructure and services, and LTS. These Mission Support activities align with the cleanup through FY 2060, when the Hanford Site is expected to be fully transitioned to LTS. DOE-RL has planned for an LTS period that runs from FY 2061 through FY 2090 as part of Mission Support.

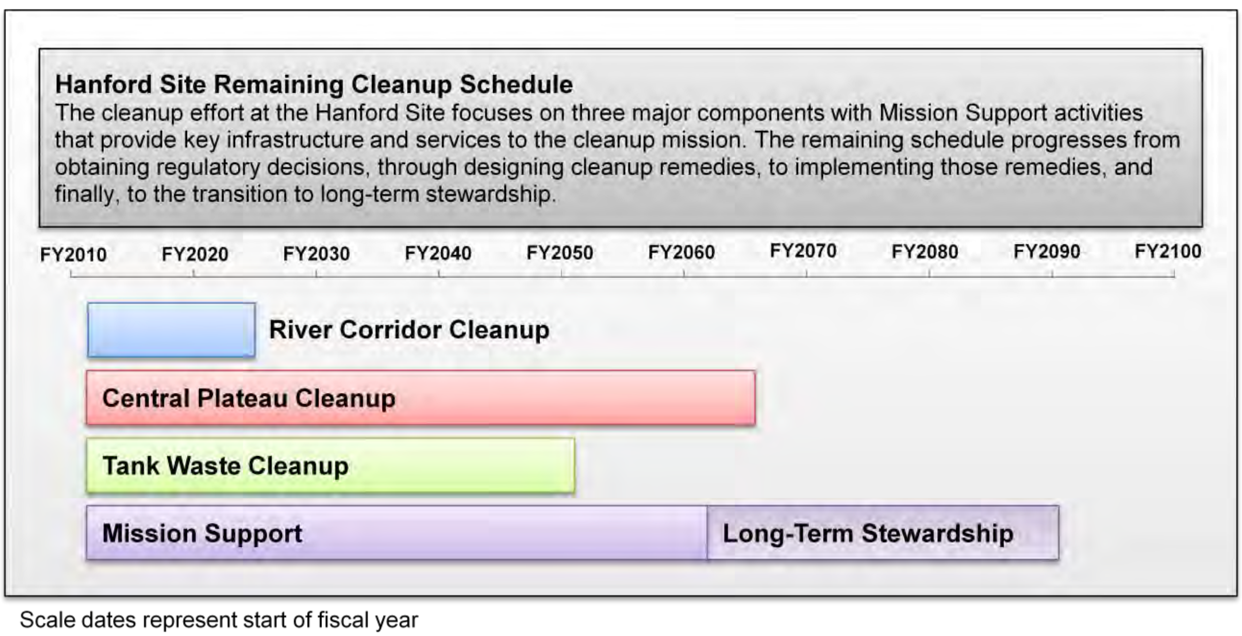


Figure 3-1. Hanford Site Remaining Cleanup Schedule.

3.3 HANFORD SITE ESTIMATED CLEANUP COST

The DOE remaining cleanup costs are estimated to be about $115 billion to complete the scope for the River Corridor, Central Plateau, Tank Waste, and Mission Support activities. DOE-RL scope accounts for about $52 billion, or about 45 percent of the total costs. DOE-ORP scope accounts for about $63 billion, or about 55 percent. These estimates include cost uncertainty because many of the final cleanup decisions have not been made. Once these decisions are made, estimates will be revised.

Figure 3-2 summarizes the Hanford Site estimated ~~"to~~ go" cleanup cost distribution between DOE-RL and DOE-ORP. Figure 3-3 shows the Hanford Site remaining cleanup costs by year for DOE-RL and DOE-ORP. Figure 3-4 summarizes the estimated Hanford Site cleanup costs by DOE-RL and DOE-ORP PBSs. Table 3-2 provides a summary of total estimated cleanup costs for each PBS.

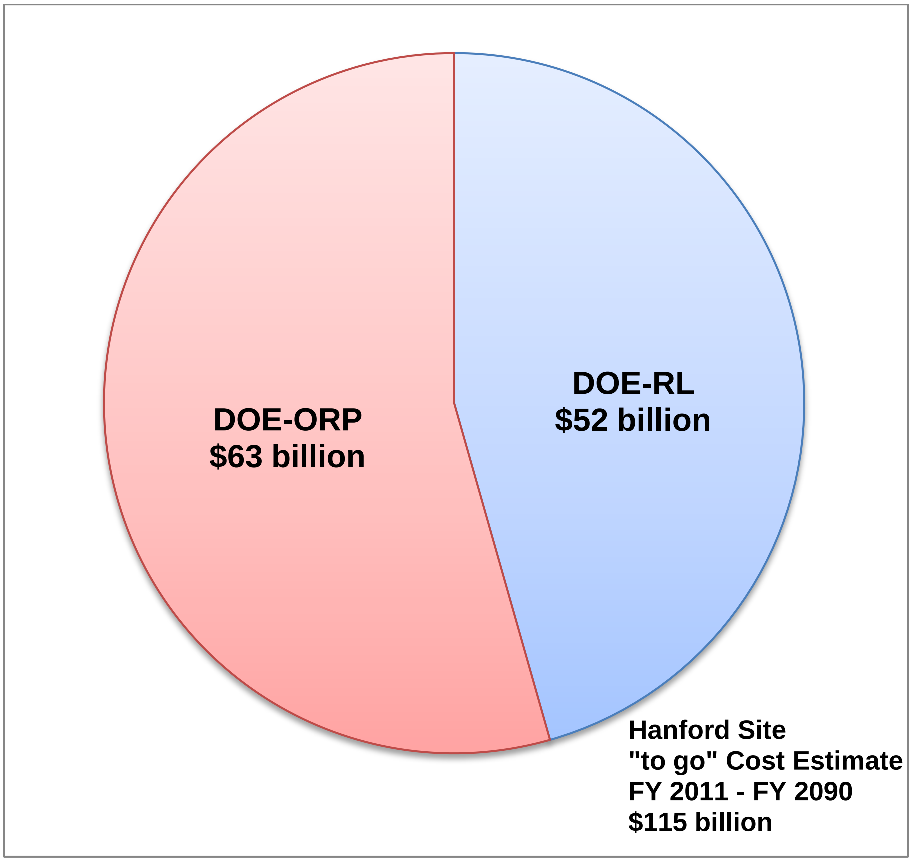


Figure 3-2. Hanford Site Estimated Cleanup Cost Distribution by U.S. Department of Energy Field Office.

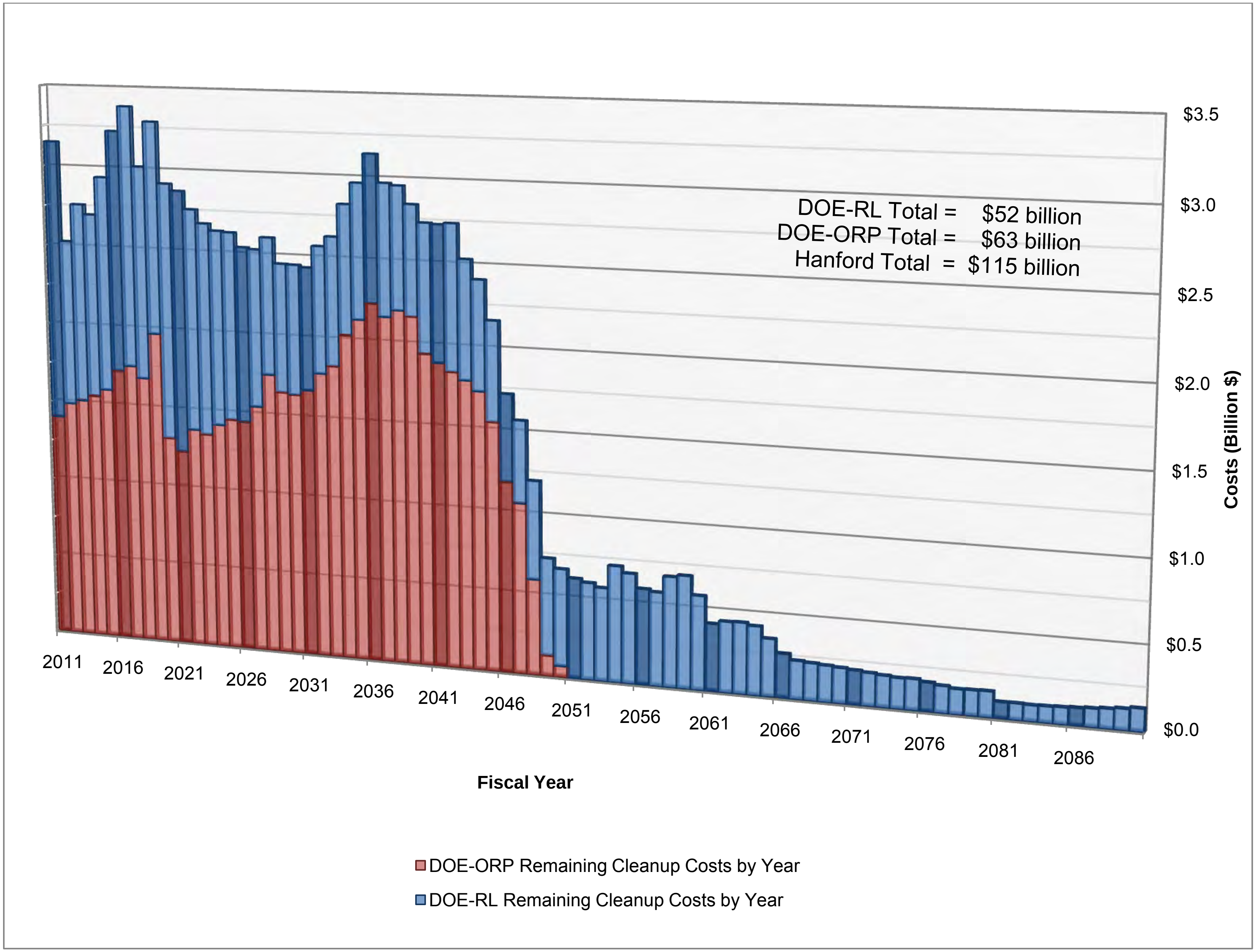


Figure 3-3. Hanford Site Remaining Cleanup Costs by Fiscal Year.

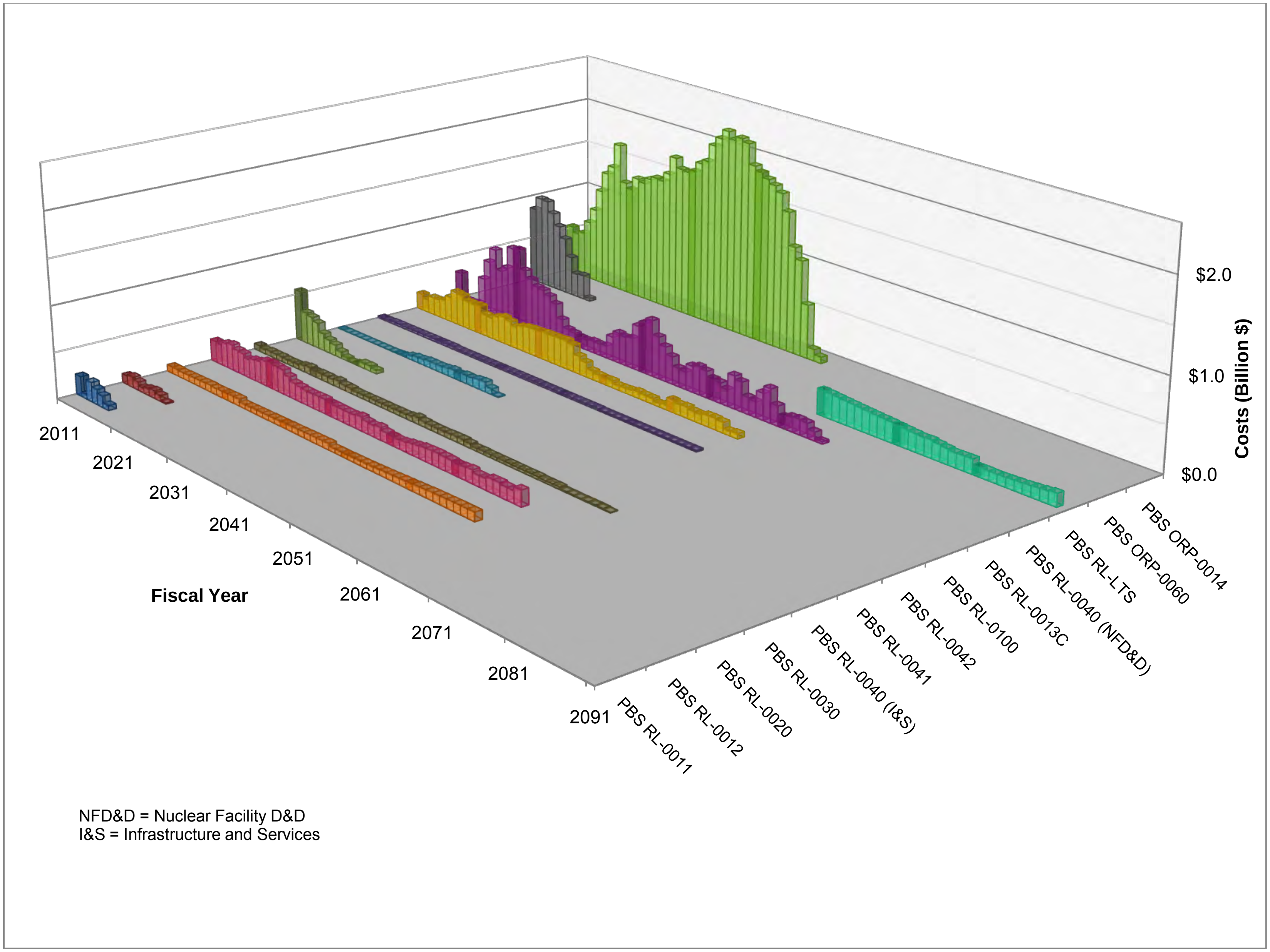


Figure 3-4. Hanford Site Remaining Cleanup Costs by Project Baseline Summary.

Table 3-2. Hanford Site Remaining Cleanup Cost Estimates by PBS.

Project Work Scope	Estimated Cleanup Costs[1] (Billion $)
DOE-RL Total Remaining Estimated Costs	**$47.4 - $51.9**
NM Stabilization and Disposition – PFP (PBS RL-0011)	$0.8
SNF Stabilization and Disposition (PBS RL-0012)	$0.5 - $0.6
Solid Waste Stabilization and Disposition - 200 Area (PBS RL-0013C)	$9.0 - $9.2
Safeguards and Security (PBS RL-0020)	$3.3
Soil and Water Remediation - Groundwater/Vadose Zone (PBS RL-0030)	$8.0 - $8.3
Nuclear Facility D&D - Remainder of Hanford (PBS RL-0040)	$13.9 - $17.6
Infrastructure and Services (PBS RL-0040)	$2.3
Nuclear Facility D&D - River Corridor Closure Project (PBS RL-0041)	$2.1 - $2.2
Nuclear Facility D&D - Fast Flux Test Facility Project (PBS RL-0042)	$1.1
Richland Community and Regulatory Support (PBS RL-0100)	$1.0
Long-Term Stewardship (PBS RL-LTS)	$5.4
DOE-ORP Total Remaining Estimated Costs	**$56.5 - $62.7**
Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014)	$50.4 - $56.6
Major Construction – Waste Treatment Plant (PBS ORP-0060)	$6.1
Hanford Site Total Remaining Estimated Costs	**$103.9 - $115**

[1] Cost ranges have been shown in this table to reflect cost and schedule uncertainty; the higher number is used throughout this report.

D&D = decontamination and decommissioning.
DOE-ORP = U.S. Department of Energy, Office of River Protection.
DOE-RL = U.S. Department of Energy, Richland Operations Office.
LTS = long-term stewardship.
NM = nuclear materials.
PBS = project baseline summary.
PFP = Plutonium Finishing Plant.
SNF = spent nuclear fuel.

NOTE: These cost estimates do not reflect the cost estimates prepared for the remaining cleanup action alternatives as shown in Table ES-2.

3.4 SCOPE AND COSTS NOT DIRECTLY RELATED TO CLEANUP

As stated in TPA Milestone M-036-01:

> **“USDOE may also include costs other than those directly related to environmental obligations (such as security costs) but shall clearly distinguish expenditures for environmental obligations from other expenditures.”**

For purposes of this 2011 Lifecycle Report, DOE has treated all Hanford Site scope and costs as being directly related to environmental obligations. This approach has been taken because virtually all Hanford Site work is necessary for successful completion of the cleanup and can rarely be distinguished from non-cleanup work. This is particularly the case when work fulfills multiple purposes, such as maintaining Hanford Site infrastructure (e.g., roads, utilities). Even the costs for security include, in addition to guarding nuclear materials, other actions that directly support cleanup, such as controlling and restricting access to contaminated areas of the Hanford Site, protecting property and equipment used for environmental remediation, and ensuring that only authorized workers are allowed on-site to perform cleanup work.

4.0 RIVER CORRIDOR CLEANUP

The River Corridor, the area of the Hanford Site along the Columbia River, is comprised of four production and operations areas:

- **100 Areas –** the location of nine former production reactors, associated support facilities, and related waste sites.
- **300 Area –** the location of research, development, and fuel fabrication facilities, and related waste sites.
- **400 Area –** the buildings and waste sites other than the Fast Flux Test Facility (FFTF).
- **600 Area –** the location of two major burial grounds (618-10 and -11) with some soil and debris sites.

The majority of the River Corridor Cleanup is on track for completion by FY 2015. Work related to the 100-K Area is scheduled for completion by FY 2024, in conjunction with SNF Stabilization and Disposition (PBS RL-0012) and Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) work scope.

DOE manages the River Corridor Cleanup through two projects, which are planned and funded under separate PBSs:

1. Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041) addresses the cleanup of waste sites, burial grounds, and facilities in the 100, 300, 400, and 600 Areas and the interim safe storage (ISS) of the C, D, DR, F, H, KE, KW, and N Reactors. This project is currently responsible for operating and maintaining the ERDF, located on the Central Plateau, which is the disposal location for the remediation waste from the River Corridor and other Hanford Site cleanup operations. Section 4.1 discusses the scope of this project.
2. SNF Stabilization and Disposition (PBS RL-0012) addresses the removal of fuel and sludge from the K Basins. Because the 105-K East (105-KE) Basin has been demolished, the remaining scope is focused on the 105-K West (105-KW) Basin. Section 4.2 discusses the scope of this project.

Groundwater cleanup is underway in the River Corridor. DOE-RL manages the groundwater cleanup through Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030), which covers groundwater remediation for the entire Hanford Site. Therefore, the groundwater associated with the River Corridor is discussed in the Central Plateau Cleanup in Section 5.2.

Cleanup is conducted in accordance with interim and final records of decision (RODs) and action memoranda as listed in Appendix D and with key TPA milestones as listed in Table 4-1. These TPA milestones provide the structure that the TPA agencies have agreed to for Hanford Site priorities and scope sequencing.

Table 4-1. River Corridor Cleanup Key Tri-Party Agreement Milestones.

Milestone	Title	Compliance Date
Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041)		
M-016-00A	Complete all interim response actions for the 100 Areas, excluding K Area.	12/31/2012
M-016-00B	Complete all interim 300 Area remedial actions.	09/30/2018
M-016-00C	Complete all interim response actions for 100-K Area.	TBD
M-016-47	Complete interim remedial actions for 100-D Area.	12/31/2011
M-016-51	Complete interim remedial actions for 100-H Area.	12/31/2011
M-016-53	Complete interim response actions for 100-K Area within the perimeter boundary and to the river for Phase I actions.	12/31/2012
M-016-55	Complete interim response actions for 100-N Area.	12/31/2012
M-016-56	Complete interim remedial actions for 100-IU-2 and 100-IU-6.	02/28/2012
M-016-69	Complete all interim 300 Area remedial actions.	09/30/2015
M-016-74	Complete interim remediation for all 300 Area.	09/30/2012
M-016-75	Initiate substantial and continuous remediation on the 309 facility.	09/30/2013
M-016-139	Complete revegetation of 300-FF-2 OU waste sites governed by Milestone M-016-74.	03/31/2013
M-016-143	Complete interim response actions for 100-K Area within the perimeter boundary and to the river for Phase 2 actions.	12/31/2015
M-089-00	Closure of non-permitted mixed waste units in 324 Building Radiochemical Engineering Cells B and D.	09/30/2012
M-092-16	Complete removal/transfer/initiate storage of PH-III 300 Area special case waste.	09/30/2015
M-093-00	Final disposal of 100 Areas surplus production reactor buildings.	TBD
M-093-20	Complete 105-N Reactor ISS.	09/30/2012
M-093-22	Complete 105-KE Reactor ISS.	07/31/2014
M-094-00	Complete disposition of 300 Area surplus facilities.	09/30/2015
M-094-08	Complete the selected removal and/or remedial actions for 11 of the following high priority facilities: 305B, 306E, 306W, 307 Retention Basins, 308, 309, 321, 323, 324, 324B, 327, 333, 340, 3706, and 3720.	12/31/2011
M-094-09	Complete the selected removal and/or remedial actions for 13 of the following high-priority facilities: 305B, 306E, 306W, 307 Retention Basins, 308, 309, 321, 323, 324, 324B, 326, 327, 329, 333, 340, 3706, and 3720; to include the 323 Facility.	09/30/2013

D&D = decontamination and decommissioning.
ISS = interim safe storage.
OU = operable unit.
PBS = project baseline summary.
TBD = to be determined.

4.1 NUCLEAR FACILITY D&D–RIVER CORRIDOR CLOSURE PROJECT (PBS RL-0041)

The Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041) will clean up the areas of the Hanford Site located in the Columbia River Corridor in accordance with the existing interim RODs and future final RODs (see Appendix A). Anticipated land uses for the River Corridor are described in DOE/EIS-0222-F, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, and in the pursuant ROD.

The River Corridor Closure Project has established the following cleanup objectives:

- Remediate waste sites.
- Deactivate, decontaminate, decommission, and demolish (D4) facilities.
- Place eight plutonium production reactors into ISS. Figure 4-1 and Figure 4-2 depict C Reactor before and after the ISS process. Table 4-2 provides the status of the reactors. Note B Reactor's status as a National Historic Landmark.
- Operate ERDF to support disposal of waste generated during D4, field remediation, ISS, and support to other Hanford Site waste generators.
- Complete substantive remediation to allow the 100 and 300 Areas to be deleted from the National Priorities List.
- The River Corridor Closure Project includes the 600 Area remediation of burial sites 618-10 and 618-11 by September 30, 2015.

Figure 4-1. C Reactor Before Interim Safe Storage.

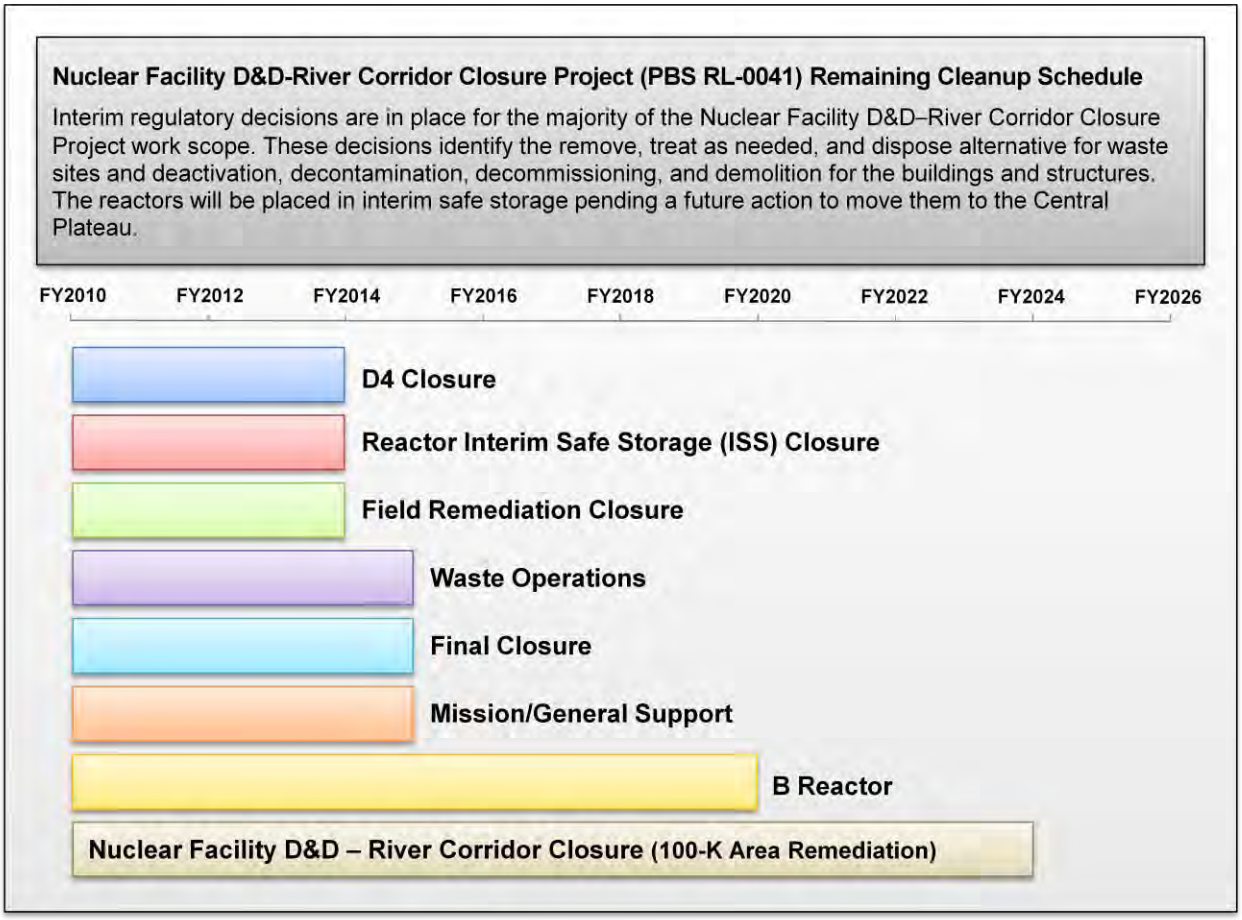
Figure 4-2. C Reactor in Interim Safe Storage.

Table 4-2. Reactor Status.

Reactor	Status (as of October, 2010)	Remaining Activity
B	Named National Historic Landmark by U.S. Department of Interior in 2008. Reactor open for escorted public tours.	Remaining remediation (basin material disposition) to be complete by 2012. National Park Service to decide in 2011 whether to incorporate B Reactor into a new Manhattan Project Historical Park.
C	Reactor placed in ISS.	Final disposition of reactor block.
D	Reactor placed in ISS.	Final disposition of reactor block.
DR	Reactor placed in ISS.	Final disposition of reactor block.
F	Reactor placed in ISS.	Final disposition of reactor block.
H	Reactor placed in ISS.	Final disposition of reactor block.
KE	Fuel storage basin demolished; continued deactivation, decommissioning, and demolition activities in preparation for emplacement of safe storage enclosure.	ISS (scheduled to be complete by 07/31/2014); final disposition of reactor block; DOE-RL is assessing potential near-term removal of this reactor through a dismantling alternative.
KW	Awaiting sludge removal to proceed with demolition of adjacent buildings and installation of safe storage enclosure to complete ISS activities.	ISS; final disposition of reactor block.
N	Reactor ISS underway.	ISS (scheduled to be complete by fiscal year 2013); final disposition of reactor block.

DOE-RL = U.S. Department of Energy, Richland Operations Office.
ISS = interim safe storage.

Figure 4-3 depicts the primary Level 2 work elements within the Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041) remaining cleanup schedule. Table 4-3 summarizes the scope for the Level 2 work elements.



Scale dates represent start of fiscal year

Figure 4-3. Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041) Remaining Cleanup Schedule.

Table 4-3. Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041) Level 2 Scope Summary. (2 pages)

Work Element	Scope Description
D4 Closure	This work element includes D4 of approximately 500 facilities, provision of utility and surveillance and maintenance services during D4, and closure of utilities located in the River Corridor. The D4 closure buildings are located throughout the River Corridor in the 100, 300, 400, and 600 Areas of the Hanford Site. Typical hazards associated with the buildings include radiological contamination (e.g., uranium, mixed fission products, activation products, plutonium), chemical hazards (e.g., beryllium, asbestos, laboratory chemicals), and industrial hazards (e.g., elevated working locations, degraded roofs, biological hazards, electrical hazards, excavations). The D4 process includes obtaining regulatory approvals; characterizing the hazards and waste; deactivating the facility by removing loose hazardous materials and equipment; decontaminating the facility to allow open-air demolition; and decommissioning the facility by disconnecting utilities and services. The structure is then demolished using techniques such as heavy equipment (e.g., track hoe, processor, loader, cranes), explosives, cutting equipment, or other methods and the demolition debris is disposed, generally to ERDF. Following demolition, samples are collected to verify that cleanup criteria are met, and the sites are backfilled and revegetated.
Reactor Interim Safe Storage (ISS) Closure	This work element includes removal of reactor area buildings and components, leaving the reactor blocks intact in ISS. The reactors will then undergo surveillance, monitoring, and maintenance for a period of time up to 75 years, to allow radionuclides to decay. Following this period, the reactor blocks will be removed from their current locations and transported to the 200 Area for disposal. Figure 4-1 and Figure 4-2 show the change in reactor site footprint before and after being placed in ISS.
Field Remediation Closure	This work element includes performing CERCLA field remediation and closure of contaminated waste sites and burial grounds within the River Corridor. This includes design and closure; confirmatory sampling; remediation of waste sites, liquid waste sites, and burial grounds; miscellaneous restoration; and support activities. The RODs for the Field Remediation Closure work scope generally identify RTD as the preferred alternative. (RODs are identified in Appendix D.) In addition to RTD, confirmatory sites were identified that require sampling to determine the need for RTD. Following sampling, these sites either become RTD sites or are closed as no-action sites. Contamination in the waste sites and burial grounds of the River Corridor include chemical and radioactive constituents, such as asbestos, lead, chromium, carbon tetrachloride, strontium, uranium, cesium, and tritium. The cleanup process involves sampling and analyzing the site to determine the extent and type of contamination, excavating contaminated waste materials, and restoring the landscape through site backfill, grading, and revegetation.
Waste Operations	This work element includes the transportation, disposal, and treatment (if required) of waste from the River Corridor Cleanup activities, as well as from other Hanford Site cleanup operators. Waste operations will expand and operate the ERDF, and transition the ERDF to a successor operator at the end of the Nuclear Facility D&D–River Corridor Closure Project.
Final Closure	This work includes preparing an integrated River Corridor work plan for a CERCLA baseline risk assessment; preparing a baseline risk assessment for the 100 and 300 Areas; conducting a risk evaluation for River Corridor areas outside of the 100 and 300 Areas; conducting orphan site evaluations; conducting surface soil surveys; preparing remedial action reports; preparing a remedial investigation report and a proposed plan for River Corridor source areas.

Table 4-3. Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041) Level 2 Scope Summary. (2 pages)

Work Element	Scope Description
Mission/General Support	This work element consists of functional support and business operations necessary to achieve River Corridor Closure and field project objectives. This includes providing trained and qualified staff, performance standards, facilities services, and office supplies. General support functions include safety health and quality, regulatory and environmental management, project integration, project services, engineering services, and Office of the Project General Manager.
B Reactor	This work element includes management and oversight for B Reactor facility activities, including planning, directing, and providing technical support to maintain, upgrade, and preserve the B Reactor facility in a safe condition.
Nuclear Facility D&D–River Corridor Closure (100-K Area Remediation)	This work element includes remediation of waste sites and building and structure D4 in the 100-K Area. These activities are consistent with the activities identified for D4 closure and field remediation closure, but are managed by a separate contract due to the need to complete removal of sludge from KW Basin prior to completing the remediation. Work is underway utilizing separate contracts for work inside versus outside the fence at the Nuclear Facility D&D–River Corridor Closure Project (100-K Area Remediation). The scope includes the ISS of the KE and KW Reactors consistent with the other 100 Area reactors.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq.

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act.*
D4 = deactivation, decontamination, decommissioning, and demolition.
D&D = decontamination and decommissioning.
ERDF = Environmental Restoration Disposal Facility.
ISS = interim safe storage.
PBS = project baseline summary.
ROD = record of decision.
RTD = remove, treat, and dispose.

Figure 4-4 presents the remaining cleanup costs for PBS RL-0041 by fiscal year, and Figure 4-5 presents the remaining estimated costs by work element.

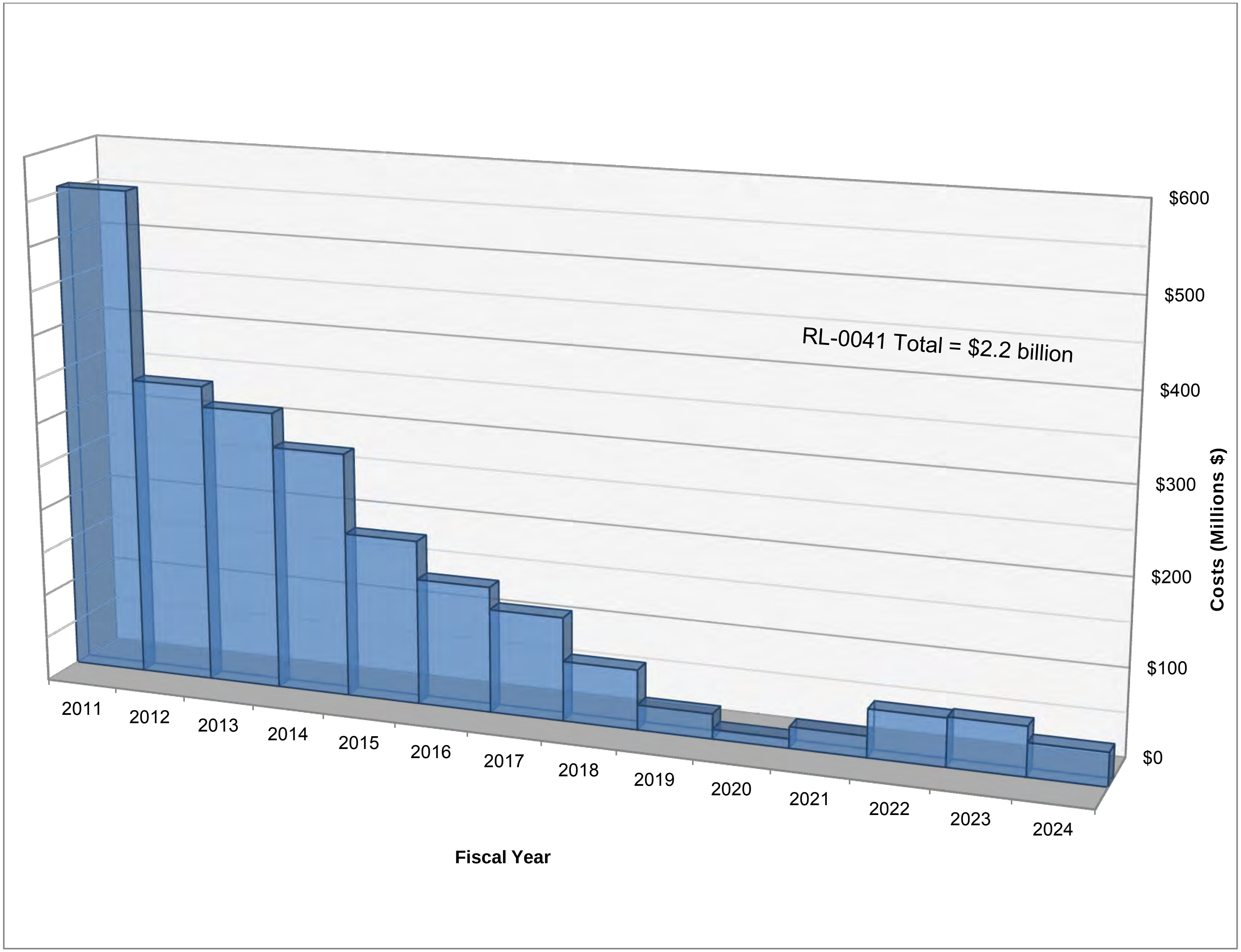


Figure 4-4. Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041) Remaining Estimated Cleanup Costs by Fiscal Year.

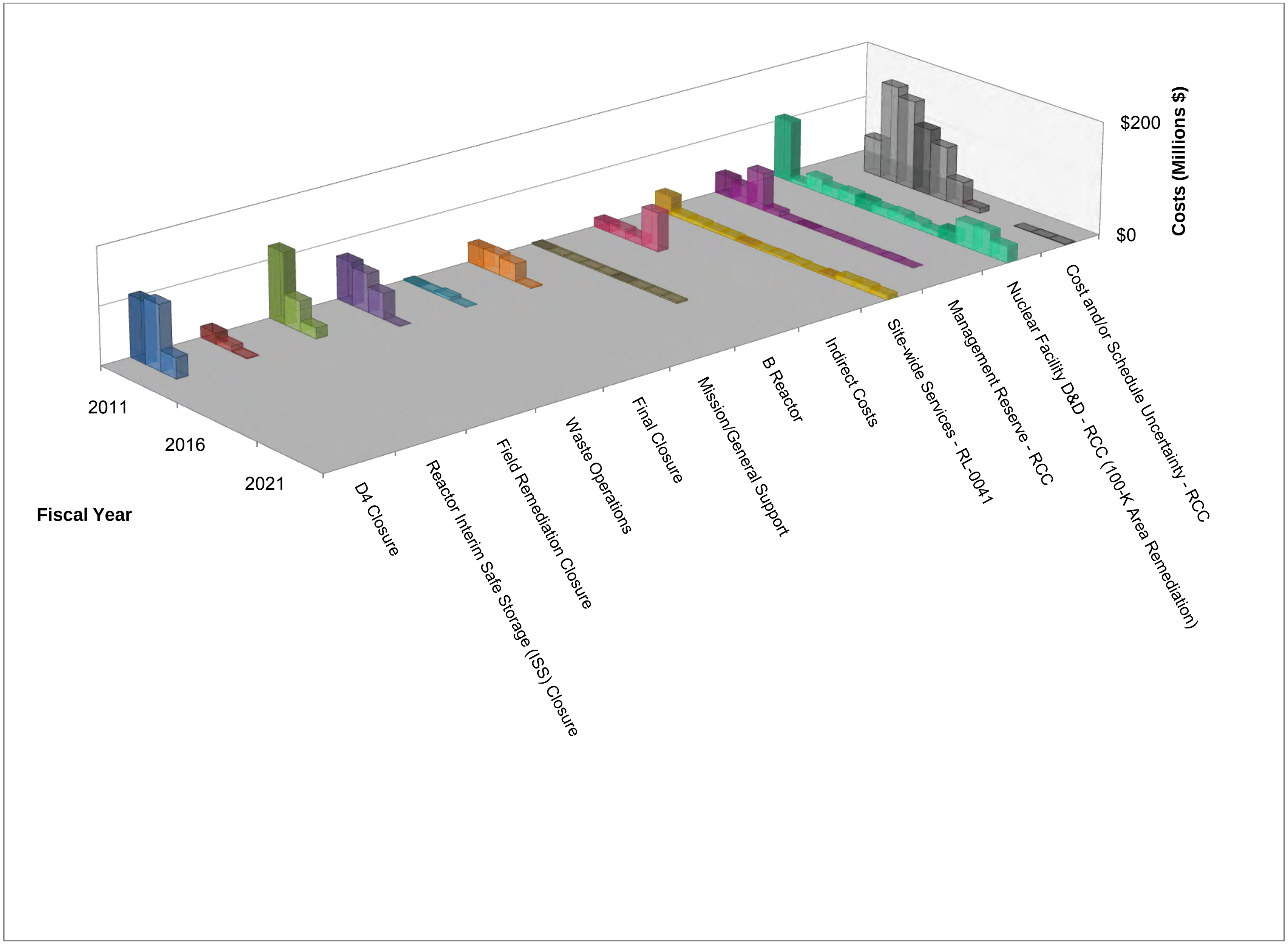


Figure 4-5. Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041) Remaining Estimated Cleanup Costs by Work Element.

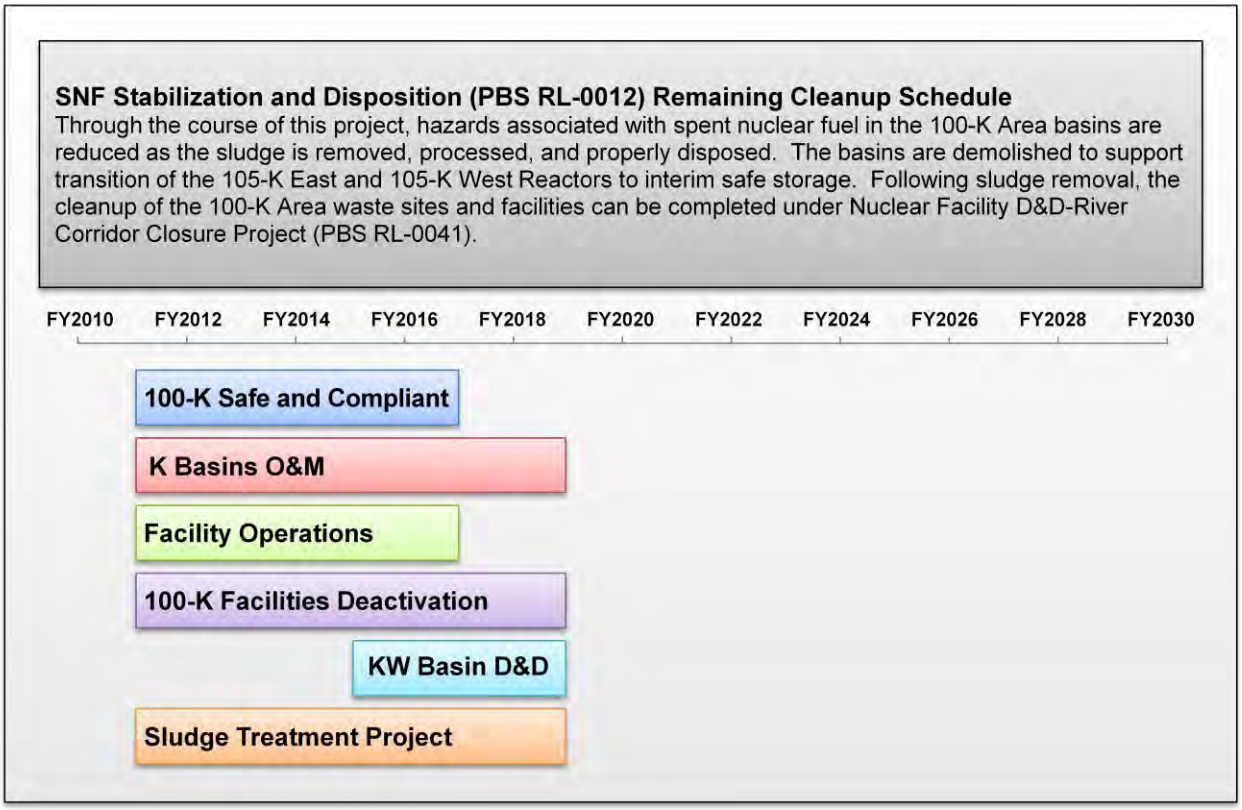
4.2 SNF STABILIZATION AND DISPOSITION (PBS RL-0012)

The Spend Nuclear Fuel (SNF) Stabilization and Disposition Project (PBS RL-0012) provides for safe stabilization, packaging, and interim storage of SNF sludge. After the removal of sludge, the project will D4 the K Basins and other SNF project-related facilities. The mission requires sludge removal and treatment in concert with deactivating and dismantling the remaining K Basin systems and structures as they are no longer needed for the sludge project. At the completion of this project, significant hazards to workers, the public, and the environment will have been eliminated.

The major cleanup objectives for the SNF Stabilization and Disposition Project (PBS RL-0012) are:

- All SNF will be removed from the K Basins and repackaged, dried, and transported to interim storage at the Canister Storage Building (CSB).
- Sludge material from K Basin knock-out pots will be pretreated, packaged, dried, and transported to interim storage at the CSB pending disposal at a future repository.
- The remaining sludge will be retrieved and shipped to an interim on-site storage facility, then treated and packaged for shipment to an off-site disposal facility.
- Debris within the 105-KW Basin will be packaged and transported for disposal.
- The water in the 105-KW Basin, after treatment with existing ion exchange equipment, will be transported to the 200 Area for treatment and disposal.
- The 105-KW Basin will be isolated from its associated reactor building and the basin building shell and superstructure removed. The 105-KW Basin substructure will be demolished and the demolition waste transported to the 200 Area for disposal at the ERDF.

The work scope for SNF Stabilization and Disposition Project (PBS RL-0012) is organized into six main work elements, as shown in Figure 4-6, which also presents the remaining cleanup schedule. Additional scope information on these work elements is provided in Table 4-4.



Scale dates represent start of fiscal year

Figure 4-6. SNF Stabilization and Disposition Project (PBS RL-0012) Remaining Cleanup Schedule.

Table 4-4. SNF Stabilization and Disposition (PBS RL-0012) Level 2 Scope Summary.

Work Element	Scope Description
100-K Safe and Compliant	This work element provides for the safety of workers, the public, and the environment from K Basin infrastructure and contaminated materials through monitoring, surveillance, containment, and management activities.
K Basins Operations and Maintenance	This work element includes dose data gathering and analysis; sampling and characterization of both radioactive and hazardous waste to maintain compliance within the 105-KW Basin (note that 105-KE Basin already has been demolished); and basic plant maintenance and general duties of operations to keep 105-KW Basin in a safe and compliant condition during sludge and D&D processes.
Facility Operations	This work element includes auxiliary operations support, conduct of operations support, waste management support, and sample management support. Specific tasks include, but are not limited to, operational and environmental sampling, operation of potable and service water supplies, and conduct of operations.
100-K Facilities Deactivation	This work element consists of the deactivation of ancillary facilities in preparation for further D4 activities. Specific examples of activities include deactivation of utilities, removal of furniture and equipment/tools, stabilization of asbestos, identification and recording of hazardous materials, and decontamination of radiological contaminated areas. The scope also includes deactivation of the Cold Vacuum Drying Facility.
KW Basin Deactivation and Demolition	This work element covers the deactivation, including utility isolation, and dewatering of the 105-KW Basin followed by activities, such as asbestos abatement, to prepare the basin for demolition. The demolition of the 105-KW Basin will be conducted similar to the 105-KE Basin demolition that was completed in FY 2009. The garnet filter material will be transferred to appropriate containers, sampled, and shipped to an appropriate on-site disposal facility. The filters themselves will be grouted and shipped to ERDF as monoliths.
Sludge Treatment Project	This work element includes the design, procurement, fabrication, installation, testing, startup, operation, deactivation, and decontamination of the equipment necessary to perform the functions to remove consolidated containerized sludge, knock-out pot sludge, and settler tank sludge from the 105-KW Basin, to then stabilize and package the sludge for interim storage at the Hanford Site. Once stabilized and placed into storage, the waste stream will be handed off to another project area (PBS RL-0013C, Solid Waste Stabilization and Disposition–200 Area) for final disposition to WIPP or other disposal facilities.

D4 = deactivation, decontamination, decommissioning, and demolition.
D&D = decontamination and decommissioning.
ERDF = Environmental Restoration Disposal Facility.
FY = fiscal year.
PBS = project baseline summary.
WIPP = Waste Isolation Pilot Plant.

Figure 4-7 presents remaining estimated cleanup costs for SNF Stabilization and Disposition (PBS RL-0012) by fiscal year, and Figure 4-8 presents remaining estimated cleanup costs by work element.

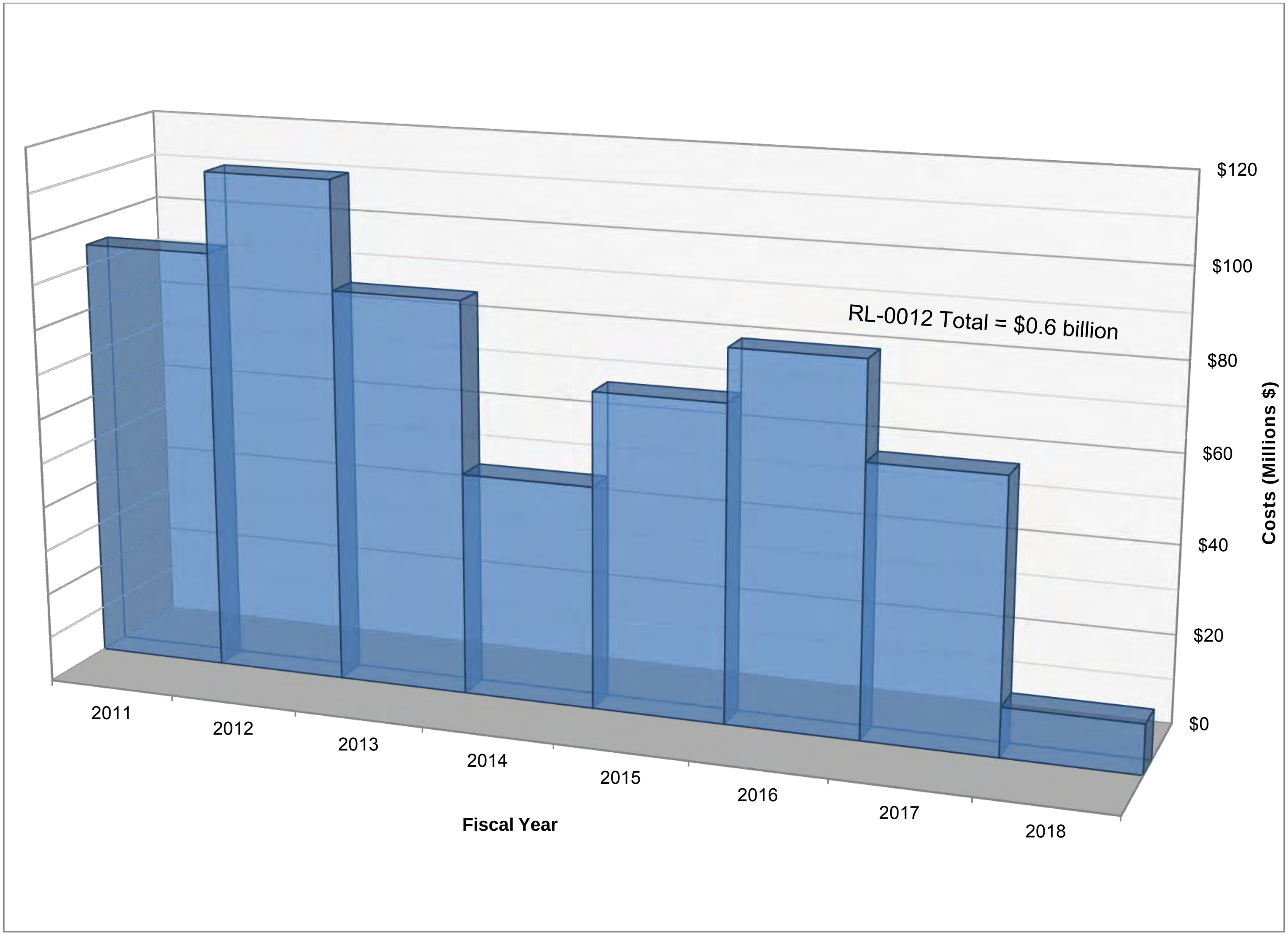


Figure 4-7. SNF Stabilization and Disposition (PBS RL-0012) Remaining Estimated Cleanup Costs by Fiscal Year.

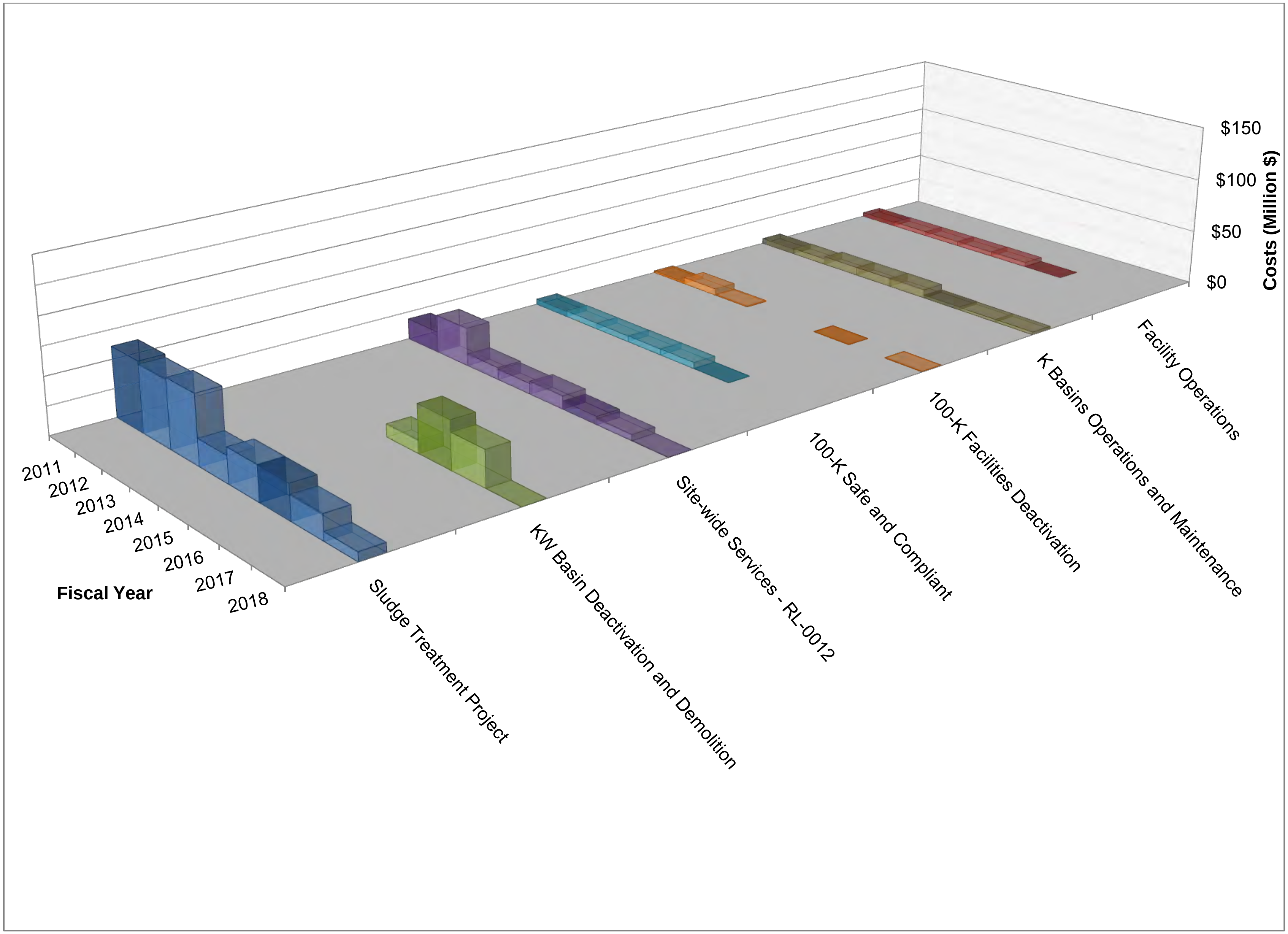


Figure 4-8. SNF Stabilization and Disposition (PBS RL-0012) Remaining Estimated Cleanup Costs by Work Element.

4.3 RIVER CORRIDOR CLEANUP ASSUMPTIONS AND UNCERTAINTIES

In planning for the Hanford Site lifecycle, there are uncertainties that are analyzed to estimate potential scope, cost, and schedule changes. The following assumptions are identified for Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041) work scope:

- Final RODs will confirm that cleanup levels established in the interim RODs are protective of human health and the environment. Additional work scope to address ecological receptors will not significantly impact cost or schedule.
- Regulatory changes will not require additional activities (e.g., document revisions, additional sampling) that would significantly affect costs or schedules.
- The B Reactor National Historic Landmark designation will not impact the completion dates or cost of other cleanup activities.
- Pacific Northwest National Laboratory (PNNL) operating facilities will be available in accordance with current schedules for the 300 Area cleanup.

For SNF Stabilization and Disposition (PBS RL-0012), the following assumptions are currently identified:

- Compliance with regulatory standards and requirements will provide an adequate level of protection for the worker, public health, safety, and the environment during operations activities and after D4 is complete.
- ERDF waste acceptance criteria will not change substantially.
- T Plant is acceptable for sludge storage and no pretreatment for the sludge is needed before transfer.
- Post-CERCLA ROD treatability studies and focused feasibility studies will not affect the sludge treatment process.

Some of these assumptions may be subject to change because of schedule uncertainty (e.g., turnover dates for PNNL facilities and the K Basins). However, the *River Corridor Closure Project Project Execution Plan* (DOE 2010b), developed in accordance with DOE O 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, is under change control and will accommodate assumption changes.

4.4 RIVER CORRIDOR CLEANUP ACTION - REACTOR CORE DISPOSITION COST ESTIMATE ALTERNATIVE ANALYSIS

The reactor core disposition cost estimate alternative analysis identifies the potential actions surrounding decommissioning of the 100 Area reactors. Currently, five of the nine reactors (C, D, DR, F, and H) have been placed in ISS configuration. The N Reactor and KE Reactor are undergoing ISS and KW Reactor is scheduled to undergo ISS by 2019. The B Reactor, which is a National Historic Landmark, is being evaluated by the National Park Service for inclusion in a new, multi-site Manhattan Project National Historical Park. The National Park Service expects to make its decision in 2011. Pending the outcome of that decision, the ISS activities for B Reactor are on hold, and are not included in this analysis.

4.4.1 Reactor Core Disposition Range of Plausible Alternatives and Reasonable Upper Bound

In December 1992, DOE issued DOE/EIS-0119F, *Addendum (Final Environmental Impact Statement): Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington*. In September 1993, DOE issued 58 FR 48509, ―Record of Decision: Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington," which implements the recommendation for ―safe storage followed by one-piece removal" of the surplus reactors.

The following alternatives were evaluated in the final environmental impact statement (EIS) (DOE/EIS-0119F):

- Safe Storage Followed by Deferred Dismantlement.
- Immediate One-Piece Removal.
- In Situ Decommissioning.
- Safe Storage Followed by Deferred One-Piece Removal.
- No Action.

The alternatives evaluated in the EIS (DOE/EIS-0119F) were subsequently reviewed in DOE/RL-2005-45, *Surplus Reactor Final Disposition Engineering Evaluation*, conducted under TPA Milestone M-093-25, ―Submit engineering evaluation - final surplus reactor disposition."

Based on the information presented in both the final EIS (DOE/EIS-0119F) and the engineering evaluation (DOE/RL-2005-45), the range of alternatives that have previously been evaluated presented a reasonable range of plausible alternatives. Accounting for progress that has been made on the ISS of the reactors, the range of plausible alternatives identified for this Lifecycle Report is as follows:

- **Safe Storage Followed by Deferred Dismantlement.** Complete ISS on remaining reactors; safe storage for a period of up to 75 years of surveillance, monitoring, and maintenance. At the end of the safe storage period, demolition of the reactor buildings and piece-by-piece dismantlement of the reactor cores and transport of radioactive waste to the 200-West Area for burial.

- **Immediate One-Piece Removal.** Demolition of the reactor buildings that have not been placed in ISS, demolition of the reactor blocks in ISS, and transport of all the reactor blocks, intact on a tractor-transporter, from the present 100 Areas to the 200-West Area for disposal.

- **In Situ Decommissioning.** Demolition of the reactor buildings and safe storage enclosures and filling void beneath and around the reactor blocks. The reactor blocks, adjacent shield walls, and the spent fuel storage basin together with the contained radioactivity, gravel, and grout would be covered to a depth of at least 16.4 feet with a mound containing earth and gravel.

- **Safe Storage Followed by Deferred One-Piece Removal.** Complete ISS on remaining reactors; safe storage for a period of up to 75 years of surveillance, monitoring, and maintenance; at the end of the safe storage period, demolition of the reactor blocks and transport of the reactor blocks, intact on a tractor-transporter, from the present 100 Area locations to the 200-West Area for disposal.

TPA Milestone M-036-01 requires that the annual Lifecycle Report assess the plausible range of alternatives and a reasonable upper bound alternative. Based on cost, implementation time, and worker safety, the Safe Storage Followed by Deferred One-Piece Removal is identified as the most plausible alternative. Similarly, the Safe Storage Followed by Deferred Dismantlement is considered to be the upper bound because of higher costs, longer implementation time, and greater worker dose.

4.4.2 Reactor Core Disposition Alternatives - Cleanup Action Scope Definition

> **Reactor Core Disposition**
> 1. Lower bound alternative: Safe storage followed by deferred one-piece removal.
> 2. Upper bound alternative: Safe storage followed by deferred dismantlement.

The two alternatives, a lower bound and upper bound, are considered in this Lifecycle Report and both assess one-piece removal and dismantlement options (excluding B Reactor). These alternatives have been developed and evaluated in the final EIS (DOE/EIS-0119F) and the subsequent engineering evaluation (DOE/RL-2005-45). The two alternatives are basically the same except that several of the reactors have already undergone ISS activities. Because considerable evaluation has already been performed on the disposition of the reactors, the information presented in this Lifecycle Report is consistent with and updated from the final EIS (DOE/EIS-0119F) and the engineering evaluation (DOE/RL-2005-45). The cost estimate has been escalated from the 2005 estimate to 2010 constant dollars.

Uncertainties include the following:

- Regulatory documentation is needed to dispose of the reactor blocks on the Hanford Site.
- A disposal facility must be available. May need to assess commissioning and building an appropriate disposal facility.
- Uncertainty regarding regulatory requirements following an extended safe storage period and subsequent activities needed to meet the requirements.
- Availability of properly trained work force and technical equipment at the time of removal.
- Impact to surrounding land areas following cleanup of River Corridor.

Uncertainties are assessed qualitatively and assumptions are provided where needed to help manage the uncertainties.

4.4.3 Reactor Core Disposition Alternatives - Schedule(s)

The current alternative for the reactors is ISS, where this has not already been completed (see Table 4-2 for reactor status). The removal of the reactors from the 100 Areas to the Central Plateau is not currently in DOE's cost estimates. The schedule for removal of the reactors will be established based on cleanup priorities, funding availability, and on the following considerations.

- Removal of the reactors must be completed by 2068 based on the ROD issue date of 1993 and a maximum 75-year storage period; therefore, removal must start by FY 2054, based on a 14-year implementation period for the one-piece removal alternative and FY 2038, based on a 30-year implementation period for the dismantlement alternative.

- Under current planning, ERDF is scheduled to complete operations by 2055. If ERDF is to be the disposal location for the reactor cores, then removal actions would have to start no later than FY 2041, based on a 14-year implementation period for the one-piece removal alternative and no later than FY 2025, based on a 30-year implementation period for the dismantlement alternative.

4.4.4 Reactor Core Disposition Upper Bound Alternative – Estimated Cost Deferred One-Piece Removal

The costs for removing the reactors are provided as a sensitivity analysis and are summarized in Table 4-5. These costs represent removal of the reactors from the River Corridor to the Central Plateau and are based on the EIS (DOE/EIS-0119F) estimates that have been escalated to 2010 constant dollars using an annual escalation rate of 2.3 percent; however the B Reactor is not included.

Table 4-5. Estimated Costs for Removing Eight Reactor Cores from the River Corridor.

Reactor Core Removal Activities	Costs (Million $) (2010 dollars)
Engineering	$128
Procurement Support	$ 66
Decommissioning	$482
Total	**$676**

4.4.5 Reactor Core Disposition Results, Comparison, and Conclusions

The cost to remove the reactors from the River Corridor (in 2010 dollars) is estimated at $676 million. The 1993 ROD (58 FR 48509), along with the supplement analysis (DOE/EIS-0119F-SA-01) concluded that the reactors would be removed by 2068. The actual schedule will be driven by funding availability and priorities at the Hanford Site. Other considerations include the final disposal location and availability of required workers and equipment.

Regulatory agency and public input will factor into the ultimate schedule for removal of the reactors from the River Corridor.

5.0 CENTRAL PLATEAU CLEANUP

The Central Plateau is a 75-square-mile area near the center of the Hanford Site that contains approximately 900 excess facilities, including five massive chemical processing facilities called canyons, and roughly 800 non-tank farm waste sites. The Central Plateau is also home to ongoing waste management operations, such as the Mixed Waste Low-Level Burial Grounds, liquid waste facilities, and the Waste Receiving and Processing (WRAP) Facility. Infrastructure services (e.g., power, water, telecommunication lines), either existing or to be constructed, in the Central Plateau are needed to support cleanup. This collection of facilities, waste sites, canyons, and ongoing waste management operations and infrastructure is spread across the Central Plateau. The tank waste and WTP facilities on the Central Plateau are discussed in Chapter 6.0 as part of DOE-ORP's scope.

During site operations, 450 billion gallons of liquid waste were discharged to the ground; most within the Central Plateau (TRAC-0151-VA, *Historical Perspective of Radioactively Contaminated Liquid and Solid Wastes Discharged or Buried in the Ground at Hanford*). These past releases have created extensive plumes of groundwater contamination with a combined area of approximately 66.5 square miles that exceeds drinking water standards (DOE/RL-2010-11, *Hanford Site Groundwater Monitoring and Performance Report for 2009*). A significant portion of the contamination remains in the soil column above the water table and poses a potential threat to groundwater. Interim groundwater treatment is in place for contaminant plumes in the 200-West Area and in several locations in the 100 Areas. An ROD for the large carbon tetrachloride plume in the 200-West Area (200-ZP-1 OU) was signed in 2008 (EPA 2008, *Record of Decision Hanford 200 Area 200-ZP-1 Superfund Site, Benton County, Washington*).

Active waste management facilities are operating to support the ongoing cleanup and many of these facilities will be required to support cleanup in the future. These facilities include liquid effluent treatment, solid waste packaging and handling, solid waste disposal, spent fuel storage, analytical laboratories, and the WTP for treatment of radioactive tank waste.

In the Central Plateau, the cleanup objective is to remediate waste sites and to decommission and demolish excess facilities in a manner that is protective of the environment, safe for the worker, and cost effective. Central Plateau Cleanup is organized into three major components: Inner Area, Outer Area, and Groundwater (DOE/RL-2009-81, *Central Plateau Cleanup Completion Strategy*).

The Inner Area is defined as the part of the Hanford Site that will require long-term waste management and containment of residual contamination. The objective is to make this area as small as practical and is anticipated to be less than 10 square miles.

The Outer Area includes all areas of the Central Plateau beyond the boundary of the Inner Area. It is DOE's intent to clean up the Outer Area to a level comparable to the River Corridor (that is, suitable for unrestricted surface use, under continued Federal ownership and control, and consistent with the anticipated future land use of conservation/mining).

The goal of the groundwater component is to restore it to its beneficial uses. TPA milestone revisions, which support this approach, were recently finalized (October 25, 2010) (Case No. CV-08-5085-FVS).

Cleanup work scope in the Central Plateau is managed through five projects:

- NM Stabilization and Disposition–PFP, PBS RL-0011 (Inner Area).
- Soil and Water Remediation–Groundwater/Vadose Zone, PBS RL-0030 (entire Hanford Site, including both Inner and Outer Areas and the River Corridor).
- Nuclear Facility D&D–Remainder of Hanford, PBS RL-0040 (includes the geographical cleanup of waste sites and facilities, including the remaining canyon facilities [Inner and Outer Areas]).
- Nuclear Facility D&D–Fast Flux Test Facility Project, PBS RL-0042 (includes the Fast Flux Test Reactor [located in River Corridor]).
- Solid Waste Stabilization and Disposition–200 Area, PBS RL-0013C (Inner Area).

Figure 5-1 presents the remaining cleanup schedule for the Central Plateau. Cleanup is being done in accordance with RODs and action memoranda as listed in Appendix D and with key TPA milestones as listed in Table 5-1.

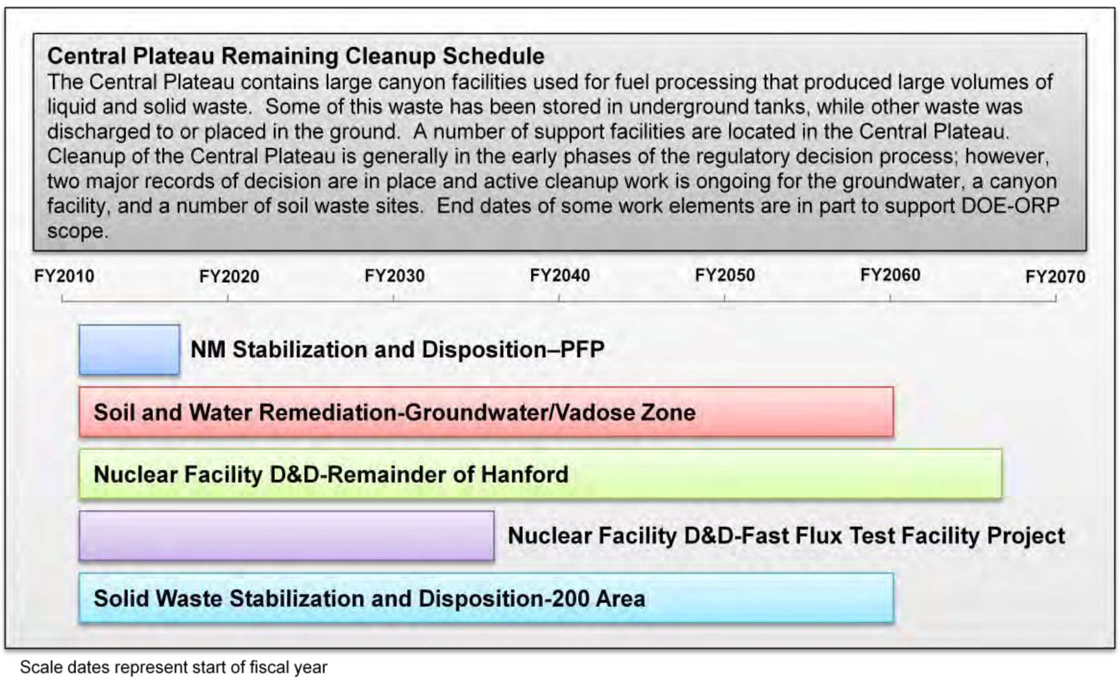


Figure 5-1. Central Plateau Remaining Cleanup Schedule.

Table 5-1. Central Plateau Cleanup Key Tri-Party Agreement Milestones. (4 pages)

Milestone	Description	Compliance Date
NM Stabilization and Disposition–PFP, PBS RL-0011		
M-083-43	Complete transition of the 242-Z Waste Treatment Facility and 236-Z Plutonium Reclamation Facility to support PFP decommissioning.	9/30/2013
M-083-44	Complete transition of the 234-5Z (Plutonium Conversion Facility) and ZA (Plutonium Conversion Support Facility), 243-Z Low-Level Waste Treatment Facility, 291-Z Exhaust Building, and 291-Z-1 Exhaust Stack to support PFP decommissioning.	9/30/2015
M-083-00A	Complete PFP facility transition and selected disposition activities.	9/30/2016
Nuclear Facility D&D–Remainder of Hanford, PBS RL-0040		
M-016-00	Complete remedial actions for all non-tank farm and non-canyon OUs.	9/30/2024
M-016-200A	Complete U Plant Canyon (221-U Facility) demolition in accordance with the remedial design/remedial action work plan.	9/30/2017
M-016-200B	Complete U Plant Canyon (221-U Facility) barrier construction in accordance with the remedial design/remedial action work plan.	9/30/2021
M-037-10	Complete unit-specific closure requirements according to the closure plan(s) for seven (7) TSD units: 207-A South Retention Basin, 216-A-29 Ditch, 216-A-36B Crib, 216-A-37-1 Crib, 216-B-63 Trench, Hexone Storage and Treatment Facility (276-S-141/142), and 241-CX Tank System (241-CX-70/71/72).	9/30/2020
M-037-11	Complete unit-specific closure requirements for two (2) TSD units: 216-B-3 Main Pond system and 216-S-10 Pond and Ditch.	9/30/2016
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. This includes B Plant, PUREX, and REDOX canyons and associated past practice waste sites in 200-CB-1, 200-CP-1, and 200-CR-1 OUs.	TBD
M-085-01	Submit a change package to establish a date for major milestone M-085-00.	9/30/2012
M-085-50	Submit revised removal action work plan for the 224B Concentration Facility in accordance with DOE/RL-2004-36, *Action Memorandum for the Non-Time Critical Removal Action for the 224-B Plutonium Concentration Facility*.	12/31/2015
M-085-51	Submit removal action work plan for the 224T Transuranic Storage and Assay Facility in accordance with DOE/RL-2004-68, *Action Memorandum for the Non-Time-Critical Removal Action for the 224-T Plutonium Concentration Facility*.	12/31/2025
M-085-60	Complete Engineering Evaluation/Cost Analysis report(s) for all Tier 2 facilities listed in Appendix J of the Tri-Party Agreement.	3/31/2018

Table 5-1. Central Plateau Cleanup Key Tri-Party Agreement Milestones. (4 pages)

Milestone	Description	Compliance Date
Solid Waste Stabilization and Disposition–200 Area, PBS RL-0013C		
M-91-00	Complete the treatment to LDR treatment standards for all Hanford Site RCRA MLLW and RCRA TRUM waste. DOE may choose to complete certification and shipment of TRUM waste for disposal at the WIPP in lieu of LDR treatment if, as of the time of shipment, such waste is exempt from LDR treatment standards when disposed at WIPP.	Date to be established pursuant to Milestone M-091-44T
M-091-01	Complete the acquisition of new facilities, modification of existing facilities, and modification of planned facilities necessary for retrieval, storage, and treatment/processing, of all Hanford Site RCRA TRUM waste.	Date to be established pursuant to Milestones M-091-01A and M-091-01B
M-091-01A	Complete the conceptual design for acquisition of capabilities and/or acquisition of new facilities, modification of existing facilities, and/or modification of planned facilities necessary for retrieval, designation, storage, and treatment/processing prior to disposal of all Hanford Site RH TRUM waste and TRUM waste in large containers (in aboveground storage as of June 30, 2009 and in retrievable storage).	9/30/2016
M-091-01B	Complete the definitive design for acquisition of capabilities and/or acquisition of new facilities, modification of existing facilities, and/or modification of planned facilities necessary for retrieval, designation, storage, and treatment/processing prior to disposal of all Hanford Site RH TRUM waste and TRUM waste in large containers (in aboveground storage as of June 30, 2009 and in retrievable storage).	9/30/2018
M-091-40	Complete the retrieval and designation of CH retrievably stored waste in burial grounds 218-W-4B, 218-W-3A, and 218-E-12B.	9/30/2016
M-091-41	Complete retrieval and designation of RH retrievably stored waste (regardless of package size, including the 200 Area caissons).	12/31/2018
M-091-41A	Complete retrieval of non-caisson RH, retrievably stored waste.	9/30/2016
M-091-42	Complete the treatment of small container CH MLLW (in aboveground storage as of June 30, 2009 and in retrievable storage) to meet applicable LDR treatment standards in compliance with WAC 173-303-140.	9/30/2017
M-091-43	Complete the treatment of large container CH MLLW and RH MLLW (in aboveground storage as of June 30, 2009 and in retrievable storage).	9/30/2017
M-091-44	Complete the treatment of large container CH TRUM waste and RH TRUM waste (in aboveground storage as of June 30, 2009 and in retrievable storage).	12/31/2030
M-091-44T	Submit a change package for annual milestones to treat or certify and ship large container CH TRUM waste and RH TRUM waste (in aboveground storage as of June 30, 2009 and in retrievable storage) to complete the disposition of this waste.	09/30/2018

Table 5-1. Central Plateau Cleanup Key Tri-Party Agreement Milestones. (4 pages)

Milestone	Description	Compliance Date
M-091-46	Complete the certification of small container CH TRUM waste (in aboveground storage as of June 30, 2009 and in retrievable storage).	9/30/2017
M-091-46H	Complete off-site shipment of all small container CH TRUM waste (in aboveground storage as of June 30, 2009 and in retrievable storage).	09/30/2018
M-092-05	Determine disposition path and establish interim agreement milestones for Hanford Site cesium/strontium capsules.	6/30/2017
Soil and Water Remediation–Groundwater/Vadose Zone, PBS RL-0030		
M-015-00	Complete the RI/FS (or RCRA facility investigation/corrective measures study and RI/FS) process for all non-tank farm OUs except for canyon/associated past practice waste site OUs covered in M-085-00.	12/31/2016
M-015-21A	Submit a 200-BP-5 and 200-PO-1 OU feasibility study report and proposed plan(s) to Ecology.	12/31/2012
M-015-38B	Submit a revised feasibility study report and revised proposed plan(s) for the 200-CW-1, 200-CW-3, and 200-OA-1 OUs for waste sites in the Outer Area of the Central Plateau to EPA.	4/30/2012
M-015-91B	Submit feasibility study report(s) and proposed plan(s) for the 200-BC-1/200-WA-1 OUs (200-West Inner Area) to EPA.	6/30/2013
M-015-92B	Submit corrective measures study and feasibility study report(s) 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) to Ecology.	6/30/2014
M-015-93B	Submit RCRA facility investigation/corrective measures study and RI/FS report and proposed corrective action decision/proposed plan for the 200-SW-2 OU to Ecology.	12/31/2016
M-015-110B	Submit corrective measures study and feasibility study report and proposed plan/proposed corrective action decision for the 200-DV-1 OU to Ecology.	9/30/2015
M-015-110D	Submit technetium-99 pilot scale treatability study test report(s) as an element of remedial investigation for the 200-BC-1/200-WA-1 OUs to EPA.	6/30/2012
M-016-120	DOE will have a groundwater treatment system (not to exceed 50 gal/min pump-and-treat capacity) for the technetium-99 plume at the S/SX Tank Farm within the 200-UP-01 OU.	12/31/2011
M-016-122	Begin Phase I operation of the new 200-West pump-and-treat system per the *200 West Area 200-ZP-1 Pump-and-Treat Remedial Design/Remedial Action Work Plan* (DOE/RL-2008-78) and the 200-ZP-1 Record of Decision (EPA 2008).	12/31/2011
M-024-00O	Complete required well installations in accordance with the RCRA and CERCLA groundwater requirements.	TBD
M-037-02	Submit revised closure plans to support TSD closure for five TSD units: 207-A South Retention Basin, 216-A-29 Ditch, 216-A-36B Crib, 216-A-37-1 Crib, and 216-B-63 Trench.	06/30/2014

Table 5-1. Central Plateau Cleanup Key Tri-Party Agreement Milestones. (4 pages)

Milestone	Description	Compliance Date
M-037-03	Submit revised closure plans to support TSD closure for two TSD units: 216-B-3 Main Pond System, and 216-S-10 Pond and Ditch.	04/30/2012

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq.

DOE/RL-2004-36, 2004, *Action Memorandum for the Non-Time Critical Removal Action for the 224-B Plutonium Concentration Facility*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2004-68, 2005, *Action Memorandum for the Non-Time-Critical Removal Action for the 224-T Plutonium Concentration Facility*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2008-78, 2009, *200 West Area 200-ZP-1 Pump-and-Treat Remedial Design/Remedial Action Work Plan*, Rev. 0 Reissue, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA, 2008, *Record of Decision Hanford 200 Area 200-ZP-1 Superfund Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington, D.C.

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

WAC 173-303-140, ―Land Disposal Restrictions,” *Washington Administrative Code*, Olympia, Washington.

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act.*
CH = contact-handled.
D&D = decontamination and decommissioning.
Ecology = Washington State Department of Ecology.
EPA = U.S. Environmental Protection Agency.
LDR = Land Disposal Restrictions.
MLLW = mixed low-level waste.
NM = nuclear material.
OU = operable unit.
PBS = project baseline summary.
PFP = Plutonium Finishing Plant.
PUREX = Plutonium Uranium Extraction (Plant).
RCRA = *Resource Conservation and Recovery Act.*
REDOX = Reduction-Oxidation Facility (S Plant).
RH = remote-handled.
RI/FS = remedial investigation/feasibility study.
TBD = to be determined.
TRUM = transuranic mixed (waste).
TSD = treatment, storage, and disposal.
WIPP = Waste Isolation Pilot Plant.

5.1 NM STABILIZATION AND DISPOSITION–PFP (PBS RL-0011)

The Plutonium Finishing Plant (PFP) complex was constructed at the Hanford Site 200-West Area in the late 1940s. Its mission was to convert plutonium nitrate product to the more stable oxide, metal, and oxalate forms for safer shipment to nuclear weapons fabrication facilities. In 1989, plutonium production operations ended at PFP and removing the plutonium inventory and plant D4 were assigned high national priority (HNF-EP-0924, *History and Stabilization of the Plutonium Finishing Plant (PFP) Complex Hanford Site*).

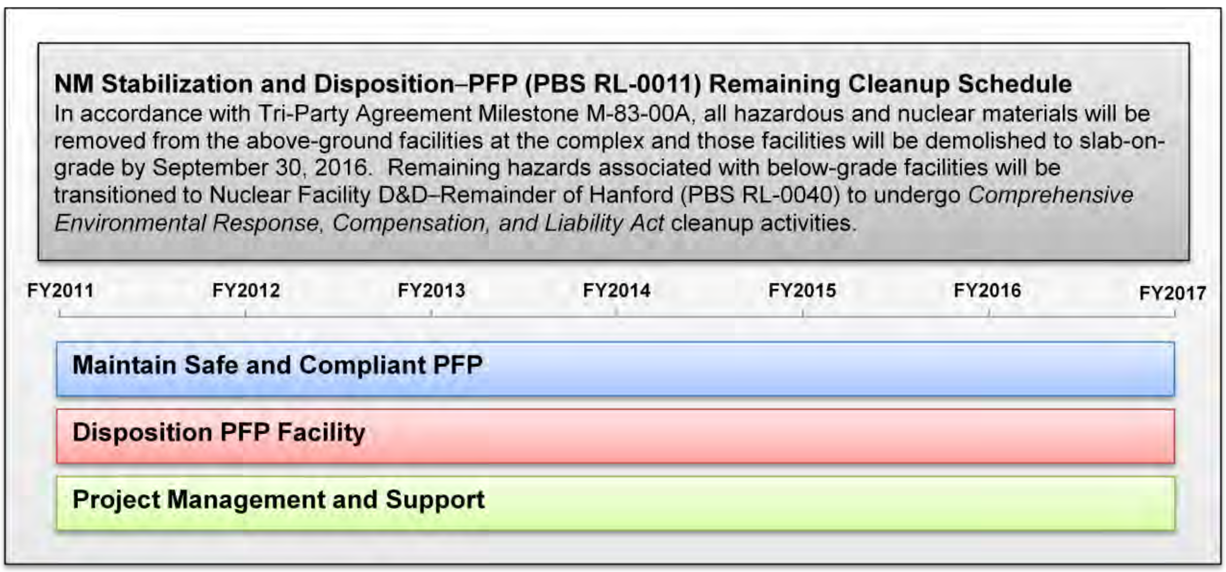
Cleanup and demolition to slab-on-grade of the PFP complex is being conducted as a closure project under NM Stabilization and Disposition–PFP (PBS RL-0011), also known as the PFP Closure Project (DOE/RL-2005-13, *CERCLA Non-Time Critical Removal Action Memorandum for PFP Above-Grade Structures*). To begin the PFP closure process, about 20 tons of plutonium-bearing material stored at PFP required an integrated DOE-wide disposition strategy. In 2004, PFP completed the project to recover, stabilize, and package the inventory to meet updated safety standards in addition to shipping designated plutonium-bearing material to the Waste Isolation Pilot Plant (WIPP). Shipment of the remaining PFP plutonium inventory to DOE storage facilities was completed in 2009.

The PFP Closure Project scope requires D4 of PFP systems and structures to accomplish the defined project end-point completion criteria in compliance with all applicable agreements, regulations, and CERCLA, RCRA, and other applicable processes. This effort eliminates significant hazards to workers, the public, and the environment, and additionally minimizes long-term risks and costs.

Major cleanup objectives for PFP closure are to:

- Remove plutonium-bearing material and waste, including un-irradiated fuel, slightly irradiated fuel, and other nuclear materials from PFP facilities (removing the plutonium inventory was completed in 2009; residual plutonium is removed in the cleanup process).
- Eliminate the Protected Area at PFP (this scope was completed in 2009).
- Clean out and demolish facilities in the PFP complex (currently underway with two major and numerous minor facilities complete).
- Transfer the remainder of the PFP complex to RL-0040 for final remediation. Waste sites and subsurface facilities will be managed through the remediation of the 200-PW-1/3/6 and 200-CW-5 OUs and the new 200-WA-1 OU.

Figure 5-2 presents the NM Stabilization and Disposition–PFP (PBS RL-0011) work elements along with the remaining cleanup schedule. Table 5-2 provides a summary of the scope of each of these work elements.



Scale dates represent start of fiscal year

Figure 5-2. NM Stabilization and Disposition–PFP (PBS RL-0011) Remaining Cleanup Schedule.

Table 5-2. NM Stabilization and Disposition–PFP (PBS RL-0011) Level 2 Scope Summary.

Work Element	Scope Description
Maintain Safe and Compliant PFP	This work element is focused on maintaining building integrity and safety systems during D4 efforts. Tasks include maintaining worker/public health and environmental safety; maintaining an environmentally compliant facility; maintaining facility systems and components; maintaining the maintenance program; and maintaining special projects.
Disposition PFP Facility	This work element includes planning, preparation, engineering, sampling, procurement, and other tasks necessary to execute the removal of plutonium holdup material (e.g., material in ducting), deactivation, and disposition of aboveground PFP facilities before transitioning the below-grade components (e.g., below-grade structures and waste sites) to Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) for surveillance and maintenance and final remediation. D4 activities will be completed for the buildings and facilities in the PFP area, reducing them to slab-on-grade as part of this activity. Slab-on-grade is defined as a concrete slab, typically the first floor of a building resting on grade (earth) that is free of dispersible radiological contamination.
Project Management and Support	This work element includes project management and support to the PFP D4 activities including procurement and project controls. This work element includes technical support, such as engineering, quality assurance, and procedure and document maintenance.

D4 = deactivation, decontamination, decommissioning, and demolition.
D&D = decontamination and decommissioning.
NM = nuclear material.
PBS = project baseline summary.
PFP = Plutonium Finishing Plant.

Figure 5-3 presents the remaining estimated cleanup costs for NM Stabilization and Disposition-PFP (PBS RL-0011) work scope by fiscal year; Figure 5-4 presents the remaining estimated cleanup costs by work element. Accelerated work scope funded by the *American Recovery and Reinvestment Act* contribute to initial peaks, and then costs decline for the remainder of the lifecycle as facilities undergo D4 to slab-on-grade.

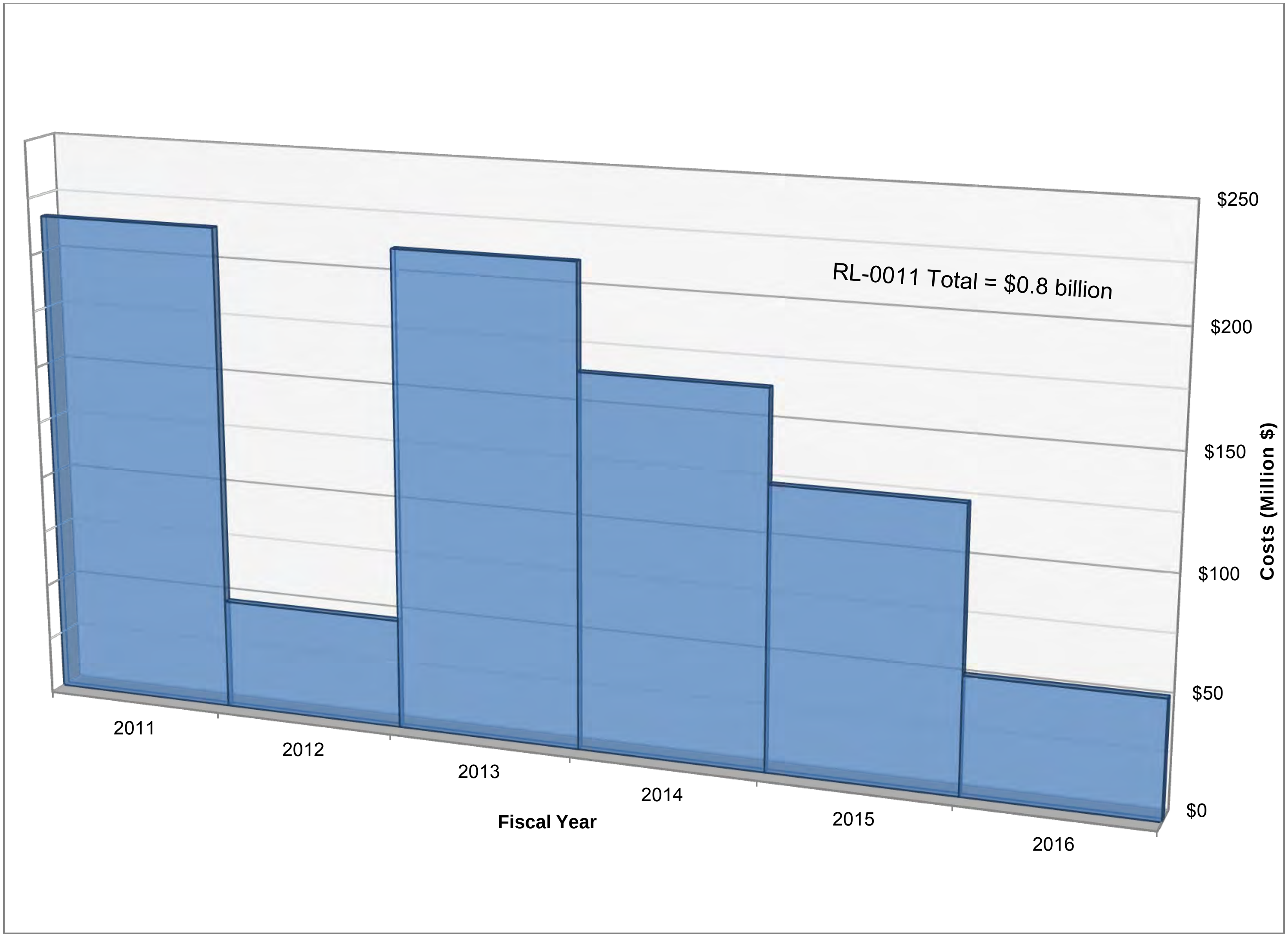


Figure 5-3. NM Stabilization and Disposition–PFP (PBS RL-0011) Remaining Estimated Cleanup Costs by Fiscal Year.

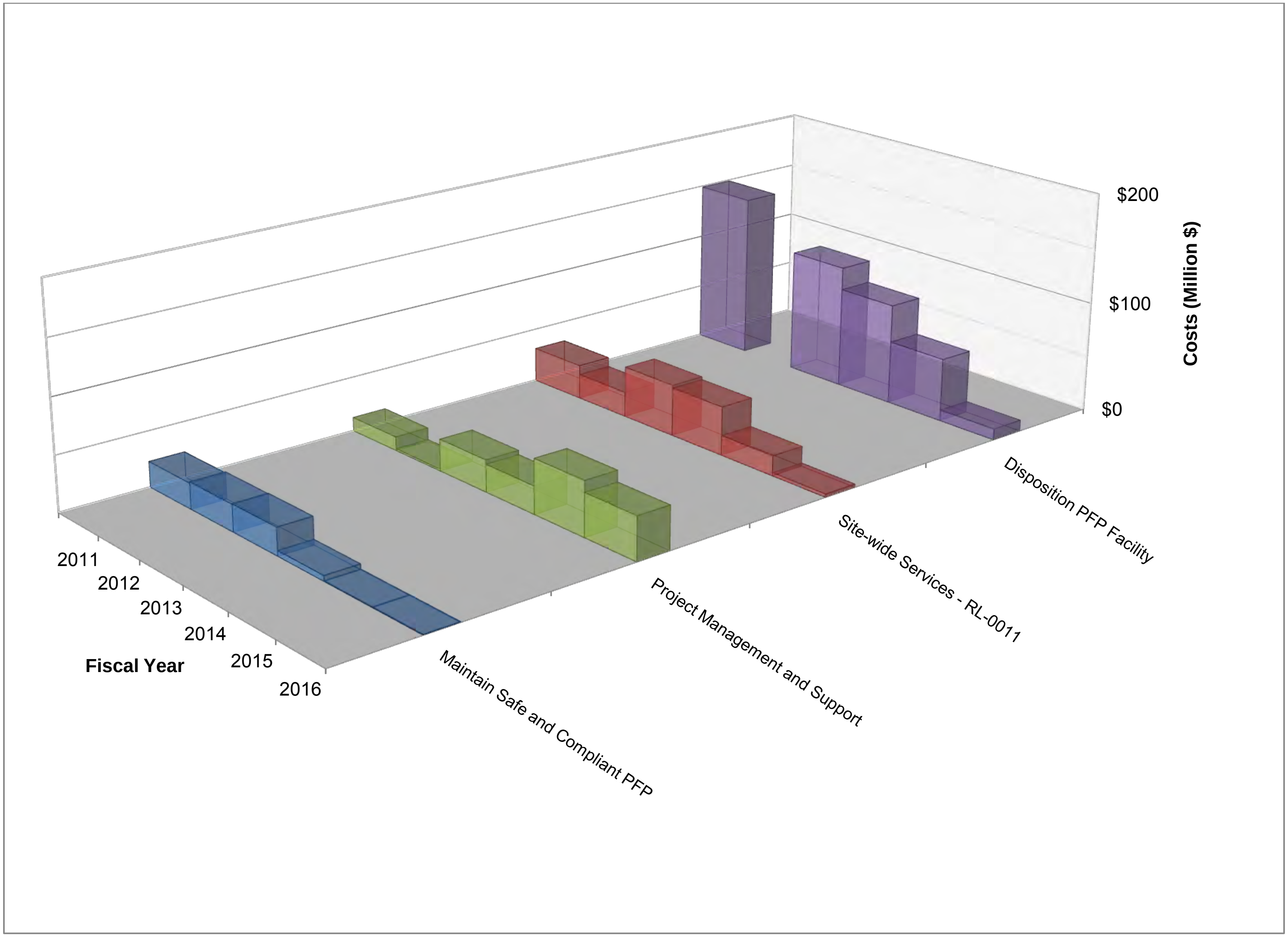


Figure 5-4. NM Stabilization and Disposition–PFP (PBS RL-0011) Remaining Estimated Cleanup Costs by Work Element.

5.2 SOIL AND WATER REMEDIATION–GROUNDWATER/VADOSE ZONE (PBS RL-0030)

The Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030), also known as the Groundwater Project, includes the following:

- The regulatory decision-making process for all the groundwater OUs on the Hanford Site.
- Remediation of all the groundwater on the Hanford Site in accordance with the groundwater OU decisions.
- The regulatory decision-making process for the River Corridor waste sites (PBS RL-0041).
- The regulatory decision-making process for the Central Plateau waste sites (remediation of waste sites is part of the Nuclear Facility D&D–Remainder of Hanford [PBS RL-0040] project scope).
- The regulatory decision-making process and remediation for the soil contamination in the Central Plateau deep vadose zone.

The project includes soil and groundwater characterization, groundwater monitoring, groundwater treatment, well drilling, treatability testing, evaluation of remediation options, and preparing the regulatory documentation necessary to obtain final RODs on remedial actions for soil waste sites and groundwater, including both the River Corridor and Central Plateau.

Much of the contamination remains in the vadose zone soil column above the water table; however, at waste sites where large volumes of liquid were released, the more mobile contaminants have reached groundwater (Figure 5-5). The tritium groundwater contaminant plume from the Central Plateau has reached the Columbia River. Additional groundwater contaminant plumes such as chromium, strontium-90, and uranium originating in the 100 or 300 Areas have also reached the Columbia River. An important target TPA milestone is to contain or remediate the hexavalent chromium groundwater plumes in the 100 Areas by the end of 2012 so that water quality standards are achieved, and to have groundwater remedies in place for strontium-90 and uranium by 2015.

The major chemical contaminants present in Hanford Site groundwater include carbon tetrachloride, chromium, cyanide, nitrate, and trichloroethene. Major radioactive contaminants include iodine-129, strontium-90, technetium-99, tritium, and uranium. The major groundwater plumes in 2009 and their locations are shown in Figure 5-5. Other groundwater contaminants that exceed drinking water standards in several Hanford Site areas but are of limited extent include sulfate, fluoride, metals (manganese, iron, antimony, arsenic), total petroleum hydrocarbons (diesel), volatile organic compounds (cis-1,2-dichloroethene, methylene chloride), and radioactive contaminants (cesium-137, gross alpha, gross beta, plutonium-239/240) (DOE/RL-2010-11).

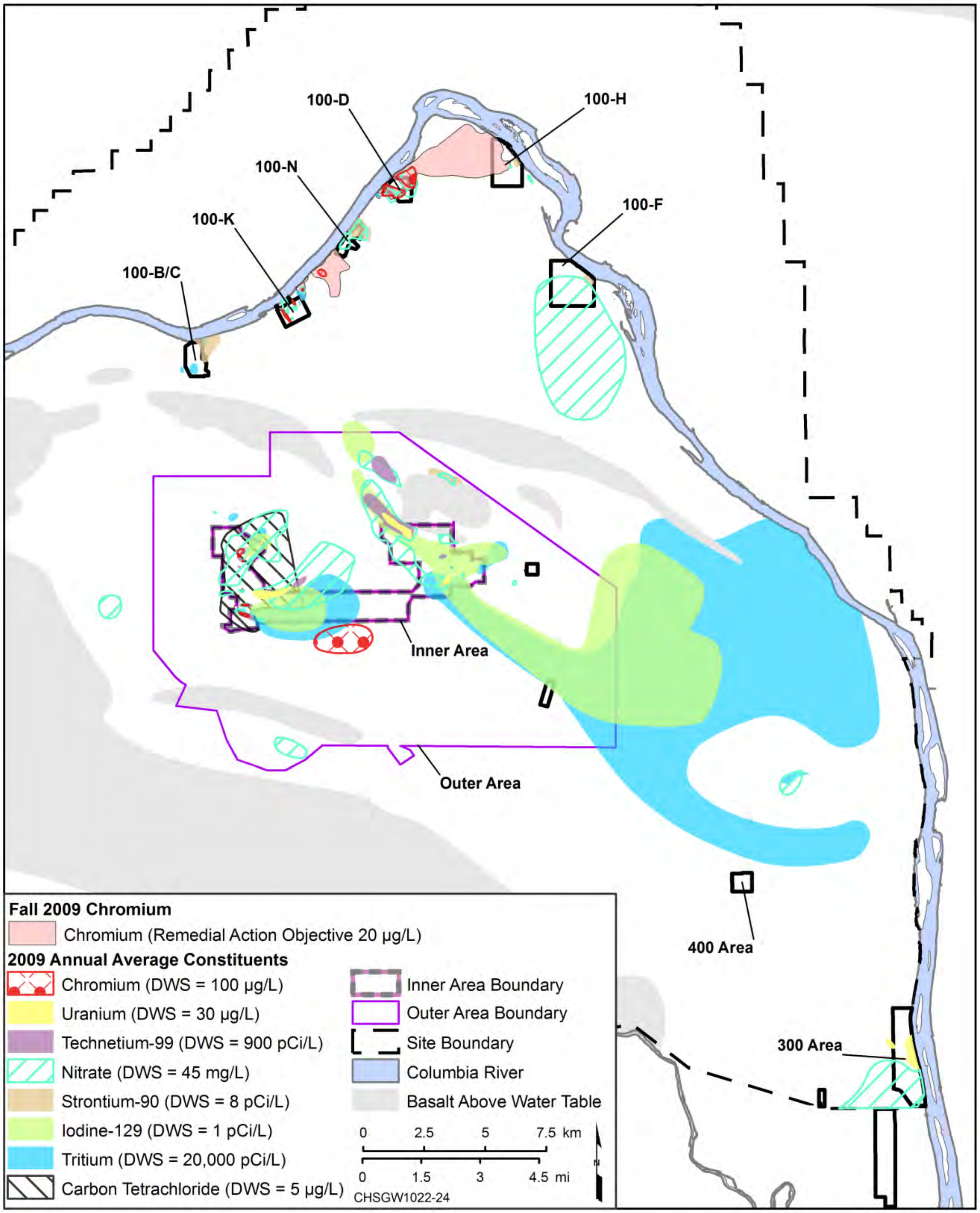


Figure 5-5. Major Hanford Site Groundwater Plumes in 2009.

The Groundwater Project has three major objectives (DOE/RL-2002-59, *Hanford Site Groundwater Strategy Protection, Monitoring, and Remediation*):

- Take actions necessary to prevent degradation of the groundwater.
- Remediate groundwater to restore it to beneficial use where practicable and to protect the Columbia River.
- Monitor groundwater to identify emerging problems and guide the remediation process.

To be successful, the Groundwater Project needs to obtain sufficient characterization data, evaluate performance of early actions, and develop remedial action objectives. The Hanford Site is divided into 10 groundwater OUs. Groundwater monitoring activities are also required by the *Atomic Energy Act* and *Hanford Facility Resource Conservation and Recovery Act Permit Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste* (WA7890008967).

Groundwater cleanup in the River Corridor is divided into six groundwater OUs:

- 100-BC-5, which addresses the groundwater contamination associated with activities conducted at the B and C Reactors and support facilities. No active remediation is in place, but the OU is being monitored and assessed for potential actions.
- 100-FR-3, which addresses the groundwater contamination associated with the F Reactor and support facilities. No active remediation is in place, but the OU is being monitored.
- 100-HR-3, which addresses the groundwater contamination associated with the D, DR, and H Reactors and support facilities. Active pump-and-treat systems are in place in both 100-D and 100-H Areas and a semi-permeable barrier is in place in the 100-D Area under an interim ROD.
- 100-KR-4, which addresses the groundwater contamination associated with the KE and KW Reactors. Pump-and-treat systems are in place in the 100-K Area under an interim ROD.
- 100-NR-2, which addresses the groundwater contamination associated with the N Reactor. A former pump-and-treat system was used to address the strontium-90 contamination at N Springs under an action memorandum and testing of an apatite barrier is ongoing at the 100-N Area.
- 300-FF-5, which addresses the groundwater contamination associated with activities in the 300 Area. The 300 Area groundwater is being monitored and evaluated under an interim ROD.

The groundwater underlying the Central Plateau is divided into four groundwater OUs:

- 200-BP-5, which addresses the groundwater contamination associated with the B Plant processing facility and associated waste sites in the northeast quadrant of the Central Plateau. No active remediation is in place, but the OU is being monitored and assessed for potential actions.
- 200-PO-1, which addresses the groundwater contamination associated with the Plutonium-Uranium Extraction (PUREX) Plant processing facility and associated waste sites in the southeast quadrant of the Central Plateau, including the BC cribs and trenches.

No active remediation is in place, but the OU is being monitored and assessed for potential actions.

- 200-UP-1, which addresses the groundwater contamination associated with the U Plant and Reduction-Oxidation (REDOX) processing facilities and the associated waste sites in the southwest quadrant of the Central Plateau. An active pump-and-treat system is in place for the 200-UP-1 OU under an interim ROD.
- 200-ZP-1, which addresses contamination associated with the T Plant and PFP processing facilities and associated waste sites in the northwest quadrant of the Central Plateau. An active pump-and-treat system was put in place in the 200-ZP-1 OU under an interim ROD. A new pump-and-treat system is being constructed to fulfill the requirements of the 2008 ROD for this OU. This OU is also supported by 200-PW-1 (previously known as 200-ZP-2), which is a source OU that is remediating carbon tetrachloride contamination above the water table at several PFP waste sites using active and passive vapor extraction systems in place under an action memorandum.

The work scope for the Groundwater Project is organized into 10 Level 2 work elements as shown in Figure 5-6, which also presents the remaining cleanup schedule for PBS RL-0030. Table 5-3 provides additional details on the scope of work for each of these work elements.

The end dates of several work elements in Figure 5-6 reflect planning estimates of the duration of groundwater remediation and long-term groundwater monitoring, well support, well maintenance, reporting, and project management. Since most of the groundwater OUs do not have RODs yet, the planning estimates will be updated in future reports as remedial decisions are completed (e.g., the cleanup timeframe in the ROD for the 200-ZP-1 OU is estimated at 125 years).

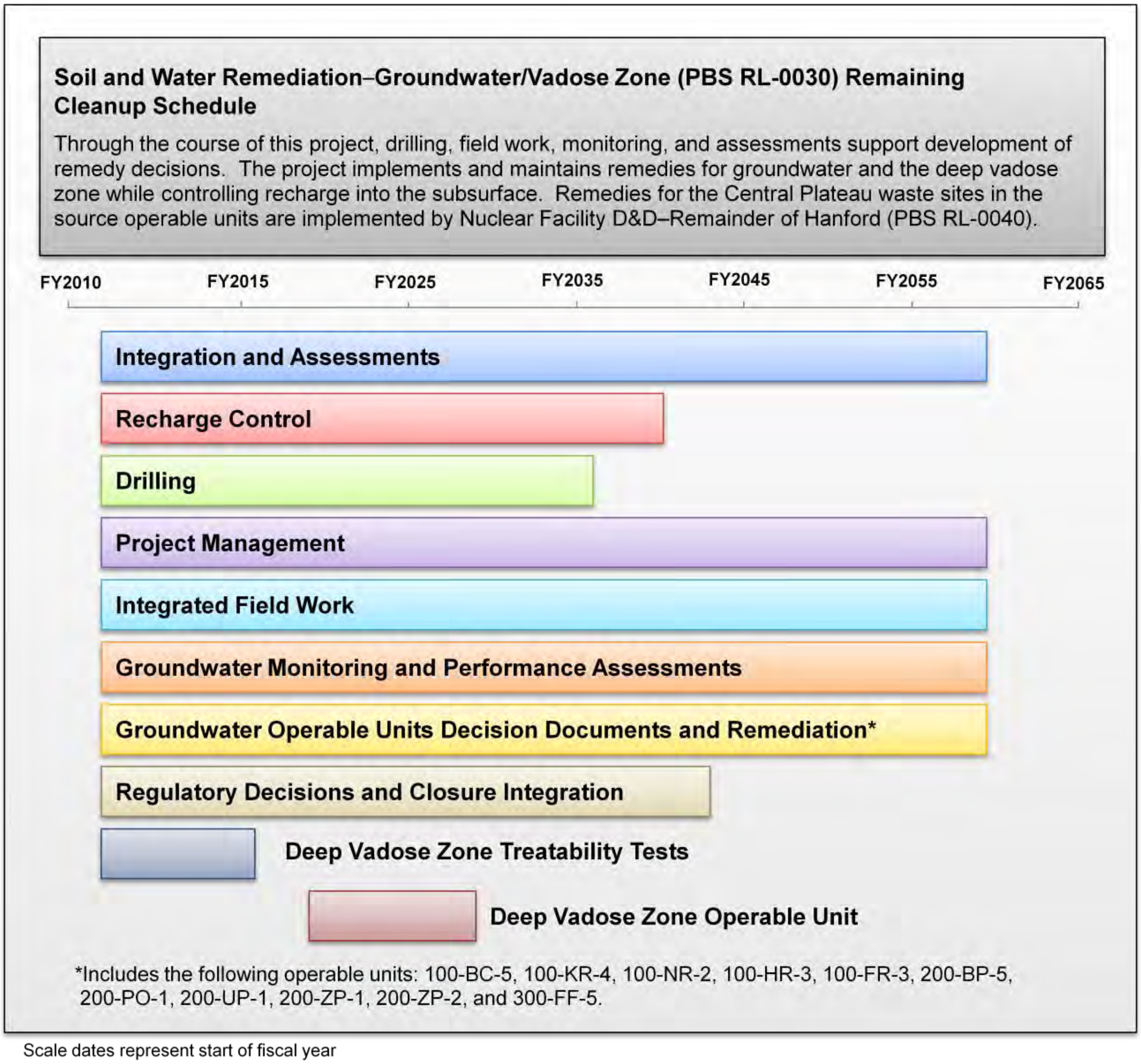


Figure 5-6. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Remaining Cleanup Schedule.

Table 5-3. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Level 2 Scope Summary. (3 pages)

Work Element	Scope Description
Integration and Assessments	This work element is comprised of six parts: Strategic Integration, Technical Integration and Assessments, Remediation Decision Support, Remediation Science and Technology, Sample and Data Management, and Environmental Databases. This integration function coordinates and focuses Hanford Site characterization and assessment efforts to ensure consistency, eliminate information gaps and overlaps, apply science and technology new to the Hanford Site, foster technical peer review, and integrate remediation decisions.
Recharge Control	This work element includes the preparation and submittal of a prioritized list of recommended service water line upgrades or storm water run-off control projects on an annual basis. Priority will be given to those projects that have potential to impact groundwater based on known or potential service water line leakage locations with respect to waste sites/subsurface contamination.
Drilling	This work element includes planning, coordinating, and implementing well drilling and well decommissioning for Hanford Site wells according to project-specific requirements. This includes drilling wells to Washington State standards and preparing all required submittals and notifications required by State law and providing well-related information for Hanford Site databases. Aspects of drilling include technical coordination, procurement, labor, subcontracts, materials, and equipment for project planning; documentation; field support during drilling; and project closeout to support drilling wells for groundwater monitoring and optimization of groundwater treatment systems.
Project Management	This work element includes program management oversight; business management and integration; project control and integration; engineering and maintenance; environmental, safety, health and quality; and technical support.
Integrated Field Work	This work element includes services, infrastructure, material, equipment, labor, and contracts that are used to plan, support, and perform field work. It includes non-OU related well maintenance, monitoring, and reporting. Major elements include operations and maintenance, training, field equipment purchases, unanticipated field work, and maintenance, monitoring, and reporting for wells that are not aligned with a specific OU.
Groundwater Monitoring and Performance Assessments	This work element includes: • Operation, maintenance, sampling, and dismantlement of the Modutanks that are used for disposal of groundwater from on-site well sampling and maintenance, characterization, and remediation activities. • Management, oversight, and performance of borehole and geophysical logging to support characterization and remedial decisions. • Groundwater sampling, analysis, monitoring, evaluation, assessment, and reporting for RCRA TSDs, CERCLA OUs, and other permitted facilities and sites. • Coordination and management of groundwater sampling and water level determinations. • Operation, maintenance, and relocation of the Hanford Site Geotechnical Sample Library, the repository for historical sediment, core, and other soil and sediment samples used for scientific studies including laboratory studies, bench tests, conceptual model development, and fate and transport evaluations for contaminant migration. • Project management for these activities.

Table 5-3. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Level 2 Scope Summary. (3 pages)

Work Element	Scope Description
Groundwater OUs Decision Documents and Remediation	This work element includes the management and implementation of groundwater remediation for the Hanford Site, including: • Implementing the RI/FS process for groundwater OUs by performing remedial investigations and feasibility studies leading to final RODs. • Preparing DQO reports, sampling and analysis plans, waste management plans, and other regulatory documentation, as needed, for all groundwater OUs. • Conducting as needed field studies to support decision making and design. • Designing treatment systems in accordance with the RODs and remedial action work plans. • Implementing the treatment systems in accordance with the design and the ROD requirements. • Conducting ongoing monitoring and reporting. • Maintaining system and monitoring wells. The work scope is managed by OU and is consistent between the OUs. Figure 5-7 provides an overview of the active groundwater remediation efforts. Details of the actual assumptions for this work element are provided in Table 5-4.
Regulatory Decisions	This work element includes planning, management, characterization, documentation, and other associated activities necessary to complete the remedial decision process for each closure zone, including closure plans for RCRA TSD sites. Specific activities include RI/FSs, proposed plans, closure plans, engineering evaluation/cost analyses, DQOs, sampling and analysis plans, RODs, and other documents and activities leading to remedial decisions and remediation planning. Following completion of assessment activities through decision documentation (e.g., ROD or closure plan), completion of the remedial design/remedial action work plan and waste site/facility remediation and/or closure will be addressed under Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040). The reorganization of Central Plateau OUs resulting from the October 2010 TPA changes to Central Plateau Cleanup is summarized in Table 5-5.
Deep Vadose Zone Treatability Tests	This work element involves conducting the deep vadose zone treatability test(s) in accordance with the *Deep Vadose Zone Treatability Test Plan for the Hanford Central Plateau* (DOE/RL-2007-56), conducting cross-cutting engineering and technical studies necessary to support decision-making for Central Plateau remediation of the Deep Vadose Zone OU, and evaluating tradeoffs associated with remedial action decisions. The preliminary types of studies planned include: • Risk methodology studies, including evaluation of modeling and calculation methods, evaluation of contaminant distribution coefficients, soil moisture recharge rate, and other technical parameters affecting modeling. • Program support studies, including development of risk communication tools and technical basis documentation. • Risk tradeoff/sensitivity studies, including risk comparisons for various disposal alternatives and comparison of regional risk versus Hanford Site risk. • Treatability/optimization studies, including evaluation of previous treatability tests to identify potential applicability to Central Plateau remediation, and evaluation of excavation, characterization, and treatment methods that may be considered during the Central Plateau RI/FS process. • Other studies as identified to respond to emerging issues and priorities. Table 5-6 describes the currently identified treatability tests.

Table 5-3. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Level 2 Scope Summary. (3 pages)

Work Element	Scope Description
Deep Vadose Zone OU	This work element addresses mitigation of the contamination present at the Hanford Site in the deep vadose zone. The initial action planned for this OU is the development of the decision documents. Other tasks for this OU, such as remedial action planning and implementation; well support activities; monitoring and reporting support; OU modifications and expansions; field studies and deployment activities; and final deactivation and decommissioning of the OU remediation activities at the conclusion of the project, will be included following the decision process. Changes to the TPA have been undertaken to add milestones for testing remedial technologies and to establish a new deep vadose zone OU (200-DV-1). In addition, DOE is establishing a project team to focus on the development and evaluation of deep vadose zone remedies. DOE is also establishing the Deep Vadose Zone Applied Field Research Center at the Hanford Site, which would be the focal point for investigation and resolution of critical deep vadose zone issues at the Hanford Site and within the DOE complex.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq.

DOE/RL-2007-56, 2008, *Deep Vadose Zone Treatability Test Plan for the Hanford Central Plateau*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act.*
DOE = U.S. Department of Energy.
DQO = data quality objectives.
OU = operable unit.
PBS = project baseline summary.
RCRA = *Resource Conservation and Recovery Act.*
RI/FS = remedial investigation/feasibility study.
ROD = record of decision.
TPA = Tri-Party Agreement.
TSD = treatment, storage, and disposal.

Table 5-4. Groundwater Operable Unit Remediation.

Groundwater Operable Unit	Current Remedial Action	Planning Assumption Remedial Action	Estimated Period of Remediation
100-BC-5	None	Pump-and-treat	10 years
100-FR-3	None	Pump-and-treat	10 years
100-HR-3	Pump-and-treat systems in D and H Areas; semi-permeable barrier	Expanded pump-and-treat augmented with electrocoagulation treatment; bioremediation; inject zero valent iron into existing semi-permeable barrier	Through FY 2020
100-KR-4	Pump-and-treat systems in KE and KW areas	Continued pump-and-treat	Through FY 2018
100-NR-2	Pump-and-treat formerly operated; testing apatite reactive barrier	Expansion of apatite reactive barrier, total petroleum hydrocarbon plume remediation, phytoremediation	Through FY 2020
200-BP-5	None	Pump-and-treat	Through FY 2022
200-PO-1	None	Monitored natural attenuation	Not yet identified
200-UP-1	Pump-and-treat system	Expanded pump-and-treat system	Through FY 2039
200-ZP-1	Pump-and-treat system	Expanded pump-and-treat system	Through FY 2036
200-ZP-2	Soil vapor extraction	Soil vapor extraction	Through FY 2043
300-FF-5	Monitoring and institutional controls	Install polyphosphate barrier	Through FY 2024

Table 5-5. Central Plateau Soil Operable Unit Remediation.

New Operable Units (October 2010)	Changes to Previous Operable Units
200-PW-1/3/6, 200-BC-1, and 200-CW-5	No additions or deletions of waste sites.
B Plant Canyon/associated waste sites (200-CB-1)	Waste sites, including pipelines, in close proximity to the canyon building are reassigned to the new 200-CB-1 OU.
PUREX Canyon/associated waste sites (200-CP-1)	Waste sites, including pipelines, in close proximity to the canyon building are reassigned to the new 200-CP-1 OU.
REDOX Canyon/associated waste sites (200-CR-1)	Waste sites, including pipelines, in close proximity to the canyon building are reassigned to the new 200-CR-1 OU.
Solid Waste Burial Grounds (200-SW-2)	Waste sites in the footprint of the burial grounds are reassigned to the 200-SW-2 OU.
200-West Inner Area (200-WA-1)	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 reassigned to the new 200-WA-1 OU.
200-East Inner Area (200-EA-1 and 200-IS-1)	200-IS-1 sites not included in one of the canyon OUs remain in the 200-IS-1 OU. Other waste sites not included in 200-CB-1, 200-CP-1, 200-PW-3, or 200-SW-2 are reassigned to the new 200-EA-1 OU.
Deep Vadose Zone (200-DV-1)	Waste sites from the 200-TW-1/2 and 200-PW-5 OUs that have contaminants in the deep vadose zone are reassigned to the new 200-DV-1 OU.
Outer Area (200-OA-1, 200-CW-1, and 200-CW-3)	One site from 200-CW-1 OU is reassigned to the 200-SW-2 OU. Other 200-CW-1 sites and the 200-CW-3 sites will remain in their existing OU. Sites from other OUs that are located in the geographically-based Outer Area are reassigned to the new 200-OA-1 OU.

OU = operable unit.
PUREX = Plutonium Uranium Extraction (Plant).
REDOX = Reduction-Oxidation Facility (S Plant).

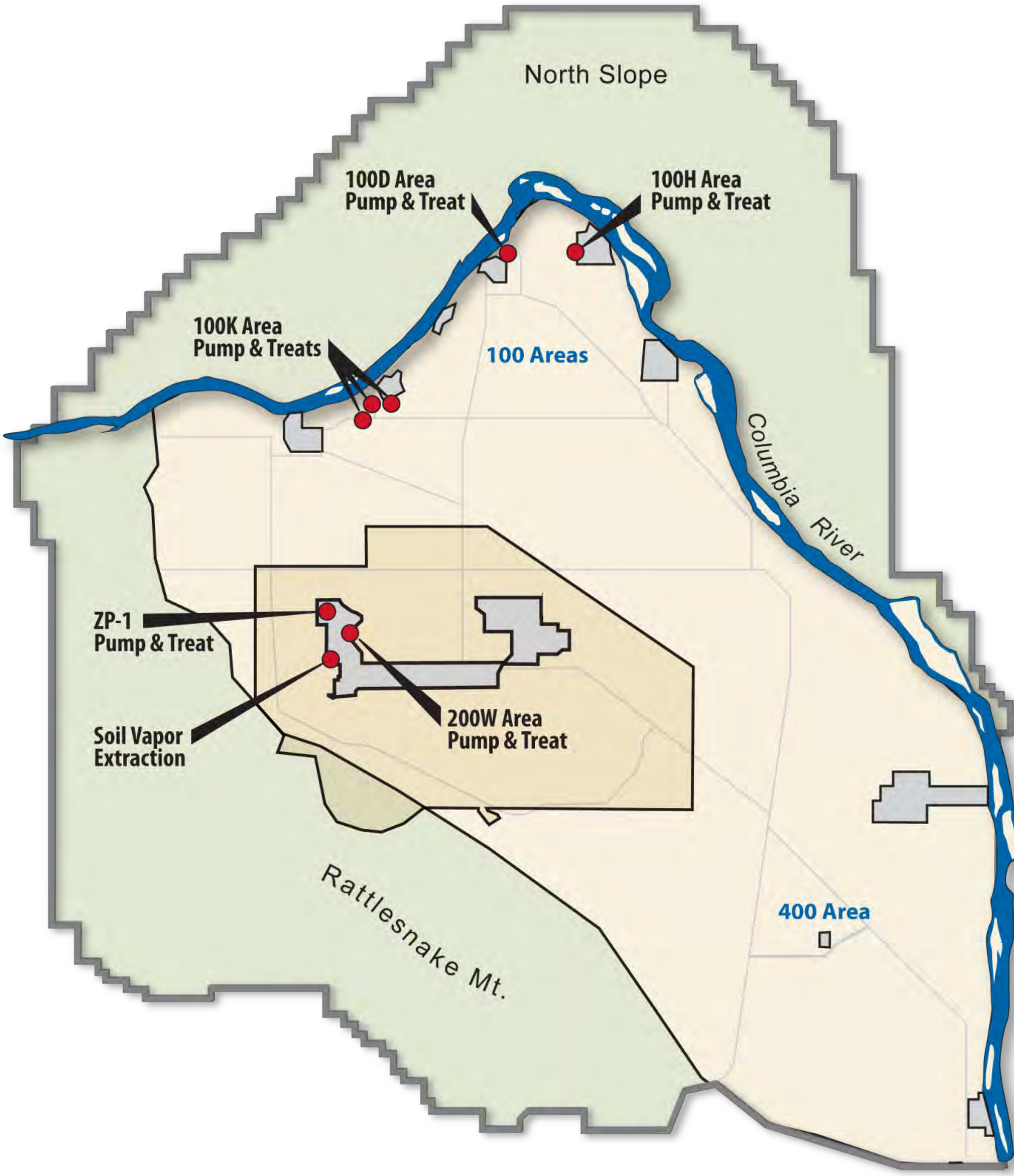


Figure 5-7. Overview of Hanford Site Groundwater Remedial Actions.

Table 5-6. Summary of Deep Vadose Zone Treatment Technologies Being Tested.

Technology	What is it?	Reason for Treatability Testing
Desiccation	Desiccation involves drying a targeted portion of the vadose zone by injecting dry air and extracting soil moisture. This reduces soil moisture that could transport contamination deeper.	Removing water from the vadose zone using desiccation has the potential to reduce the mobility of contaminants through the vadose zone.
In situ gaseous reduction	A reducing gas (e.g., hydrogen sulfide) is used to directly or indirectly reduce some contaminants so they are less soluble.	Has the potential to immobilize technetium-99 and uranium and has been demonstrated at the field scale for similar applications.
Multi-step geochemical manipulation	This developmental stage technique involves introducing gases into the vadose zone that create conditions for precipitation of minerals and contaminants.	Although still conceptual, it builds on the in situ gaseous reduction technology and provides potential for more effective immobilization of contaminants.
Grout injection	Injection of grout or a binding agent into the subsurface to physically or chemically bind or encapsulate contaminants.	Grouting technologies have the potential for use as part of a remedy for the deep vadose zone.
Soil flushing	Adding water and an appropriate mobilizing agent, if necessary to mobilize contaminants and flush them from the vadose zone into groundwater where they can be removed by a pump-and-treat system.	Provides a potential mechanism to remove subsurface contaminants; however, testing is needed to address technical uncertainties about mobilizing targeted contamination without mobilizing non-targeted mineral components.
Surface barriers	Surface barriers reduce subsurface water infiltration and the driving force for contaminant migration toward the groundwater.	Surface barriers are a baseline technology for near-surface contamination and a promising technology for controlling migration of contaminants in the deep vadose zone.

Figure 5-8 presents the remaining estimated cleanup costs for Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) by fiscal year; Figure 5-9 presents the remaining estimated cleanup costs by work element. Higher costs are anticipated for about the next 10 years as groundwater remediation systems are placed in service and begin (or continue) operating. Remaining costs decline and primarily cover ongoing remediation operations, monitoring and reporting, and well support for the treatment systems.

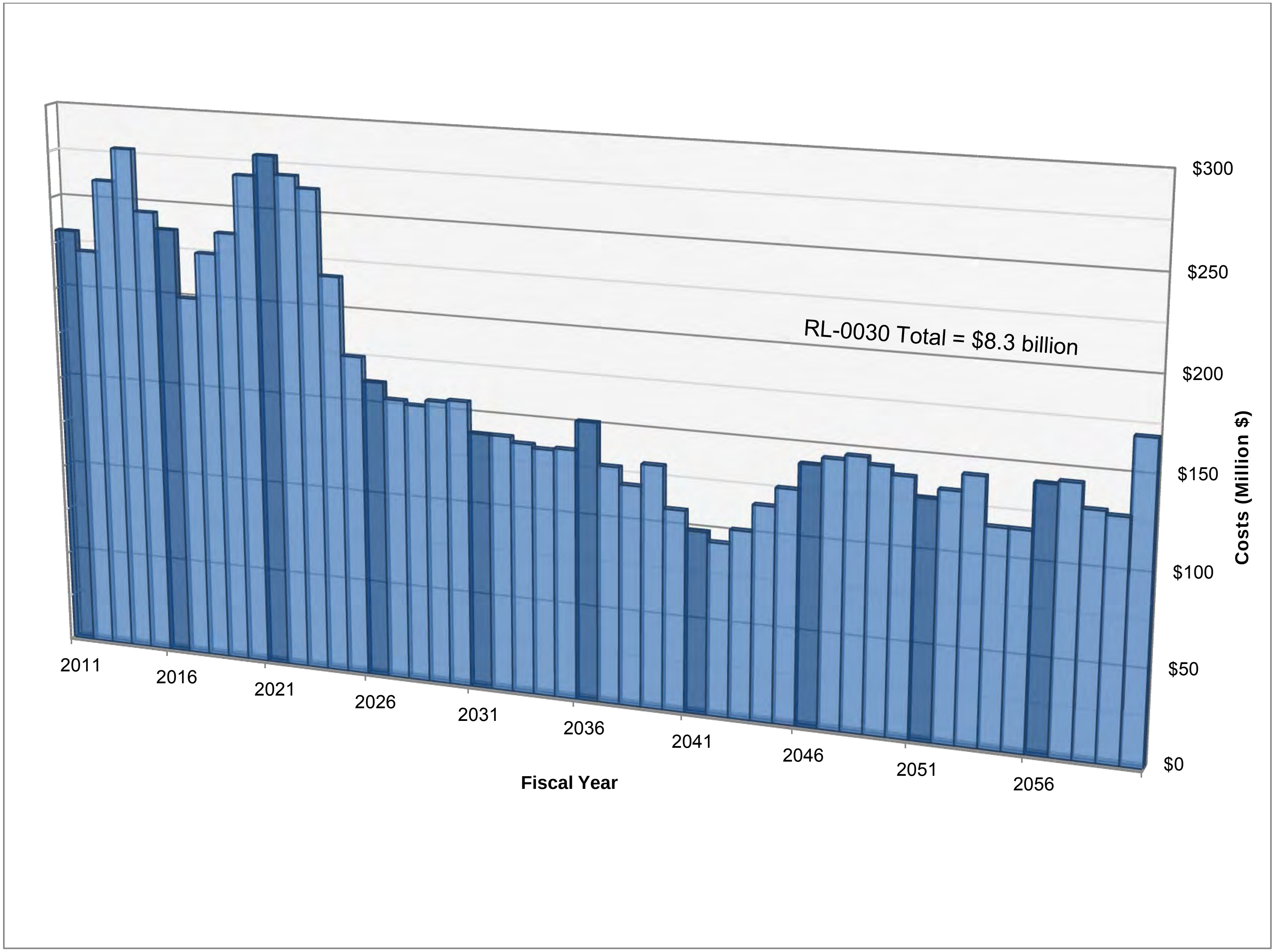


Figure 5-8. Soil and Water Remediation-Groundwater/Vadose Zone (PBS RL-0030) Remaining Estimated Cleanup Costs by Fiscal Year.

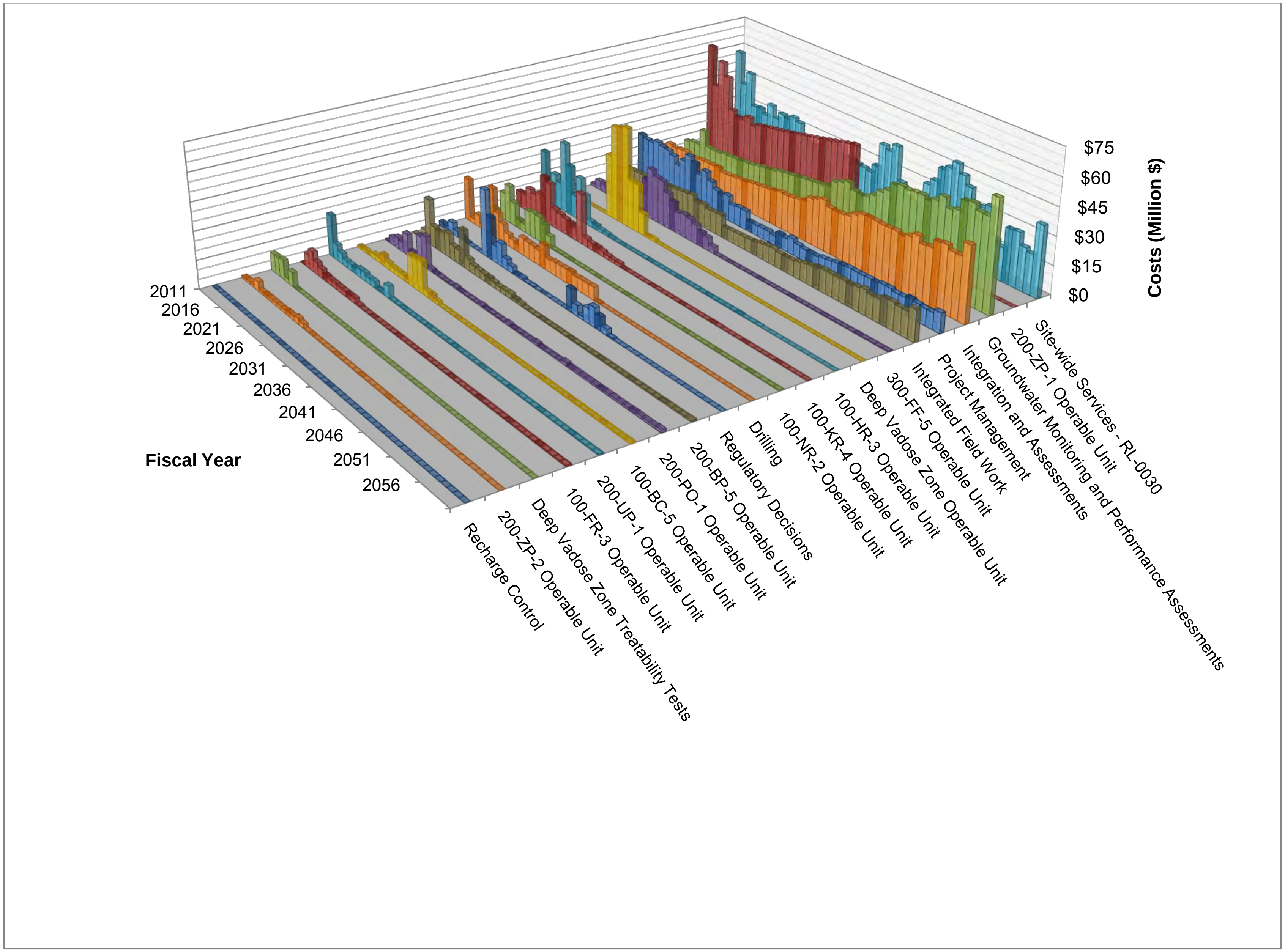


Figure 5-9. Soil and Water Remediation-Groundwater/Vadose Zone (PBS RL-0030) Remaining Estimated Cleanup Costs by Work Element.

5.3 NUCLEAR FACILITY D&D–REMAINDER OF HANFORD (PBS RL-0040)

Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) is the geographically based cleanup and closure of the Central Plateau and remaining scope in the other Hanford Site areas. In addition to the Central Plateau Cleanup scope, PBS RL-0040 includes the infrastructure and services scope under Mission Support, which is discussed in Chapter 7.0. This section focuses on the cleanup-related elements of the PBS, also known (and referred to in the rest of this section) as the Central Plateau Remediation Project. The Central Plateau Remediation Project (PBS RL-0040) scope includes Hanford Site demolition and remediation scope that is organized into 26 geographical areas referred to as closure zones.

Following completion of assessment activities through decision documentation (e.g., ROD or closure plan) under Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030), completion of the remedial design/remedial action work plan and waste site/facility remediation and/or closure will be addressed under the Central Plateau Remediation Project (PBS RL-0040). The Central Plateau Remediation Project (PBS RL-0040) scope includes implementing the decisions through the physical cleanup of canyon facilities, buildings and structures, waste sites, and miscellaneous sites (e.g., debris piles), and utilities to ensure appropriate protectiveness has been provided for the five canyon buildings and the Central Plateau waste sites and structures.

To accomplish the Central Plateau Remediation Project (PBS RL-0040), the following major objectives have been established:

- Perform safe S&M of facilities and waste sites pending remediation.
- Integrate planning and execution activities with other Central Plateau projects.
- Remediate waste sites.
- Decontamination and decommissioning (D&D) canyons.
- D&D excess facilities.

The project will be complete when the following end point criteria have been reached:

- Canyons and surplus facilities removed or dispositioned and ready for transition to LTS.
- Central Plateau waste sites remediated in accordance with approved decisions.
- Legacy wastes and facilities at PNNL dispositioned.
- Institutional controls implemented.
- Post-remediation operations and maintenance requirements implemented.

The work scope for the Central Plateau Remediation Project (PBS RL-0040) is organized into three primary Level 2 work elements as shown in Figure 5-10, which also presents the remaining cleanup schedule for this PBS. Table 5-7 provides additional details on the scope of work for each of these work elements.

The duration of the work elements in Figure 5-10 includes planning estimates for completing remedial actions for the 26 Central Plateau and remainder of Hanford closure zones.
The duration, in part, is dependent on transition of the tank farms to the project for final disposition after closure activities are completed by DOE-ORP (see Chapter 6.0). It is also dependent on transition of waste management facilities that are no longer needed to support Hanford Site cleanup from Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) to the project for final disposition (see Section 5.5).

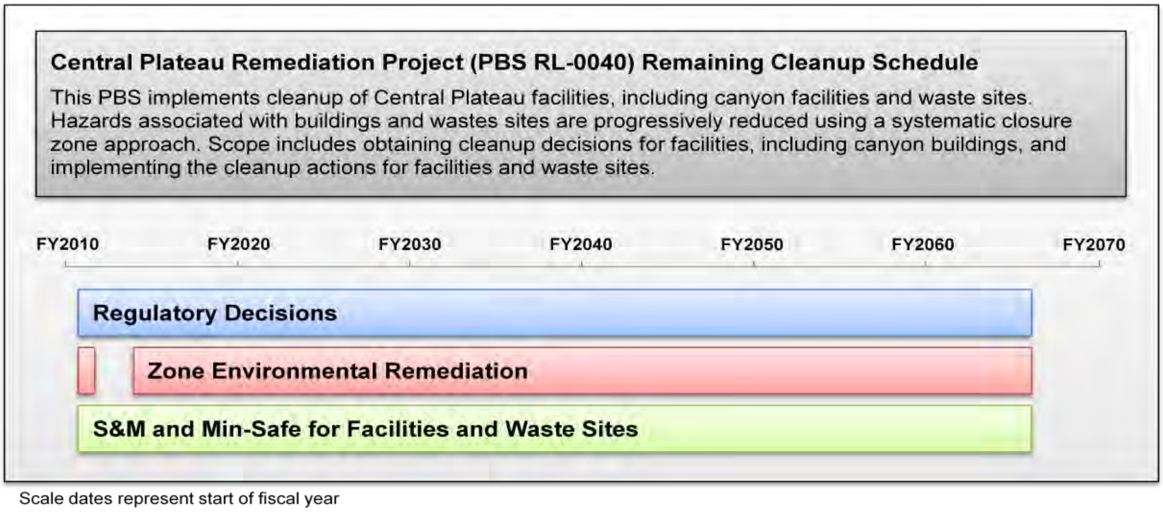


Figure 5-10. Central Plateau Remediation Project (PBS RL-0040) Remaining Cleanup Schedule.

Table 5-7. Central Plateau Remediation Project (PBS RL-0040) Level 2 Scope Summary.

Work Element	Scope Description
Regulatory Decisions	This work element includes general management direction and technical/ESH&Q support, cross-cutting engineering and technical studies necessary to support decision-making for Central Plateau remediation and to evaluate tradeoffs associated with remedial action and facility disposition decisions, regulatory decisions for canyons and related nuclear process facilities, and regulatory decisions for below-slab remediation for non-canyon facilities.
Zone Environmental Remediation	This work element is the geographic remediation of closure zones in the Central Plateau. Each zone has a variety of cleanup features that can include waste sites, facilities, canyons, pipelines, and remedial barriers. The actions to be taken for cleaning up each waste site, including pipelines, will be determined through the regulatory decision processes (under Soil and Water Remediation–Groundwater/Vadose Zone, PBS RL-0030) and as part of remedial definition activities. Potential remedial actions for waste sites range from monitored natural attenuation to capping or removal, depending on waste site conditions. Contamination levels, risks, proximity to facilities, and other considerations are factored into the selection. Existing structures (other than the canyon facilities) are expected to be demolished and the debris disposed of at ERDF.
S&M and Min-Safe for Facilities and Waste Sites	This work element includes surveillance and system, structural, equipment, and other maintenance on Central Plateau facilities/buildings and waste sites.

ERDF = Environmental Restoration Disposal Facility.
ESH&Q = Environment, Safety, Health, and Quality.
PBS = project baseline summary.
S&M = surveillance and maintenance.

Figure 5-11 presents the remaining estimated cleanup costs for the Central Plateau Remediation Project (PBS RL-0040) by fiscal year; Figure 5-12 presents the remaining estimated cleanup costs by work element. Costs over the next 10 to 15 years are associated primarily with substantial cleanup of waste sites and facilities near B Pond and Gable Mountain Pond, B Plant, PFP, PUREX, REDOX, Semi-Works, and the solid waste burial grounds in 200-West Area. The cleanup remedies that the estimated costs are based on come from a range of alternatives.

5.4 NUCLEAR FACILITY D&D–FAST FLUX TEST FACILITY PROJECT (PBS RL-0042)

The FFTF is a deactivated, 400-megawatt (thermal) liquid-metal (sodium)-cooled, research and test reactor located in the 400 Area. The facility was used to develop and test advanced fuels and materials for the Liquid Metal Fast Breeder Reactor Program and to serve as a prototype facility for future Liquid Metal Fast Breeder Reactor Program facilities. In December 1993, DOE issued a shutdown order for FFTF because the Liquid Breeder Reactor Program had been cancelled.

The scope of Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042) is to provide for safe D&D, secure storage and stabilization of the hazardous/radioactive materials, interim maintenance of the facilities, demolition, and disposal of the waste. The mission requires removal and dispositioning of sodium coolant, the Reactor Containment Building, reactor support buildings, and auxiliary facilities and support systems. The project technical objective will achieve the following:

- Remove and disposition sodium coolant and clean residual sodium.
- Fill spaces with grout below the 550-foot elevation level (grade level) of the Reactor Containment Building.
- Decommission and demolish all facilities.

The regulatory decision for the FFTF containment building final closure, including the de-fueled reactor vessel, will be determined following the appropriate environmental analysis process. For planning purposes, the reactor containment dome is assumed to be removed, the below-grade Reactor Containment Building grouted and entombed, and the support facilities and structures demolished to 3 feet below grade and backfilled. The FFTF alternatives are being evaluated in DOE/EIS-0391, *Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington*.

Waste sites within the 400 Area are included as part of the 300-FF-2 OU, which is being remediated under the Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041). These waste sites will be remediated in accordance with the ROD for the 300-FF-2 OU (EPA/ROD/R10-01/119, *Declaration of the Interim Record of Decision for the 300-FF-2 Operable Unit, Hanford Site, Benton County, Washington*); the scope is included under PBS RL-0041 and discussed in Section 4.1.

Figure 5-13 shows the Level 2 scope elements and the remaining cleanup schedule for the Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042). Table 5-8 summarizes the work scope.

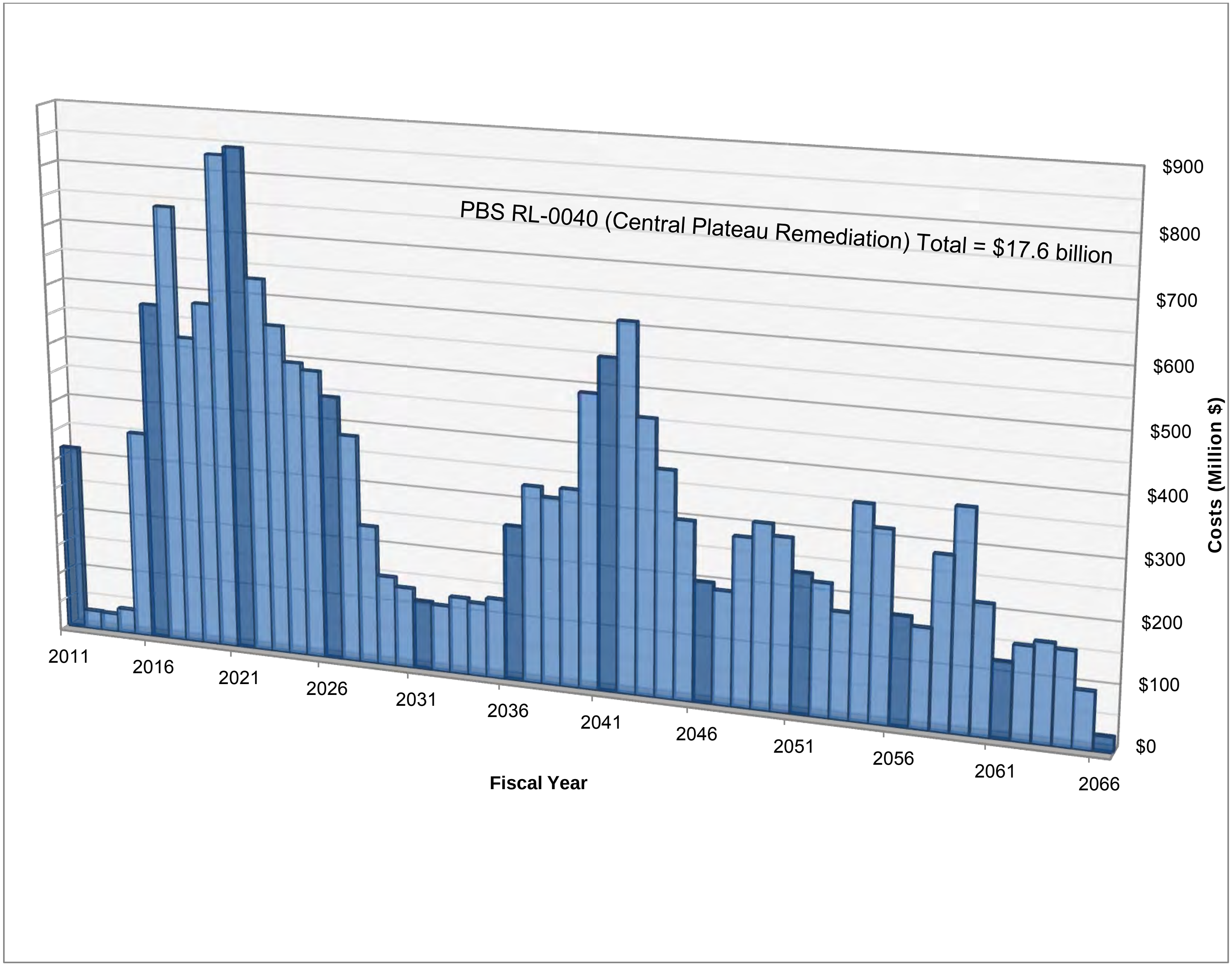


Figure 5-11. Central Plateau Remediation Project (PBS RL-0040) Remaining Estimated Cleanup Costs by Fiscal Year.

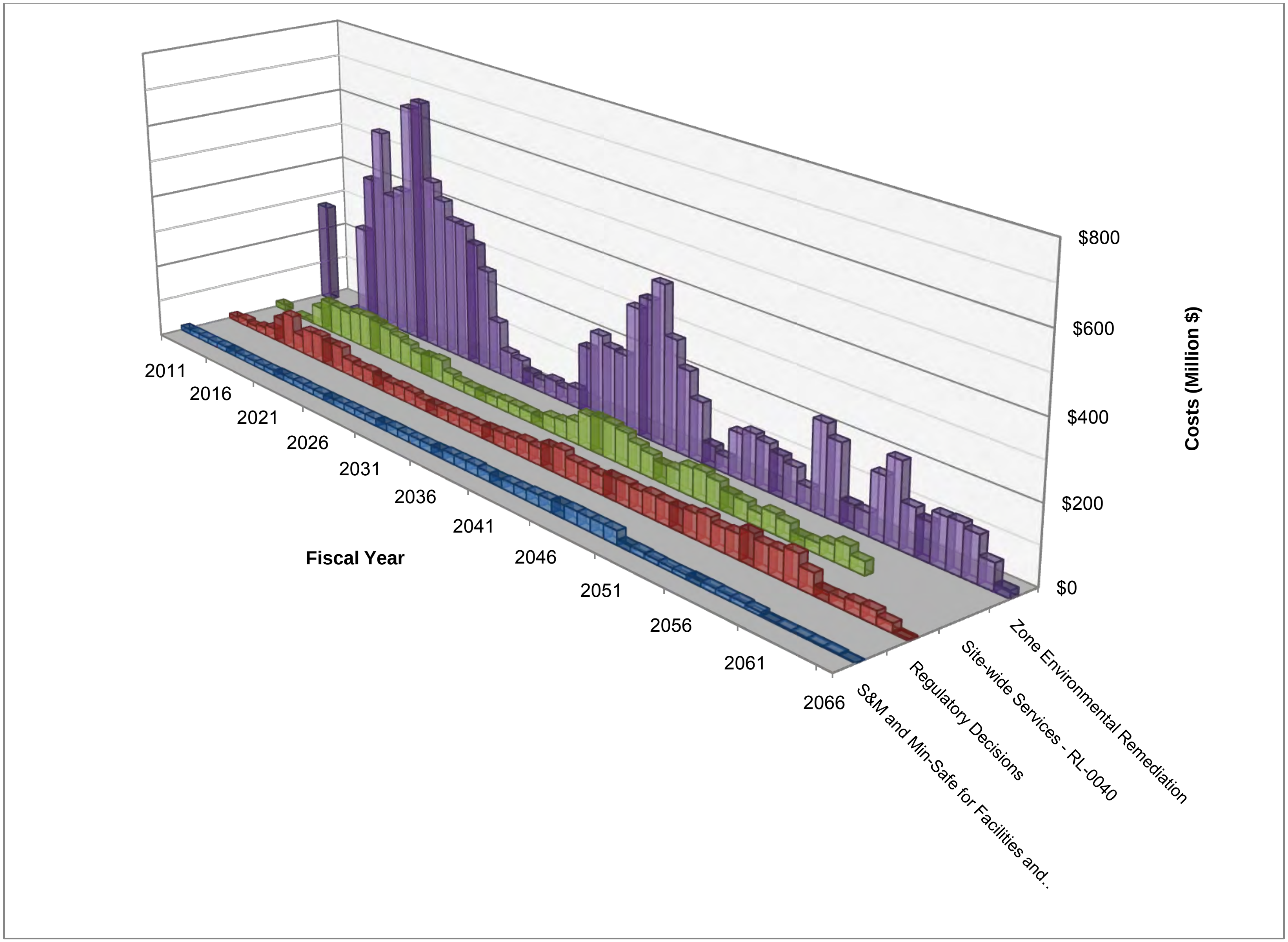


Figure 5-12. Central Plateau Remediation Project (PBS RL-0040) Remaining Estimated Cleanup Costs by Work Element.

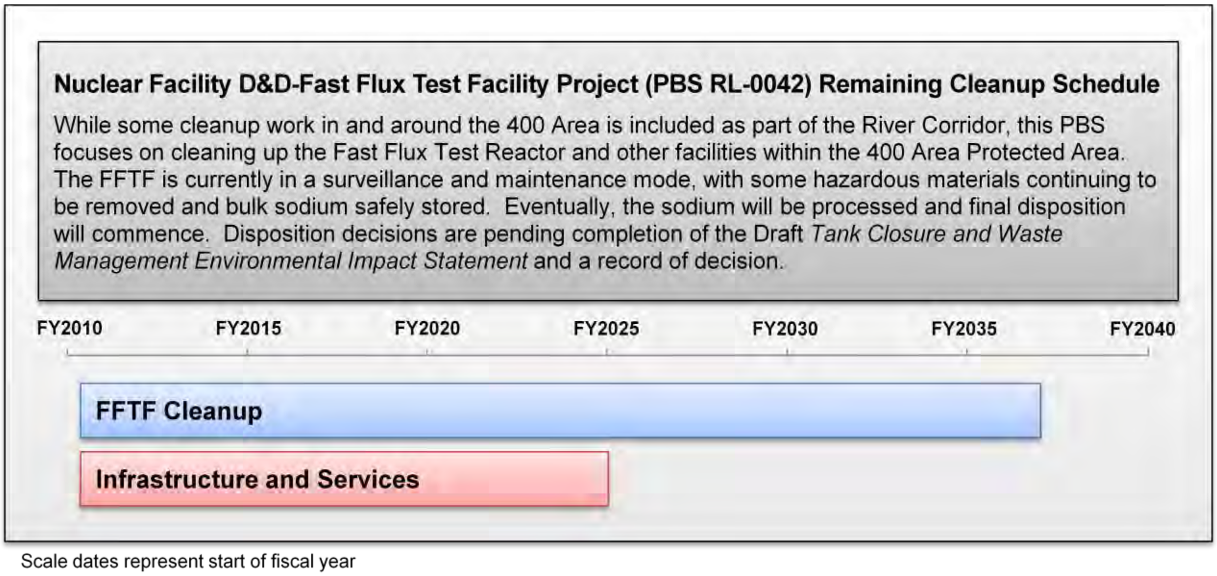


Figure 5-13. Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042) Remaining Cleanup Schedule.

Table 5-8. Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042) Level 2 Scope Summary.

Work Element	Scope Description
FFTF Cleanup	This work element includes monitoring, surveillance, and maintenance of the FFTF and surrounding area in a safe and compliant manner until D&D; deactivation of the FFTF; disposition of the FFTF sodium; construction of a sodium reaction facility; decommissioning of the FFTF in accordance with a future record of decision; and project management for these activities.
Infrastructure and Services	This work element includes activity related to a DOE-RL direct contract.

DOE-RL = U.S. Department of Energy, Richland Operations Office.
D&D = decontamination and decommissioning.
FFTF = Fast Flux Test Facility.
PBS = project baseline summary.

Figure 5-14 presents the remaining estimated cleanup costs for the Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042) by fiscal year; Figure 5-15 shows the remaining estimated cleanup costs by work element. Relatively low initial costs are indicative of the S&M period. Costs increase for about 15 years and are primarily associated with the construction of a sodium reaction facility, disposition of sodium, and the FFTF decommissioning efforts.

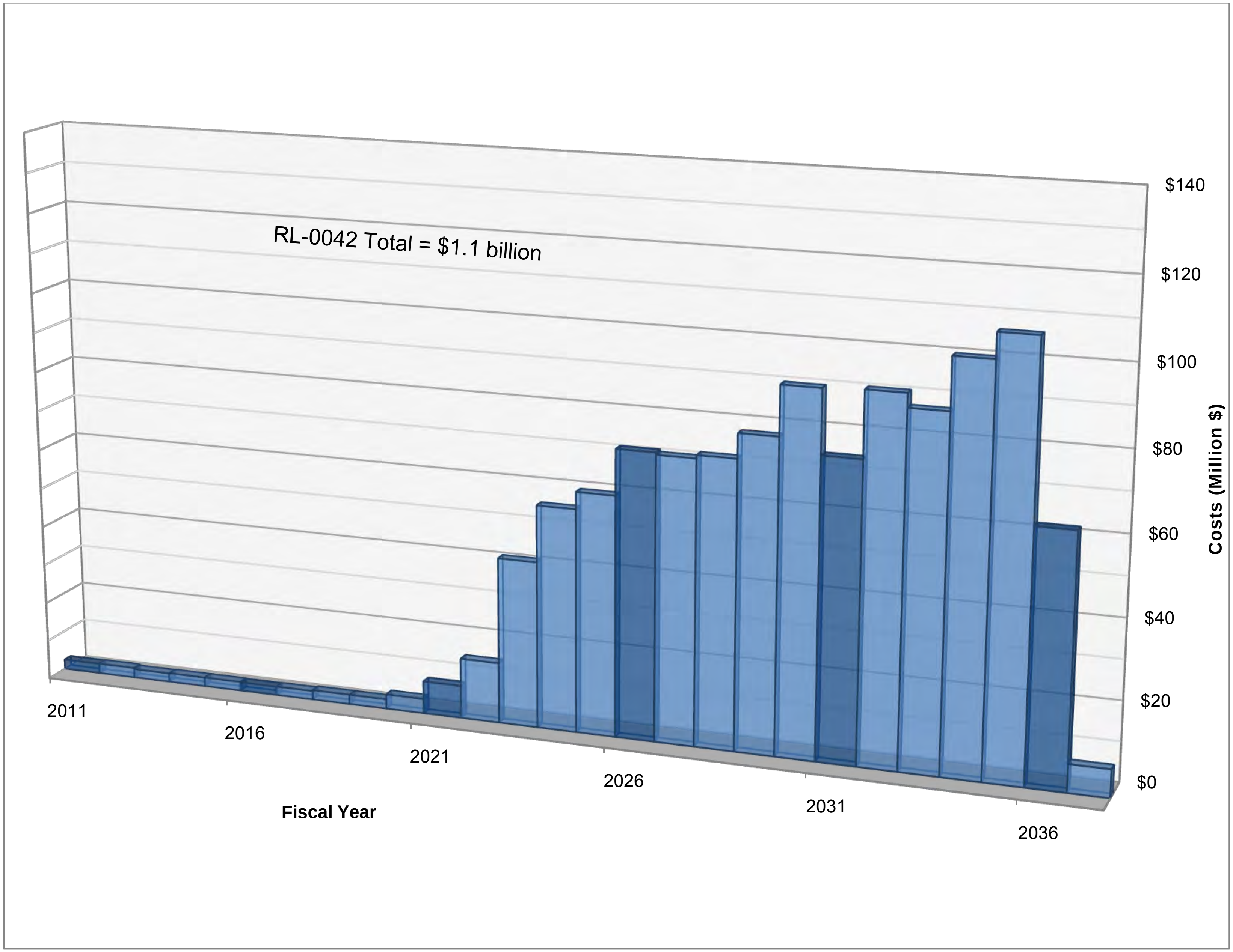


Figure 5-14. Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042) Remaining Estimated Costs by Fiscal Year.

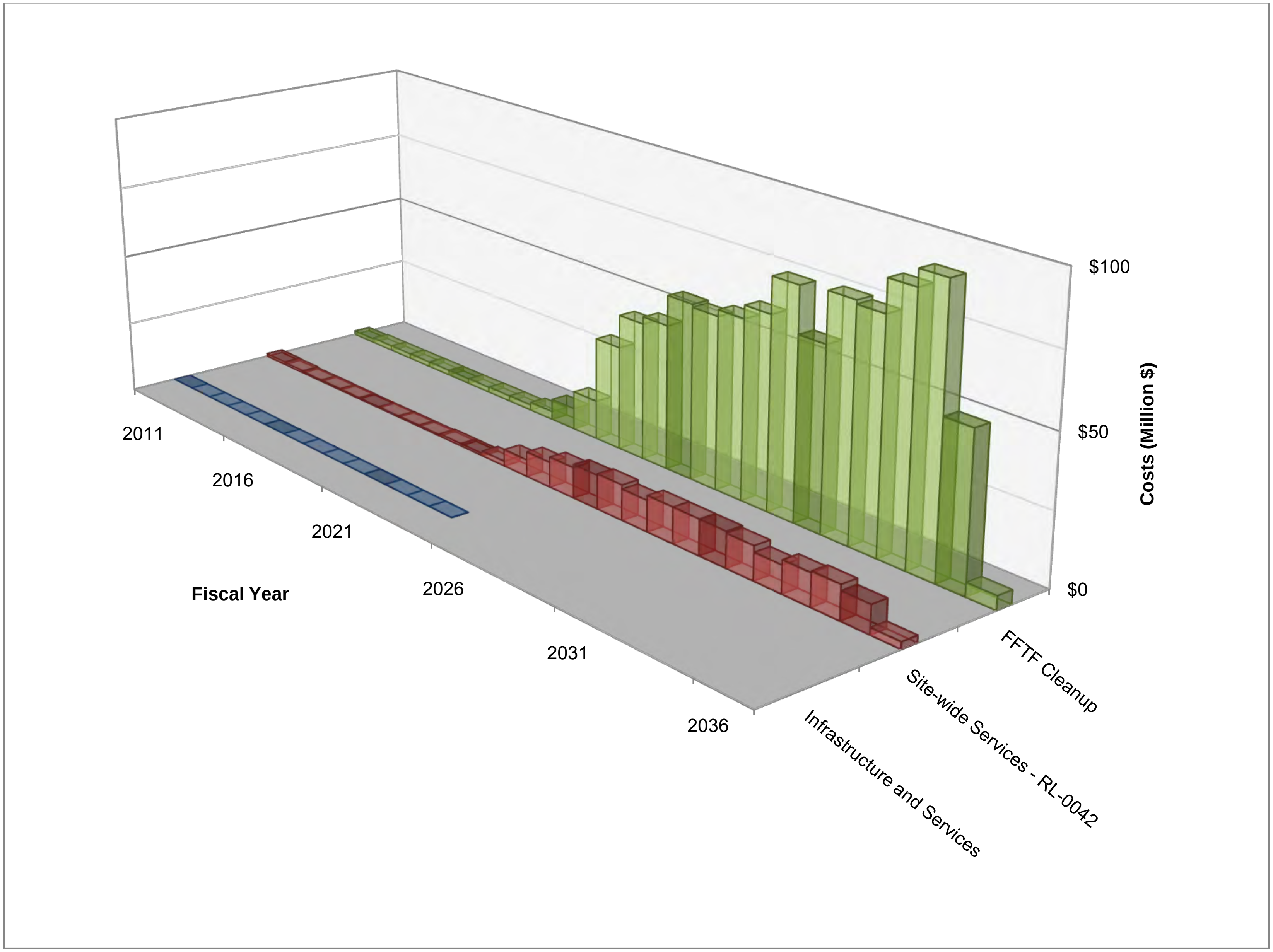


Figure 5-15. Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042) Remaining Estimated Costs by Work Element.

5.5 SOLID WASTE STABILIZATION AND DISPOSITION–200 AREA (PBS RL-0013C)

The scope of the Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) project is to provide waste treatment and disposal services for Hanford Site facilities and operations. The major mission objectives are to:

- Operate Hanford Site waste treatment facilities, including T Plant, WRAP Facility, and 200 Area Liquid Effluent Treatment Facilities.
- Provide Base Waste Management Operations at the CSB and 200 Area Interim Storage Area, the Integrated Disposal Facility (IDF), the Waste Encapsulation and Storage Facility for cesium/strontium capsule storage, and Low-Level Burial Grounds and mixed waste disposal trenches.

Additional objectives are:

- Retrieve and ship transuranic (TRU) waste for disposal to the WIPP.
- Develop alternative methods for treatment and disposal of orphan waste.
- Obtain processing capabilities to include repackaging of large and remote-handled contaminated waste containers.

The Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) includes completing the following activities:

- Cesium and strontium capsules will be transferred to dry storage and/or permanent disposal.
- Irradiated nuclear fuels will be removed off-site to a national repository for final disposition.
- Complete retrieval of stored underground TRU waste and dispose of waste.
- Mixed low-level and low-level waste will be treated as necessary and disposed.
- Waste management facilities will be deactivated at the end of their useful lives and will be turned over to Nuclear Facility D&D-Remainder of Hanford (PBS RL-0040) for final disposition.
- The Low-Level Burial Grounds (including the mixed waste trenches) will be closed and transferred to Nuclear Facility D&D-Remainder of Hanford (PBS RL-0040) for cap installation and final disposition.
- The ERDF will be operated to provide solid waste treatment and disposal services in support of Hanford Site cleanup after completion of the Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041).
- The IDF will be closed according to the closure plan requirements in the Dangerous Waste Permit (WA7890008967). Closure will follow completion of tank waste vitrification.

Figure 5-16 presents the scope elements and the remaining cleanup schedule for Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C). Table 5-9 summarizes each scope element. As waste management facilities are no longer needed to support Hanford Site cleanup, they will be transitioned to Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) for final disposition.

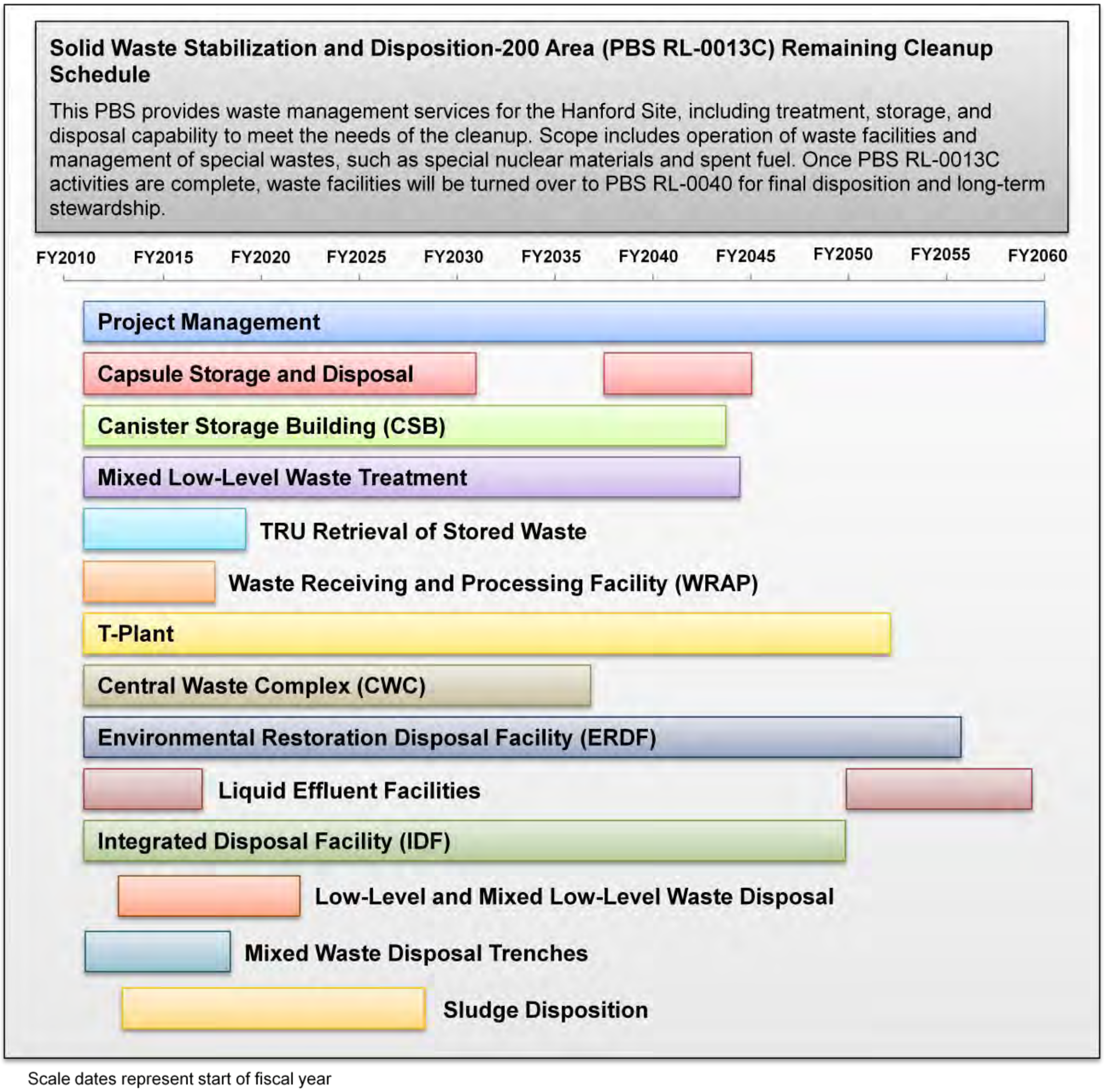


Figure 5-16. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Remaining Cleanup Schedule.

Table 5-9. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Level 2 Scope Summary. (2 pages)

Work Element	Scope Description
Project Management	This work element provides for the overall project management, coordination, direction, and customer interface to ensure the proper conduct of operation for this project.
Capsule Storage and Disposal	This work element addresses operation of the WESF pool cells, and includes life extension upgrades to ensure safe and compliant operations, retrieval and disposition of cesium/strontium capsules, and transition of WESF for final D&D.
Canister Storage Building (CSB)	This work element includes safe storage of SNF and immobilized high-level waste from the WTP while awaiting final disposition at the geologic repository, repackaging of SNF for shipment, and coordination with the off-site repository for evaluations and information.
Mixed Low-Level Waste (MLLW) Treatment	This work element addresses treatment of MLLW to meet regulatory requirements. Treatment technologies include macro-encapsulation, stabilization, or thermal techniques, such as vacuum desorption. Once categorized, the waste will be prepared for shipment to the appropriate processing or treatment facility.
TRU Retrieval of Stored Waste	This work element consists of the retrieval, designation, and transfer to a TSD facility of both contact-handled and remote-handled solid stored underground TRU waste.
Waste Receiving and Processing (WRAP) Facility	This work element provides base and minimum safe operations at the WRAP to support processing of TRU wastes to WIPP and includes transition to final D&D.
T Plant	This work element addresses the operation and maintenance of the T Plant Complex for waste processing operations, including necessary upgrades and transition to final D&D of the canyon.
Central Waste Complex (CWC)	This work element includes operation and maintenance of the CWC, including upgrades to maintain needed capability and transition to final D&D. The scope includes provision of an alternate capability (other than WRAP) to load contact-handled TRU waste into shipping containers for shipment to WIPP.
Environmental Restoration Disposal Facility (ERDF)	This work element addresses the operation of the ERDF after turnover from the River Corridor Closure Project through the end of Hanford Site cleanup, including cell expansion and ERDF interim cover construction.
Liquid Effluent Facilities	This work element includes operation and maintenance of LERF, ETF, and 200 Area TEDF to receive, store, treat, and dispose of liquid effluents from Hanford Site cleanup activities.
Integrated Disposal Facility (IDF)	This work element provides for the preparation, startup, and operation of the IDF to receive and store low-level waste and MLLW in accordance with applicable waste acceptance criteria. The scope includes provisions for IDF expansion.
Low-Level and Mixed Low-Level Waste Disposal	This work element includes the operation and maintenance of the Low-Level Burial Grounds and includes activities such as assessments and surveillances; emergency preparedness; engineering; environmental sampling, monitoring, and reporting; fire protection; maintenance; material control; nuclear safety/industrial safety; occupational safety; procedure development; grounds maintenance; quality assurance/quality control; radiological control; training; and waste management. The scope includes maintaining burial ground 218-B-12, trench 94 in ready-to-serve status to support the U.S. Navy’s reactor compartment disposal program.

Table 5-9. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Level 2 Scope Summary. (2 pages)

Work Element	Scope Description
Mixed Waste Disposal Trenches	This work element includes operation of the mixed waste disposal trenches and the design, construction, and other activities necessary to add operational layers in the trenches to maintain their ready-to-serve status and to place temporary caps on the trenches.
Sludge Disposition	The scope includes activities to stabilize and package the sludge from the 105-KW Basin for final disposition to WIPP or other disposal facilities, including Phase 2 treatment and packaging shutdown and deactivation of needed equipment, and management and support.

CSB = Canister Storage Building.
CWC = Central Waste Complex.
D&D = decontamination and decommissioning.
ERDF = Environmental Restoration Disposal Facility.
ETF = Effluent Treatment Facility.
IDF = Integrated Disposal Facility.
LERF = Liquid Effluent Retention Facility.
MLLW = mixed low-level waste.
PBS = project baseline summary.
SNF = spent nuclear fuel.
TEDF = Treated Effluent Disposal Facility.
TRU = transuranic.
TSD = treatment, storage, and disposal.
WESF = Waste Encapsulation and Storage Facility.
WIPP = Waste Isolation Pilot Plant.
WRAP = Waste Receiving and Processing (Facility).
WTP = Waste Treatment Plant.

Figure 5-17 shows the remaining estimated cleanup costs for the Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) by fiscal year; Figure 5-18 shows the remaining estimated cleanup costs by work element.

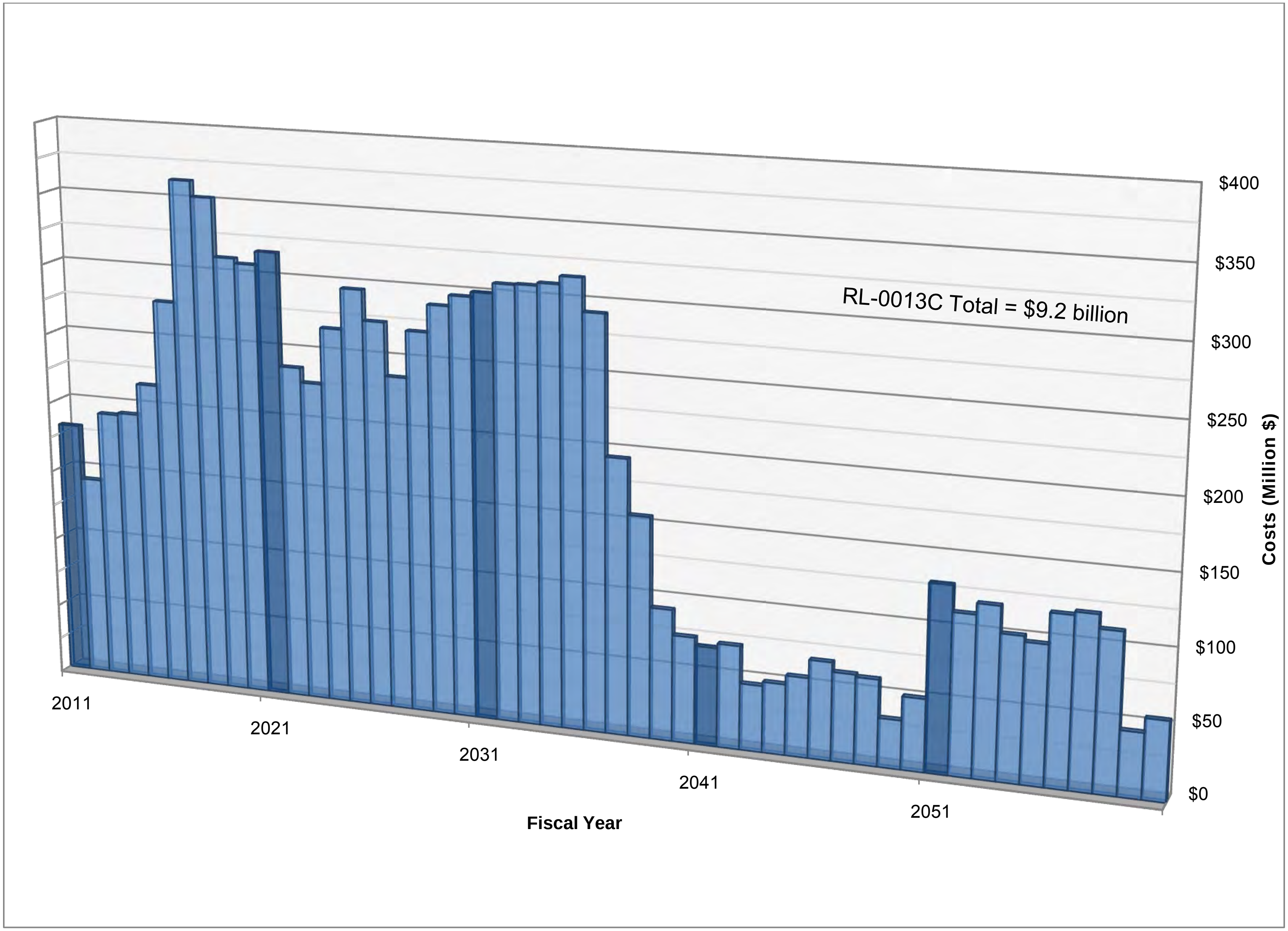


Figure 5-17. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Remaining Estimated Cleanup Costs by Fiscal Year.

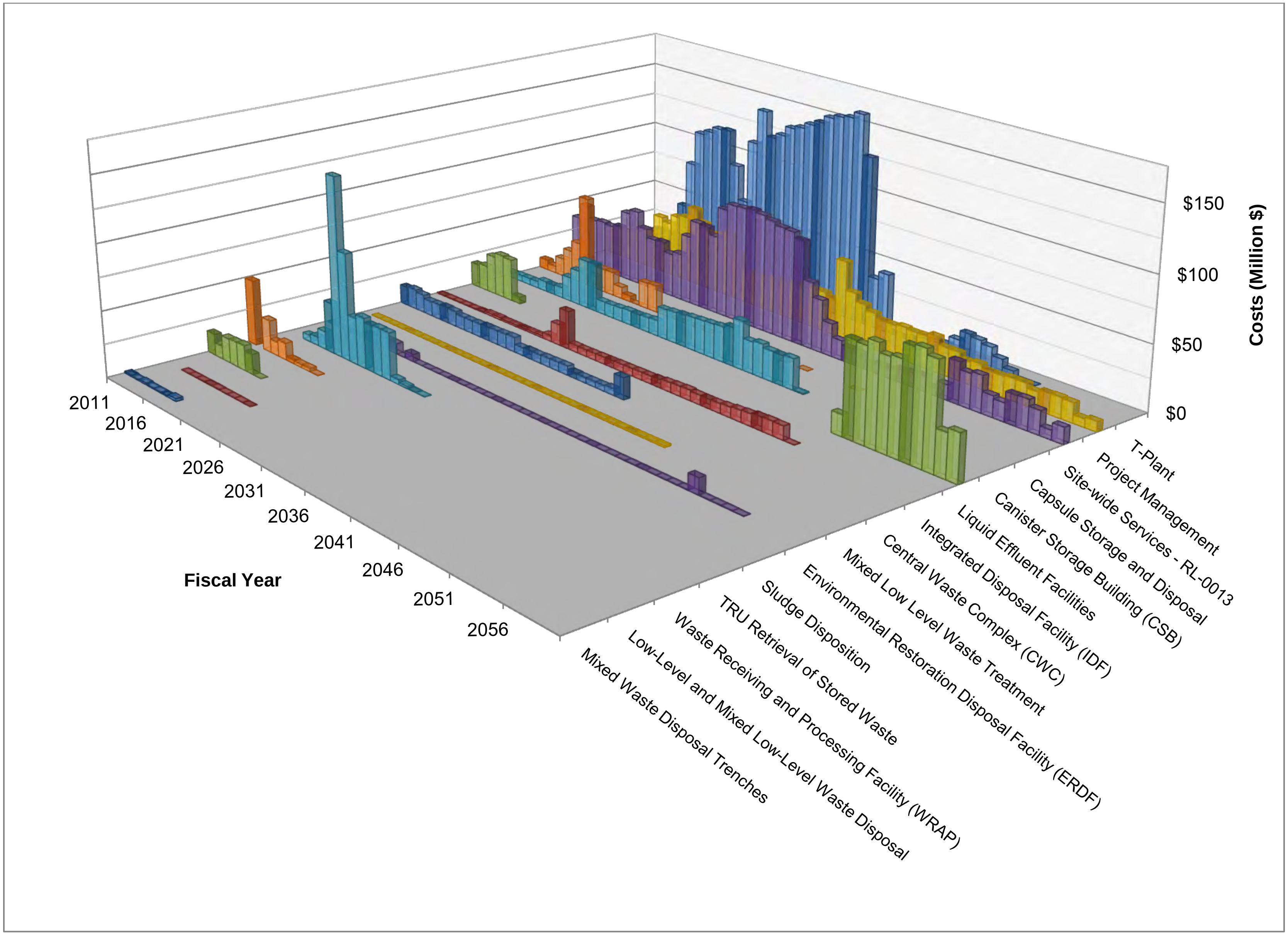


Figure 5-18. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Remaining Estimated Cleanup Costs by Work Element.

5.6 CENTRAL PLATEAU ASSUMPTIONS AND UNCERTAINTIES

In planning for the Hanford Site lifecycle, there are uncertainties considered regarding estimate scope, schedule, and cost. While a number of assumptions are made to support lifecycle development, the assumptions presented here are major assumptions that drive costs. These assumptions reflect those associated with the costs presented in this version of the Lifecycle Report, and may not exactly align with DOE/RL-2009-81. As planning activities align with the strategy, these assumptions will be revised. This new alignment will be presented in future Lifecycle Reports. Key differences have been noted where appropriate.

The following assumption is identified for NM Stabilization and Disposition–PFP (PBS RL-0011) work scope:

- The annual funding for implementation of PBS RL-0011 will match the project request.

For Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030), the following assumptions are currently identified:

- The annual funding for implementation of PBS RL-0030 will match the project request.
- Planned characterization of the vadose zone below the high-level waste tanks will be sufficient to evaluate remedies for protection of groundwater.
- No substantial new requirements will be added to meet the state's implementation of RCRA.

For Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040), the following assumptions are currently identified:

- An industrial worker scenario will be used to define the exposure scenarios and the threshold cleanup levels for waste sites located within the 200 Areas. (Note: under DOE/RL-2009-81, the industrial worker scenario will be used in the Inner Area and a rural residential scenario will be used for the Outer Area.)
- The Central Plateau area of the Hanford Site will remain under Federal control for the foreseeable future.
- All low-level legacy waste will be managed and treated on the Hanford Site via remove, treat, and dispose to approved on-site disposal facilities.
- Planning assumes that geographic aggregate barriers will be utilized.
- Removal excavations typically will be 15 feet below grade. (Note: under DOE/RL-2009-81, excavation depths in the Inner Area are not defined, but the depth would be protective of humans, the environment, and groundwater. Excavation depths in the Outer Area would be up to 15 feet deep, to be consistent with remediation in the River Corridor.)

For Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042), the following assumptions are currently identified:

- The annual funding profile for implementation of PBS RL-0042 will match the project request.
- FFTF funding to accomplish the scope can be carried over from year to year. Beginning in FY 2015, budget levels are to reflect an optimal ramp up to complete sodium residuals cleaning, bulk sodium processing, and D4 work scope.

For Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C), the following assumptions are currently identified:

- The annual funding profile for implementation of PBS RL-0013C will match the project request.
- New treatment facilities are not required to support longer WTP operations.
- T Plant will be available for modification to be the facility necessary for retrieval, storage, and treatment/processing of all Hanford Site RCRA TRUM waste as required by TPA Milestone M-091-01.
- WIPP will remain operational through the end of Hanford Site cleanup operations that have the potential to generate TRU waste.

5.7 CENTRAL PLATEAU CLEANUP ACTION - REMEDIATE 200-SW-2 OPERABLE UNIT COST ESTIMATE ALTERNATIVE ANALYSIS

Twenty-five solid waste landfills (often referred to as burial grounds or burial trenches) are located within the 200-SW-2 OU on the Central Plateau (13 landfills are in the 200-West Area and 12 landfills are in the 200-East Area). Collectively, the 200-SW-2 OU landfills received between 450,000 and 460,000 cubic meters of a heterogeneous mixture of solid waste during operations that began in the mid-1940s. The 200-SW-2 OU landfills cover a cumulative area of over 680 acres, including layback and working margin within the perimeter. Each landfill is made up of burial trenches. The cumulative area of the trenches considered as part of this analysis is 545 acres (this area excludes unused landfills and trench sections where active storage is occurring). To date, no regulatory cleanup decisions have been made for the 200-SW-2 OU.

Much of the available information regarding the 200-SW-2 OU is summarized in DOE/RL-2004-60, *200-SW-1 Nonradioactive Landfills Group Operable Unit and 200-SW-2 Radioactive Landfills Group Operable Unit Remedial Investigation/Feasibility Study Work Plan*. Waste volume and other information relevant to the 200-SW-2 OU were derived from DOE/RL-2004-60 and used for preparation of the information in this section and Appendix F. The quantity and quality of burial records and/or relevant historical information varies greatly; information generally is sparse for the earlier years and more substantive for waste buried after the late 1960s.

For estimate development purposes, the 25 landfills in the 200-SW-2 OU have been sorted into six main categories, or bins, based on similar characteristics (DOE/RL-2004-60).

The CERCLA RI/FS process is not complete for the 200-SW-2 OU. To support preparation of this Lifecycle Report, the TPA agencies participated in working sessions to develop a range of plausible alternatives and describe a reasonable upper bound cleanup alternative, as follows:

- Excavation, treatment (as necessary), and disposal of all waste from within individual landfills (this is the reasonable upper bound).
- Excavation, treatment (as necessary), and disposal of waste from selected sections of individual landfills followed by capping of remaining waste; includes continued cap maintenance and monitoring.
- Capping of individual landfills (includes continued cap maintenance and monitoring).
- In situ treatment/stabilization (e.g., vitrification or grouting) of portions of individual landfills followed by capping; includes continued cap maintenance and monitoring (this is the lower bound).

The TPA agencies agreed that while fully removing all the 200-SW-2 OU waste may or may not ultimately be selected as the CERCLA remedy, providing information on a complete removal scenario (excavate, treat and dispose of all waste) would represent an upper bound in terms of cost estimates for these waste sites. The lower bound is represented by the in situ treatment/stabilization and capping option.

Table 5-10 summarizes the lower bound alternative which is in situ treatment/stabilization of portions of individual landfills followed by capping, including continued cap maintenance and monitoring. The cost estimate includes project management activities and cleanup costs for each landfill bin. The current work scope and cost estimates for the 200-SW-2 OU are included in Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040); these cost estimates are presented in further detail in Appendix F of this Lifecycle Report.

Table 5-10. 200-SW-2 Operable Unit Lower Bound Cleanup Cost Estimate (shown in 2010 Constant Dollars).

Activities	Cost (Million $)
Overall Project Management and Support Activities	$195
Remediation Definition	$2
Operations and Maintenance	$108
Bin 1 - TSD Unit Landfills	$260
Bin 2 - Industrial Landfills	$47
Bin 3 - Dry Waste Alpha Landfills	$46
Bin 4 - Dry Waste Landfills	$18
Bin 5 - Construction Landfills	$10
Bin 6 - Caissons	$0
Total (minus Cost and Schedule Uncertainty)	**$686**
Cost and Schedule Uncertainty (20%)	**$137**
Grand Total	**$823**
TSD = treatment, storage, and disposal.	

The scope of the upper bound cleanup cost estimate is provided as a sensitivity analysis and includes removal of the individual waste trenches in each of the twenty-five 200-SW-2 OU landfills, from the surface to the bottom of each waste trench, with the exception of the 218-W-6 Burial Ground (it has been assumed that confirmational sampling and analysis will show this burial ground never received waste). The waste contained in the burial grounds ranges from low-dose rate materials, to high-dose rate materials, to potential alpha-contaminated materials. As radioactive components increase in concentration/activity within the waste, additional measures are required to protect workers, the environment, and the public; therefore, costs associated with these measures also increase, as does the time needed to complete the work scope. Disposal requirements also vary with the waste type; some material may require special disposal, such as at WIPP or a similar facility.

To account for the variability in the waste and to address the range of associated cost and schedule impacts, three cost models were developed for this Lifecycle Report to address the different waste types and disposal pathways for the 200-SW-2 OU landfill wastes.

- Cost model 1 provided estimates for wastes that are expected to be suitable for disposal at ERDF, using practices similar to the River Corridor burial ground remediation.
- Cost model 2 provided estimates for solid wastes disposed of prior to 1970 and which when retrieved may contain more than 100 nanoCuries per gram of radioisotopes with periodic table element numbers greater than uranium; cost estimates used historic costs or current estimates for comparable Hanford Site activities.
- Cost model 3 provided estimates for high-dose wastes that have no easily identifiable handling or processing methods at the Hanford Site.

Appendix F provides additional information on the cost models and their development.

Costs for the 200-SW-2 OU upper bound cost estimate for remove, treat, and dispose (RTD) are presented in Table 5-11. Cost information is provided for each general category of activity and landfill bin. The total cost estimate in 2010 constant dollars for the upper bound alternative is $16.6 billion, including a reasonable provision of $5.5 billion to account for cost and schedule uncertainty. These cost estimates are presented in further detail in Appendix F of this Lifecycle Report.

Table 5-11. 200-SW-2 Operable Unit Upper Bound Cleanup Cost Estimate (shown in 2010 Constant Dollars).

Activities	Cost (Million $)
01.01 Overall Project Management and Support Activities	$1,268
01.02 ERDF Expansion	$180
01.03 Central Characterization Project	$332
01.04 WRAP Base Operations and Min Safe	$91
01.05 Bin 1 - TSD Unit Landfills	$7,070
01.06 Bin 2 - Industrial Landfills	$903
01.07 Bin 3 - Dry Waste Alpha Landfills	$887
01.08 Bin 4 - Dry Waste Landfills	$130
01.09 Bin 5 - Construction Landfills	$23
01.10 Bin 6 - Caissons	$142
Transport to WIPP [1]	$50
Total (minus uncertainty)	**$11,076**
Cost and Schedule Uncertainty (50%)	$5,538
Grand Total	**$16,614**

[1] This cost estimate has been developed only for purposes of this Lifecycle Report and does not appear in DOE's current budget for WIPP.

DOE = U.S. Department of Energy.
ERDF = Environmental Restoration Disposal Facility.
TSD = treatment, storage, and disposal.
WIPP = Waste Isolation Pilot Plant.
WRAP = Waste Receiving and Processing (Facility).

Table 5-12 displays the cost estimates for both the lower and upper bound cleanup cost estimates for the 200-SW-2 OU.

Table 5-12. 200-SW-2 Operable Unit Lower and Upper Bound Cleanup Action Alternative Analysis.

Cleanup Action	Lower Bound Alternative Leave Waste in Place (Million $)	Upper Bound Alternative Remove, Treat and Dispose (Million $)
Remediate 200-SW-2 Operable Unit	$823	$16,614

Estimated costs associated with the reasonable upper bound have not been added into the Hanford Site estimated cleanup cost information that is provided throughout the Lifecycle Report and shown in Appendix E.

All estimated costs are intended strictly for planning purposes and do not account for many of the factors that would be part of a complete CERCLA RI/FS. As the CERCLA cleanup process continues, additional information will support development of potential alternatives; evaluation of feasibility, practicality, risk and benefits; and, refinement of associated cost estimates. Additional evaluation of other key decision parameters will occur through the CERCLA evaluation criteria in a feasibility study for the 200-SW-2 OU.

6.0 TANK WASTE CLEANUP

Tank waste cleanup is performed by the RPP. The RPP is managed by DOE-ORP as required by the *Strom Thurmond National Defense Authorization Act for Fiscal Year 1999*, and augmented by the *Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001*.

The RPP mission is to retrieve and treat Hanford Site tank waste and close the tank farms to protect the Columbia River. As a result, DOE-ORP is responsible for the retrieval, treatment, and disposal of approximately 53 million gallons of mixed waste contained in Hanford Site waste tanks, and closure of all the tanks and associated facilities. The RPP work scope consists of two major elements:

- Safely manage the radioactive mixed waste stored in the Hanford Site's underground storage tanks. This work element is conducted under Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014).
- Design, construct, and commission the WTP, which will treat and immobilize tank wastes into a vitrified glass form. This work element is conducted under Major Construction – Waste Treatment Plant (PBS ORP-0060).

Figure 6-1 illustrates the relationships between the various activities and integration of the elements for retrieval of the waste from the tanks, treatment to reduce hazards, and disposal.

The RPP is comprised of the tank farms and WTP systems - nearly 200 interrelated waste storage, transfer, treatment, transportation, and disposal facilities. The RPP and these facilities are an important element of the DOE mission to protect the Columbia River. This chapter describes the RPP mission and scope as presented in ORP-11242, *River Protection Project System Plan*, Revision 4, along with cost and schedule information as of December 2010.[1]

The underground waste storage tanks were built in groups of 2 to 18 tanks; each group is known as a tank farm (A, AN, AP, AW, AX, AY, AZ, B, BX, BY, C, S, SX, SY, T, TX, TY, and U Tank Farms). Seven tank farms (comprised of 86 tanks) are located in the 200-West Area, and 11 tank farms (comprised of 91 tanks) are located about 5 miles away in the 200-East Area. The tanks were constructed in a below-grade excavation and then backfilled to take advantage of the natural radiation shielding provided by the earth. The 177 underground storage tanks represent two basic design types: SSTs and DSTs. The smallest SSTs hold up to 55,000 gallons, while the largest DSTs hold up to 1,250,000 gallons.

When the Hanford Site was in production, irradiated fuel from the reactors was transported to six separations facilities, called canyons, for the complex process of isolating the desirable radionuclides from other reactor products. From 1944 to 1989, the separations processes yielded millions of gallons of highly radioactive and chemically hazardous waste, which was pumped through underground transfer lines and subsequently stored in the underground storage tanks. Although the reactors and separations facilities have long since ceased their operations, the underground waste tanks and their contents remain. The radioactive liquid waste was transferred

[1]Revision 5 of ORP-11242, *River Protection Project System Plan*, was released on November 17, 2010, and Revision 6 was in development at the beginning of calendar year 2011. This Lifecycle Reports reflects information from ORP-11242 Revision 4, and incorporates some important changes being contemplated pursuant to development of Revisions 5 and 6.

from the separations facilities as slurry, a liquid with suspended solids. Over time, the radioactive solids settled to the bottom of the tanks, creating a layer known as sludge. The clarified radioactive liquid above the sludge is known as supernatant or supernate.

To reduce the total quantity of waste to be stored, the supernate was periodically decanted and transferred out of waste tanks for further processing. Supernatant liquids were routinely subject to a waste evaporation process. The evaporation process results in a separation of the heated waste slurry to a steam condensate fraction, which is relatively clean for further treatment and safe disposal, and a waste slurry fraction, which becomes more concentrated and is returned to the underground waste storage tanks. Historically, the concentrated waste slurry fraction cooled and began to form salt cake, a crystalline solid waste form. At one time, most tanks contained supernate, slurry, and saltcake waste forms simultaneously. Additionally, the cesium and strontium capsules in the Waste Encapsulation Storage Facility resulted from efforts to reduce fission products in the tanks.

In addition, long-term storage at high temperatures as a result of heat from fission product decay contributed to the formation of a solid mass or group of large solids not easily removed called hard heels in the bottoms of some tanks. The current typical content of the tanks is depicted in Figure 6-2. More information regarding the tanks and the RPP can be found in ORP-11242.

The current strategy for tank waste cleanup involves a number of interrelated activities essential to the mission to retrieve and treat the Hanford Site's tank waste and close the tank farms to protect the Columbia River. DOE-ORP will reduce risk to the environment posed by tank waste by:

- Retrieving the waste from 149 SSTs, transferring it to 28 DSTs, and delivering the waste to the WTP.
- Constructing and operating the WTP, which will safely treat all the high-level waste (HLW) fraction contained in the tank farms. Approximately one-third of the low-activity waste (LAW) fraction separated from the HLW fraction in the WTP will be immobilized in the WTP LAW Vitrification Facility.
- Developing and deploying supplemental treatment capability to treat the remaining two-thirds of the LAW.
- Developing and deploying waste feed preparation capability to mitigate sodium management issues. The goal is to minimize the quantity of glass by reducing contaminants that would require the addition of glass-forming additives.
- Developing and deploying treatment and packaging capability for potential contact-handled TRU tank waste with on-site storage prior to final disposition.
- Deploying interim storage capacity for the immobilized high-level waste pending determination of the final disposal pathway (national repository).
- Closing the SST and DST farms, ancillary facilities, and associated waste management and treatment facilities.

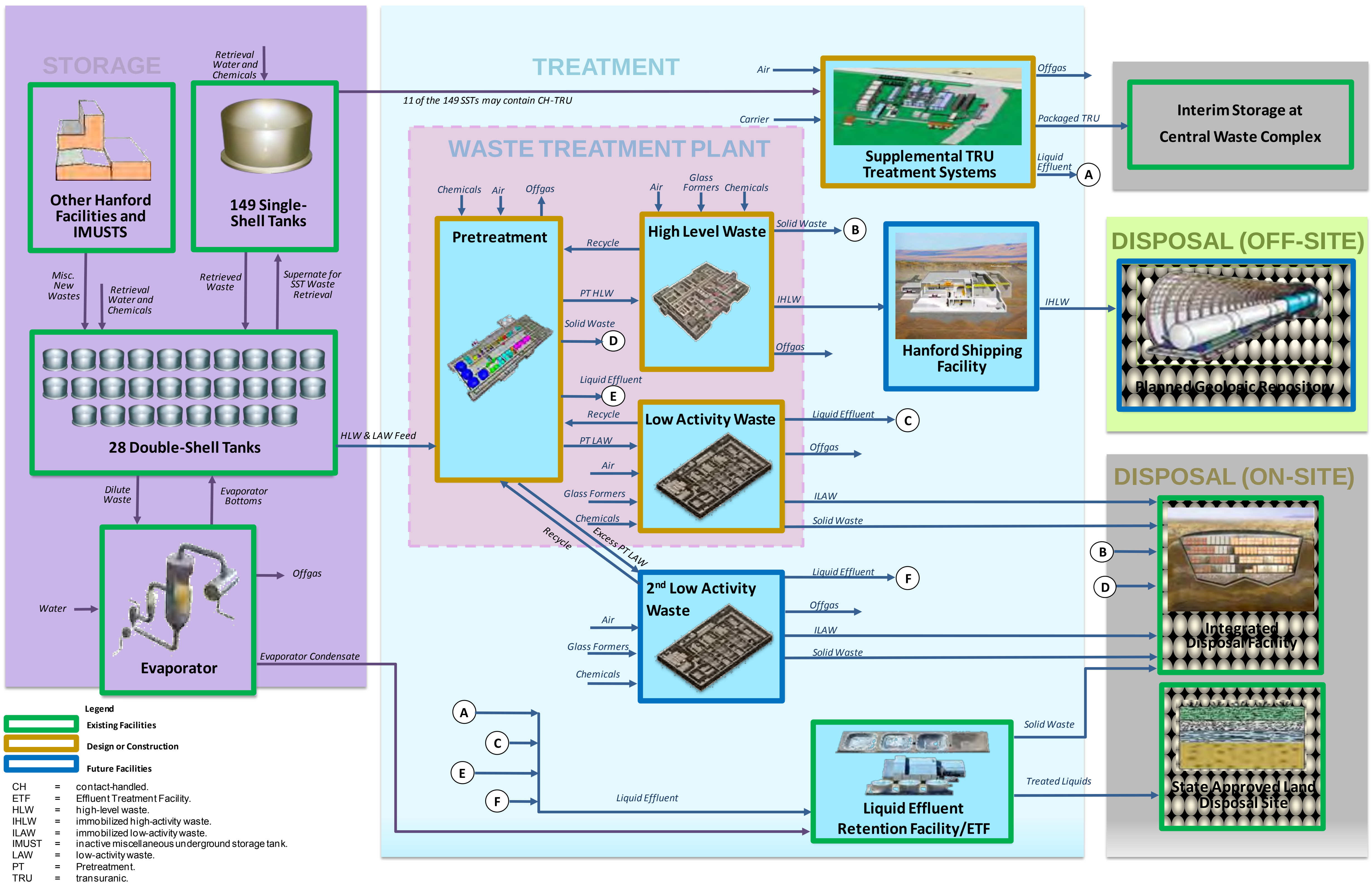


Figure 6-1. Simplified Process Diagram for Tank Waste Retrieval and Treatment.

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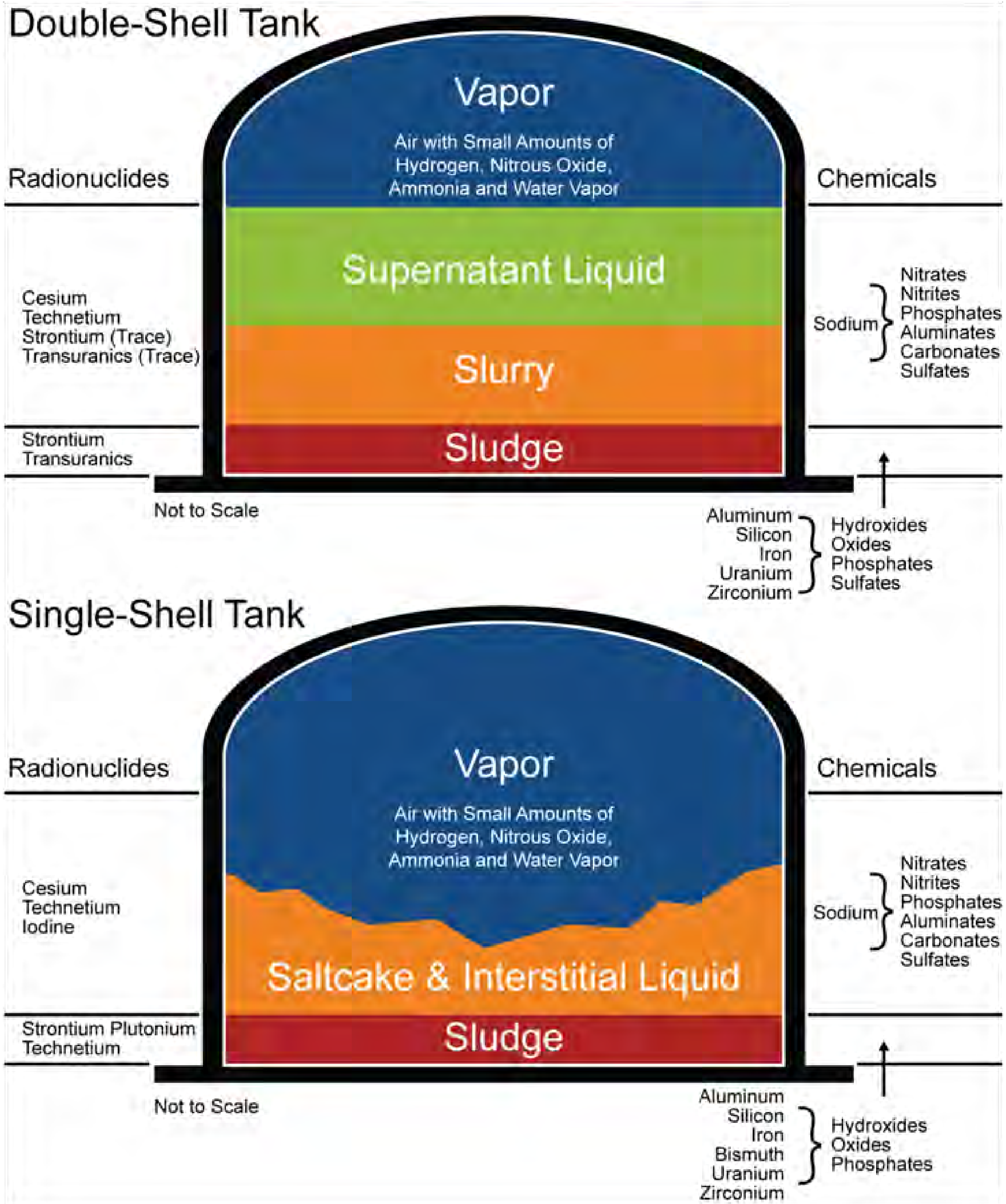
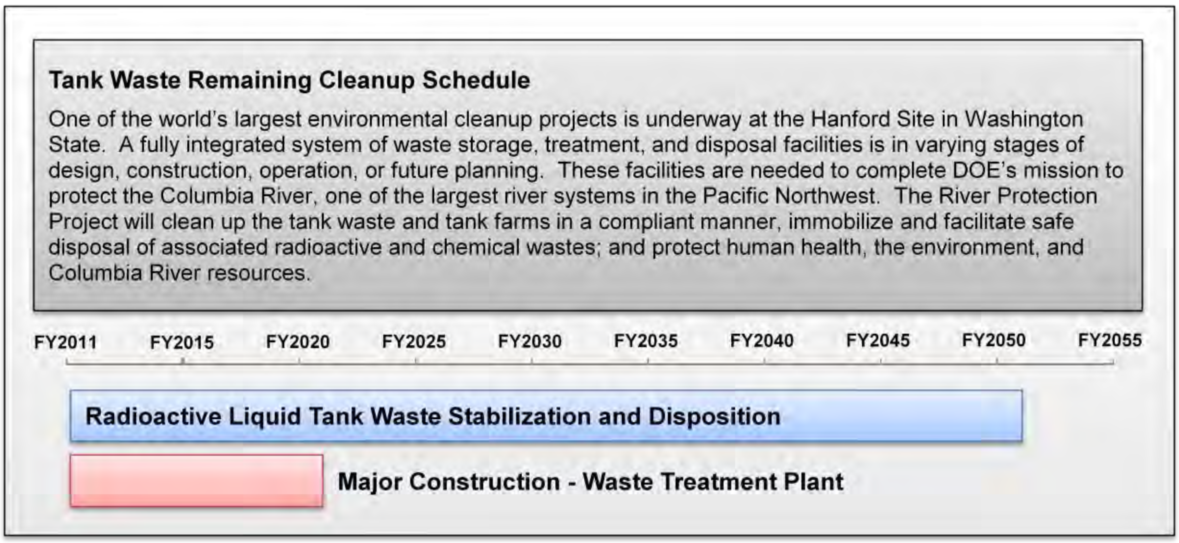


Figure 6-2. Depictions of Typical Tank Contents.

Major decisions regarding the use of supplemental treatment and the associated technology, the ultimate needed capacity, and the relationship of supplemental treatment to the WTP have not yet been completed. Decisions regarding supplemental treatment technology applications will depend partly on the outcome of the DOE/EIS-0391 process.

The work scope for tank waste cleanup is organized into two PBSs, as shown in Figure 6-3, which also presents the remaining cleanup schedule. The overall schedule objective is to complete retrieval, treatment, and closure activities by the end of FY 2050. Once closure activities are completed, the tank farms will be transitioned to Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) for final disposition or LTS.



Scale dates represent start of fiscal year

Figure 6-3. Tank Waste Remaining Cleanup Schedule.

The DOE-ORP is developing and implementing operating strategies to meet the regulatory milestones from the Consent Decree and TPA Settlement Package (DOE and Ecology, 2010a) that became effective on October 25, 2010. For ORP-11242, the DOE-ORP specified ―success criteria," a limited number of near-term and long-term dates, as proxies for approved milestones. The milestones shown in Table 6-1 were promulgated after Revision 4 of ORP-11242 was published, and were selected from the TPA and from the Consent Decree and TPA Settlement Package as those that best demonstrate significant progress.

Table 6-1. Tank Waste Cleanup Key Tri-Party Agreement and Consent Decree Milestones.

Milestone	Description	Compliance Date
M-062-40	Submit a system plan to Ecology describing the disposition of all tank waste managed by the Office of River Protection.	10/31/2011; every 3 years thereafter
D-00B-01[1]	Complete retrieval of tank wastes from the following remaining SSTs in WMA C: C-101, C-102, C-104, C-105, C-107, C-108, C-109, C-110, C-111, and C-112.	9/30/2014
M-062-45-ZZ	Submit a one-time supplemental treatment selection (a one-time selection to be made not later than April 30, 2015) and milestones.	4/30/2015
M-062-45	Every 6 years, within 6 months of the issuance of the last revision of the system plan, the parties will negotiate tank waste retrieval sequencing and milestones, and milestones for installation of infrastructure to feed tank waste from the DST system to the tank waste treatment system for the next 8 years.	4/30/2015; every 6 years thereafter
M-045-82	Submit complete permit modification requests for Tiers 1, 2, and 3 (see Appendix I of Tri-Party Agreement) of the SST system, to support final closure requirements for WMA C.	9/30/2015
M-062-31-T01	Complete final design and submit a complete RCRA Part B permit modification request for Enhanced WTP and/or Supplemental Vitrification Treatment Facility based on the M-062-45 decision.	4/30/2016
D-00A-17[1]	Hot start of WTP.	12/31/2019
M-045-85	Complete negotiations of HFFACO interim milestones for closure of the remaining WMAs (including a schedule for 200-West Area closures, the submittal of closure plans and risk assessments, and final closure dates for each WMA).	1/31/2022
D-00B-04[1]	Complete retrieval of tank wastes from the nine SSTs selected to satisfy D-00B-02.	9/30/2022
M-062-34-T01	Complete hot commissioning of Supplemental Treatment Vitrification Facility and/or WTP Enhancements.	12/30/2022
D-00A-01[1]	Achieve initial plant operations for the WTP.	12/31/2022
M-045-70	Complete waste retrieval from all remaining SSTs. Retrieval standards and completion definitions are provided in Milestone M-045-00.	12/31/2040
M-045-00	Complete the closure of all SST farms.	1/31/2043
M-062-00	Complete pretreatment processing and vitrification of Hanford high-level waste and low-activity waste tank wastes.	12/31/2047
M-42-00A	Complete the closure of all DST farms.	9/30/2052

[1] Milestones from Consent Decree and Tri-Party Agreement Settlement Package (DOE and Ecology, 2010a).

DOE = U.S. Department of Energy.
DST = double-shell tank.
Ecology = Washington State Department of Ecology.
HFFACO = *Hanford Federal Facility Agreement and Consent Order*.
RCRA = *Resource Conservation and Recovery Act*.
SST = single-shell tank.
WMA = waste management area.
WTP = Waste Treatment and Immobilization Plant.

6.1 RADIOACTIVE LIQUID TANK WASTE STABILIZATION AND DISPOSITION (PBS ORP-0014)

The 177 underground waste storage tanks and ancillary equipment, along with various support facilities and buildings, are primarily located in the Central Plateau 200-East and 200-West Areas. The waste composition varies widely, necessitating a variety of unique waste retrieval and treatment methods. In addition, many tanks are decades past their intended useful life. Some SSTs are known or are assumed to have leaked. In the 1950s and 1960s, approximately 1 million gallons of liquid radioactive waste may have been inadvertently released into the environment, contaminating the soil and groundwater. Since that time, to the maximum extent possible, SSTs have been interim stabilized to minimize further risks to the groundwater. No leakage from the DSTs has been detected.

The RPP mission is to protect the Columbia River by safely storing waste until treated and/or disposed and closing the underground storage tanks and associated facilities, in accordance with agreed upon regulatory pathways. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014) includes closure of the tanks, tank farms, and associated facilities. After closure, the remainder of the facilities will be transferred to Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) for final disposition or LTS.

The tank farms scope in this report includes planning for the lifecycle of the tank farms, beyond the term of the current contract, as detailed in ORP-11242, Revision 4. The scope of PBS ORP-0014 is organized into seven work elements as shown in Figure 6-4, which also presents the remaining cleanup schedule. Additional scope information on these work elements is provided in Table 6-2.

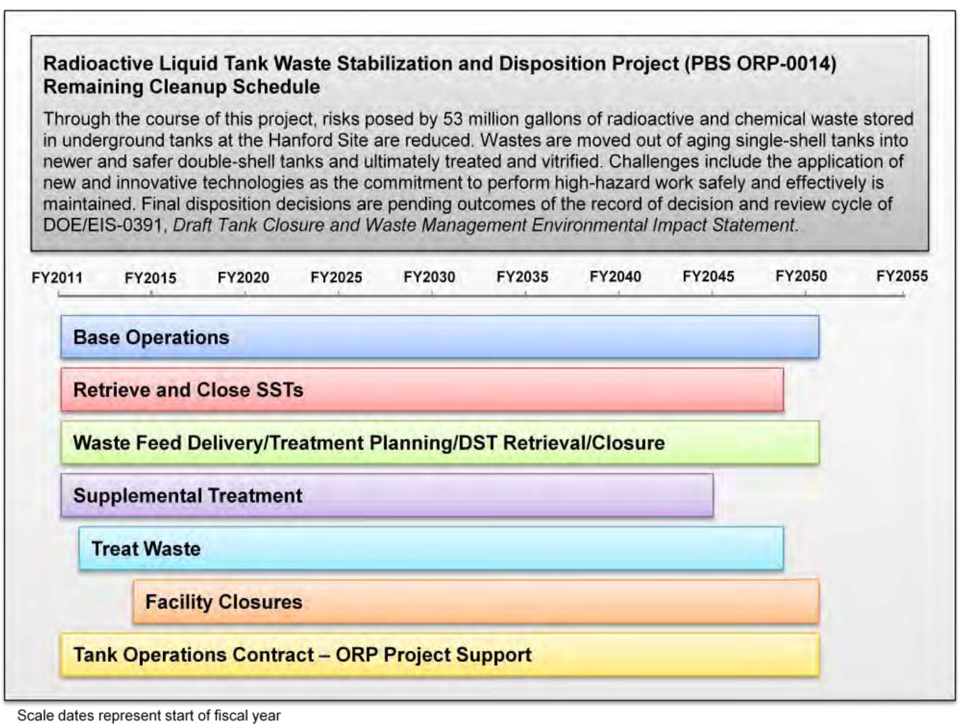


Figure 6-4. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014) Remaining Cleanup Schedule.

Table 6-2. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014) Level 2 Scope Summary.

Work Element	Scope Description
Base Operations	This work element provides for safe storage of waste, reduces the volume of waste through evaporation, provides laboratory support, and includes necessary support activities such as project management.
Retrieve and Close SSTs	This work element includes retrieval of waste from the SSTs and transfer to interim storage in DSTs. SSTs will then undergo closure in accordance with regulatory requirements, as will other associated sites in the tank farms.
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	This work element covers modeling of waste characteristics and volumes; transfer, treatment and preparation of the wastes to meet the requirements for safe retrieval of the DST wastes; successful operation of the WTP; and closure of the DSTs to protect the environment and the community.
Supplemental Treatment	This work element includes planning and analysis for supplemental low-activity waste treatment and contact-handled TRU handling, up to and including design and construction.
Treat Waste	This work element includes preparation for hot commissioning, closure planning, and final closure activities.
Facility Closures	This work element includes closure and monitoring of buildings and structures in the tank farms areas, but not covered elsewhere. Closure within this scope occurs mostly in the out-years and includes mobile facilities, office buildings, and support facilities (e.g., 200 East and West Evaporators).
Tank Operations Contract – ORP Project Support	This work element includes shared services and Mission Support.

DST = double-shell tank.
ORP = Office of River Protection.
PBS = project baseline summary.
SST = single-shell tank.
TRU = transuranic.
WTP = Waste Treatment Plant.

Figure 6-5 presents the remaining estimated cleanup costs for Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014) by fiscal year; Figure 6-6 presents the remaining estimated cleanup costs by work element. Costs rise as the WTP commissioning and startup progress, then remain fairly steady until SST closure increases the cost requirement. Costs decline steadily as the treatment mission ends and tank farm closures are completed.
The estimated cost for tank closure is based on the preferred alternative of the draft DOE/EIS-0391.

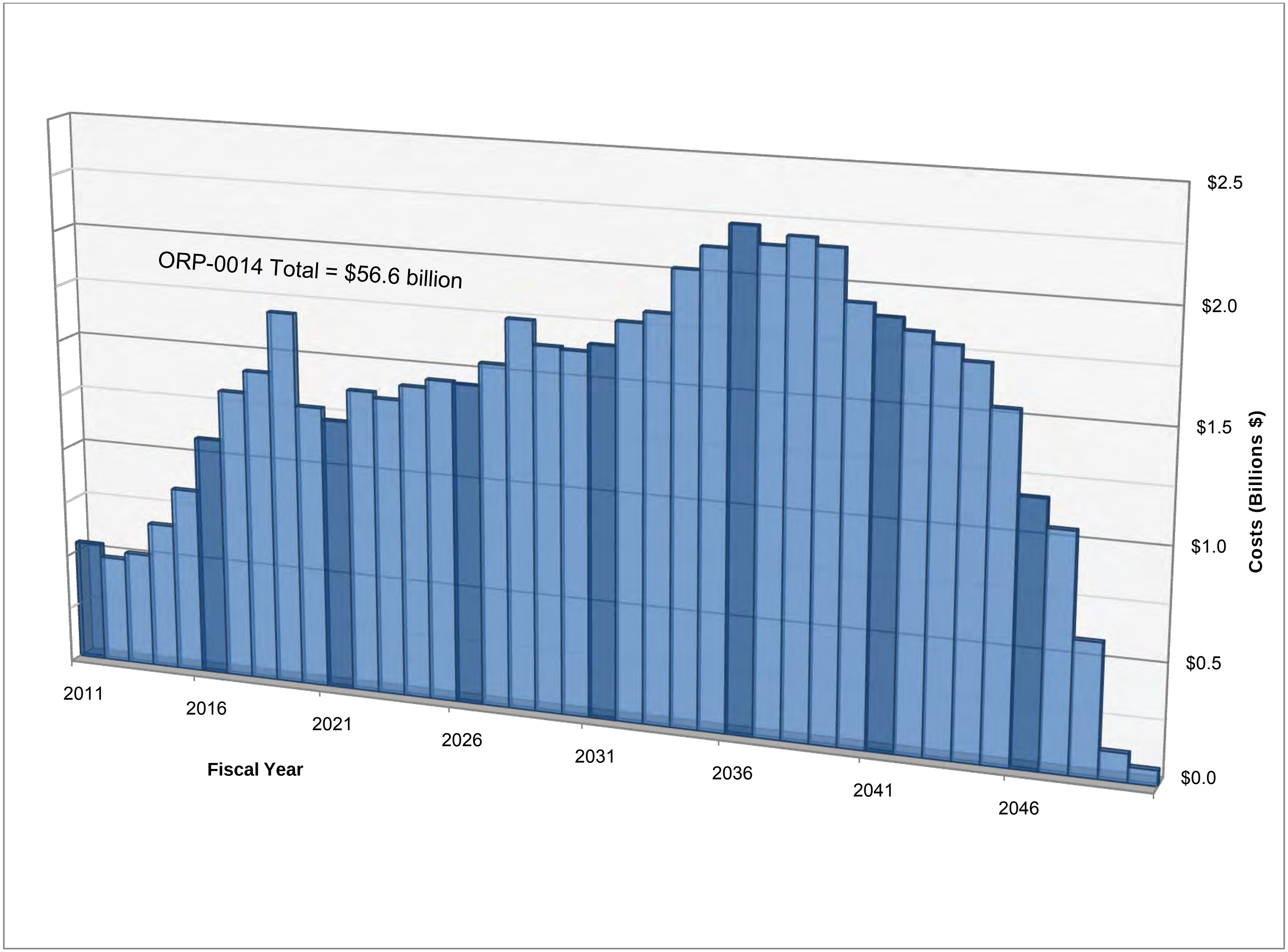


Figure 6-5. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014) Remaining Estimated Cleanup Costs by Fiscal Year.

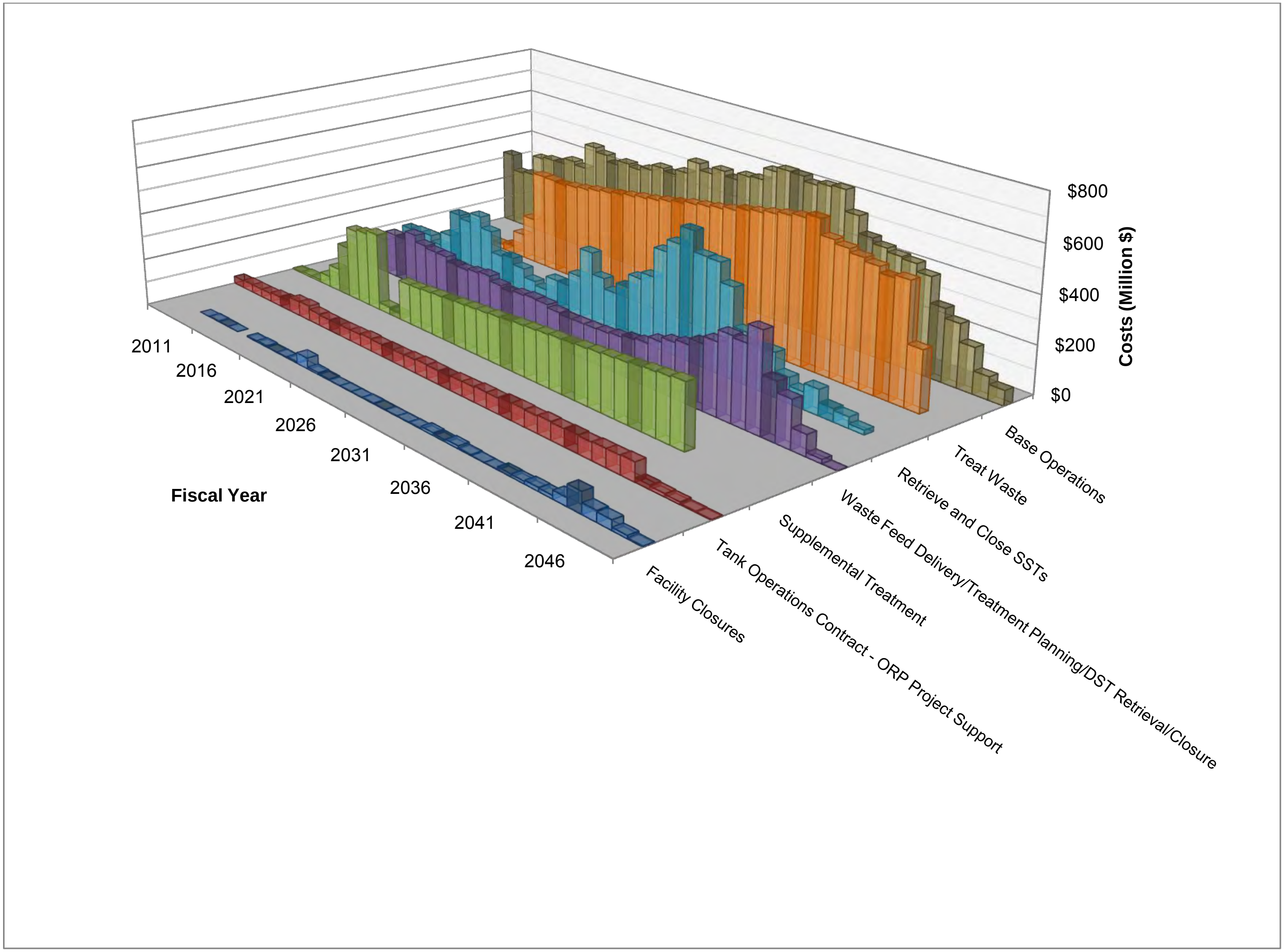


Figure 6-6. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014) Remaining Estimated Cleanup Costs by Work Element.

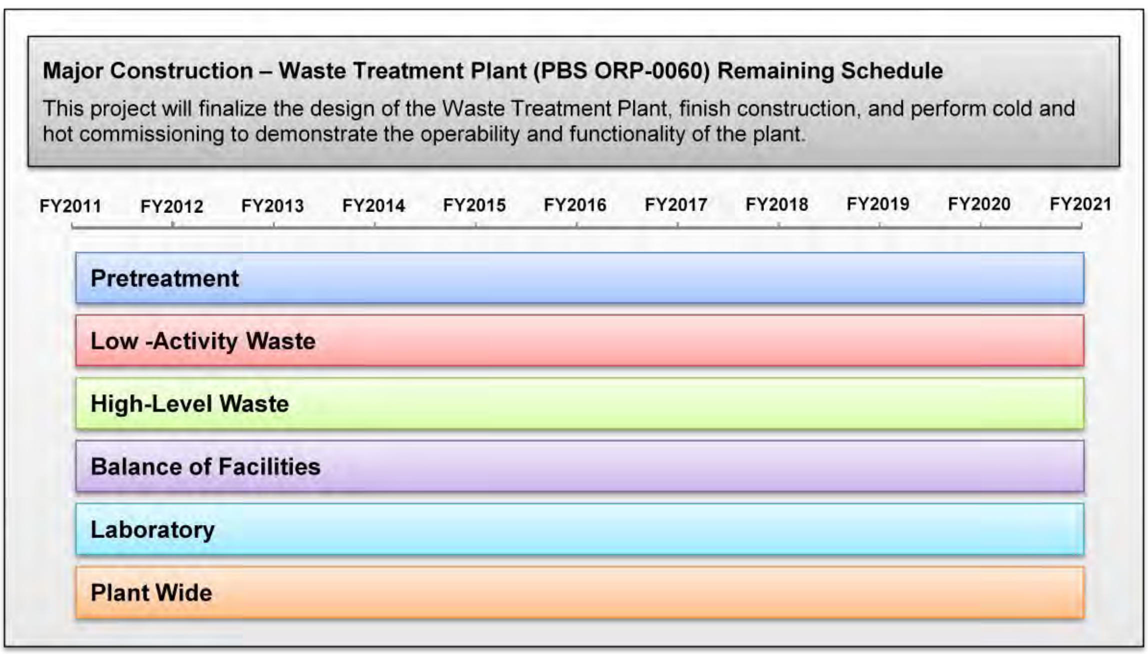
6.2 MAJOR CONSTRUCTION – WASTE TREATMENT PLANT (PBS ORP-0060)

The mission of Major Construction – Waste Treatment Plant (PBS ORP-0060) is to design, construct, and commission the WTP to pre-treat and immobilize the mixed wastes currently stored in the Hanford Site's underground storage tanks. Work is complete when the WTP construction is complete and the facilities are turned over to DOE-ORP's operations contractor.

Five main facilities are being constructed within the WTP:

- Pretreatment.
- Low-Activity Waste Vitrification.
- High-Activity Waste Vitrification.
- Balance of Facilities.
- Dedicated Analytical Laboratory.

The scope for PBS ORP-0060 is organized into six main work elements, as shown in Figure 6-7, which also presents the remaining cleanup schedule. Additional scope information on these work elements is provided in Table 6-3.



Scale dates represent start of fiscal year

Figure 6-7. Major Construction – Waste Treatment Plant (PBS ORP-0060) Remaining Schedule.

Table 6-3. Major Construction – Waste Treatment Plant (PBS ORP-0060) Level 2 Scope Summary.

Work Element	Scope Description
Pretreatment	This work element includes design, construction, and commissioning of the Pretreatment Facility. When finished, pretreatment will physically and chemically condition the waste feed stream, separating the low-activity radioactive waste from the high-level radioactive waste.
Low-Activity Waste (LAW)	This work element includes design, construction, and commissioning of the LAW Vitrification Facility. When finished, the LAW will go into a melter preparation vessel where silica and other glass-forming material are added and the mixture will be fed into one of two melters. The mixture will be heated to 2,100° F using Joule heating. The molten mixture will be poured into large stainless steel canisters that are then welded shut.
High-Level Waste (HLW)	This work element includes design, construction, and commissioning of the HLW Vitrification Facility. Similar to the LAW, when finished the HLW will be mixed with glass-forming materials, heated to molten, and poured into stainless steel canisters.
Balance of Facilities	This work element includes design, construction and commissioning of the Balance of Facilities. When finished, the dedicated facilities and utilities will support the WTP.
Laboratory	This work element includes design, construction, and commissioning of the Analytical Laboratory. When finished, samples will be analyzed to ensure the glass product meets requirements.
Plant Wide	This work element includes cross-cutting services and equipment provided to the construction site.

HLW = high-level waste.
LAW = low-activity waste.
PBS = project baseline summary.
WTP = Waste Treatment and Immobilization Plant.

Figure 6-8 presents the remaining estimated costs for Major Construction – Waste Treatment Plant (PBS ORP-0060) by fiscal year; Figure 6-9 presents the remaining estimated costs by work element. Annual costs exhibit a downward trend as WTP design is complete, facility completions increase, and the project moves toward commissioning and turnover.

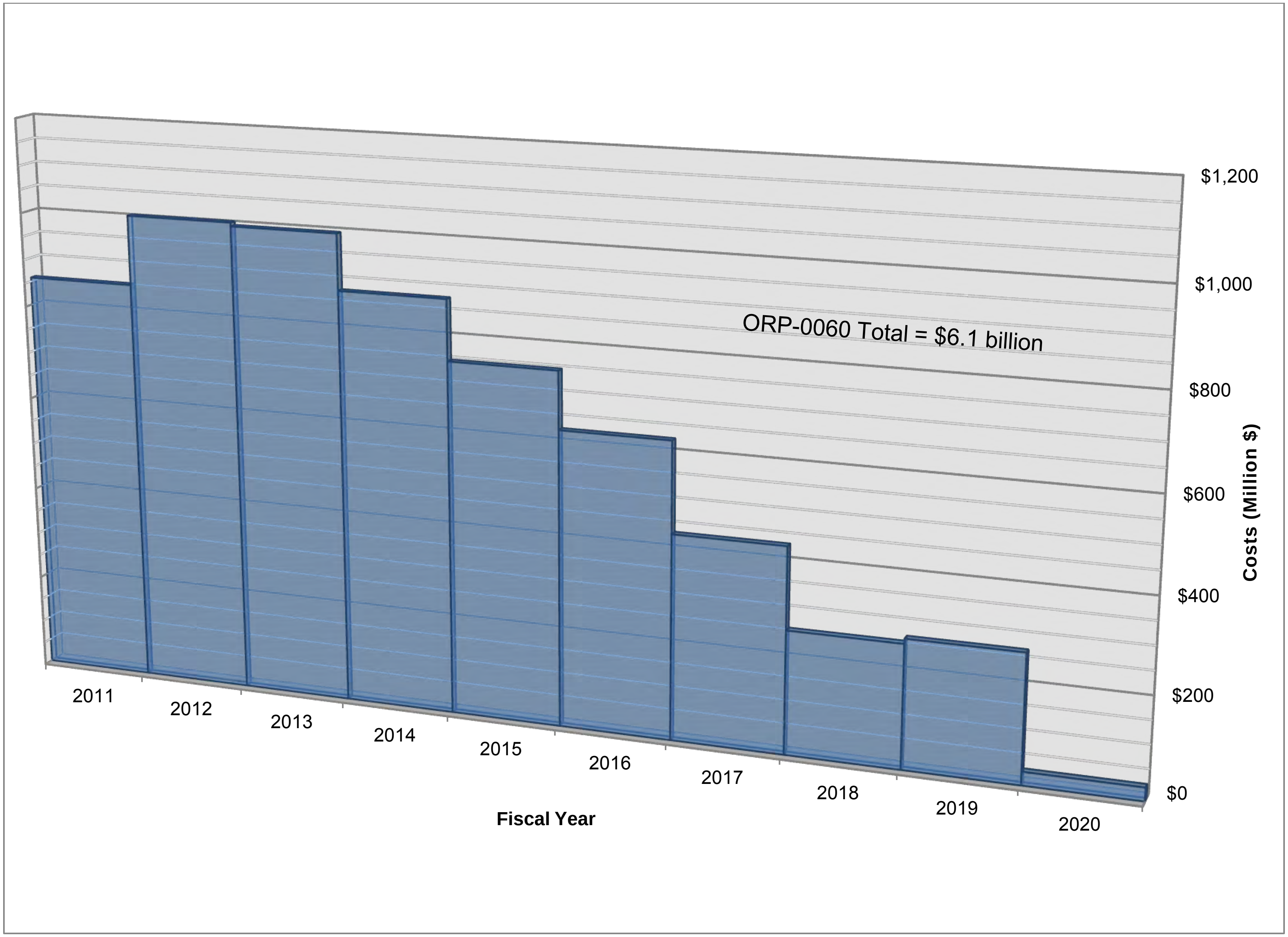


Figure 6-8. Major Construction – Waste Treatment Plant (PBS ORP-0060) Remaining Estimated Costs by Fiscal Year.

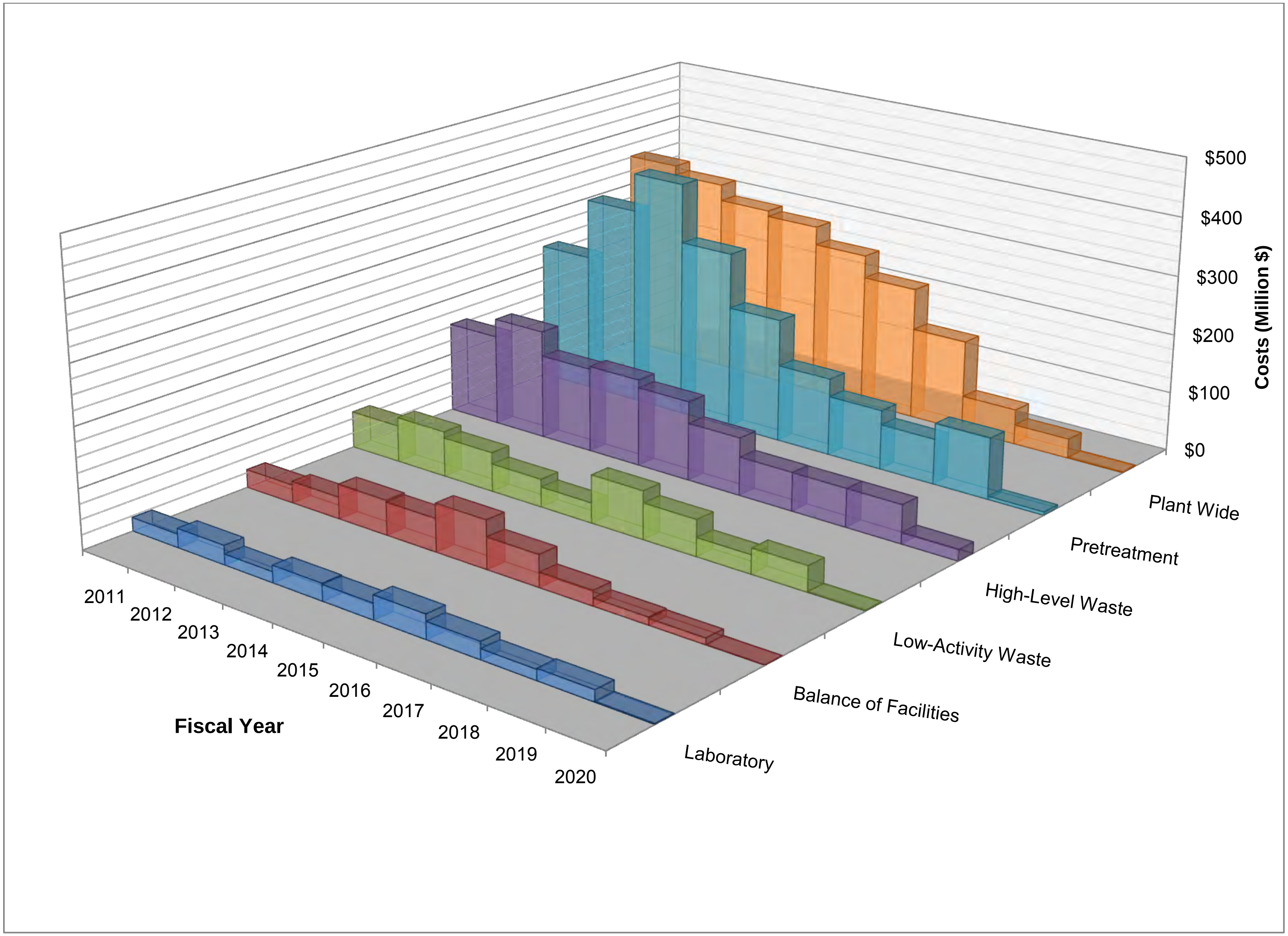


Figure 6-9. Major Construction – Waste Treatment Plant (PBS ORP-0060) Remaining Estimated Costs by Work Element.

6.3 TANK WASTE CLEANUP ASSUMPTIONS AND UNCERTAINTIES

The activities described for the RPP are assumed to be consistent with, and encompassed by, the outcome of the *National Environmental Policy Act* (NEPA) process. The operating scenarios continue to be reviewed against the assumptions in DOE/EIS-0391 as the planning process continues, and updated as appropriate. Unanticipated changes resulting from the NEPA process could impact assumptions. Detailed designs and processing of permits are subject to completion of the NEPA process and issuance of an ROD.

ORP-11242, Revision 4, details assumptions and uncertainties for the RPP. The following is a summary of key assumptions.

- Cesium and strontium capsules will not be processed in the WTP.
- A planned off-site geologic repository will be ready to accept immobilized high-level waste (IHLW) canisters from the Hanford Site starting in April 2023 at a rate that does not require construction of additional interim storage beyond that planned for the Hanford Site Shipping Facility. On-site IHLW interim storage will be operational on or before May 17, 2019, and provide interim storage for at least 2,000 canisters.
- The current strategy to comply with the IHLW acceptance criteria is described in 24590-HLW-PL-RT-07-0001, *IHLW Waste Form Compliance Plan for the Hanford Tank Waste Treatment and Immobilization Plant*. It is assumed that the strategy will be acceptable to the Office of Civilian Radioactive Waste Management. It is further assumed that the WTP-prepared hazardous waste delisting petition for the IHLW is accepted by Ecology and the receiving state before shipping the waste to the planned off-site geologic repository.
- Supplemental LAW treatment capacity will be provided by a second LAW vitrification facility located adjacent to the WTP. The second LAW facility will have the same technical assumptions as the WTP LAW Vitrification Facility, will complete hot commissioning on September 30, 2021, and will begin full operations on October 1, 2021.
- Packaged contact-handled TRU waste will be interim stored on-site at the Central Waste Complex.
- Contact-handled TRU waste treatment and packaging process capability will be available in FY 2015 to support TRU tank waste retrieval.
- Waste previously assumed to be remote-handled TRU waste will be retrieved and treated at the WTP together with the HLW.
- The DSTs will remain fully operational for the nominal 40-year waste treatment mission duration.
- The 242-A Evaporator will continue to operate, as needed, through the life of the mission to support SST retrieval and to maintain the sodium concentration in the delivered feed within WTP feed specifications. The 242-A Evaporator will not be available during scheduled maintenance outages.
- Selected technologies will be able to meet retrieval (tank residual) requirements.

- Laboratory services required to support waste characterization for tank farm projects and operations are available and provided in a timely manner.
- The IDF is currently in standby mode and will be ready to serve upon completion of an operational readiness review, performance assessment, permit modification, etc. The activation will be completed when the IDF is needed by the WTP. The IDF will provide permanent disposal for the immobilized low-activity waste, other low-level waste, and mixed low-level waste, including:
  - LAW glass packages from the WTP.
  - Solid waste from the WTP, including spent LAW and HLW melters.
  - Solid waste from the Effluent Treatment Facility from treating liquid effluent.

  The IDF can be expanded as needed to support the mission.
- The baseline case implicitly assumes that the outcome of official Waste Incidental to Reprocessing Waste Determinations will be consistent with the assumed disposition of the primary and secondary waste forms prior to disposal.
- The cross-site transfer system will be modified as needed to allow for the transfer of slurry into multiple DSTs to provide operational flexibility in management of waste and staging of feed to the WTP.
- Fiscal year funding will be available to support the baseline case, including that funding required for risk mitigating actions.

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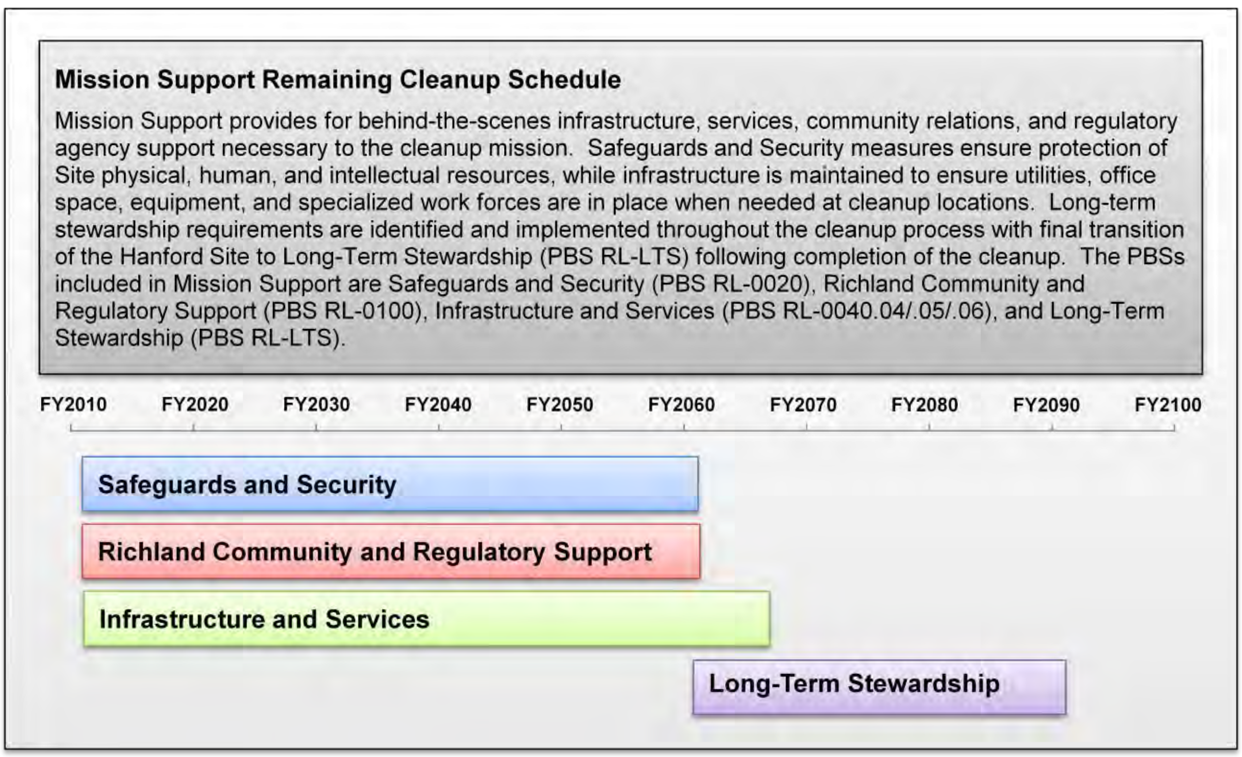
7.0 MISSION SUPPORT

The Mission Support function is service-oriented and provides key infrastructure, utility, resource, and other Hanford Site-wide cleanup support. DOE has responsibilities to protect personnel, nuclear material, and physical property on the Hanford Site. These activities are performed under Safeguards and Security (PBS RL-0020). DOE works closely with the regulatory agencies and community to provide grants and other support to the Hanford Site cleanup through Richland Community and Regulatory Support (PBS RL-0100).

There are a number of infrastructure-related Mission Support activities in place to support the cleanup. These Mission Support activities are managed under Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040), specifically under PBS elements RL-0040.04, RL-0040.05, and RL-0040.06. Following cleanup efforts at the Hanford Site, DOE will have ongoing activities to maintain the protectiveness of the cleanup actions and support transition to future land uses. This period is referred to as Long-Term Stewardship (LTS) and is covered by PBS RL-LTS. Figure 7-1 presents the remaining cleanup schedule for Mission Support.



Scale dates represent start of fiscal year

Figure 7-1. Mission Support Remaining Cleanup Schedule.

7.1 SAFEGUARDS AND SECURITY (PBS RL-0020)

The scope of this PBS includes one primary work element: Safeguards and Security. Figure 7-2 presents the remaining cleanup schedule. Table 7-1 describes the work scope. Safeguards and Security will be required until cleanup is complete. The level of effort required to ensure protectiveness may diminish as nuclear material is shipped off-site and as the cleanup progresses.

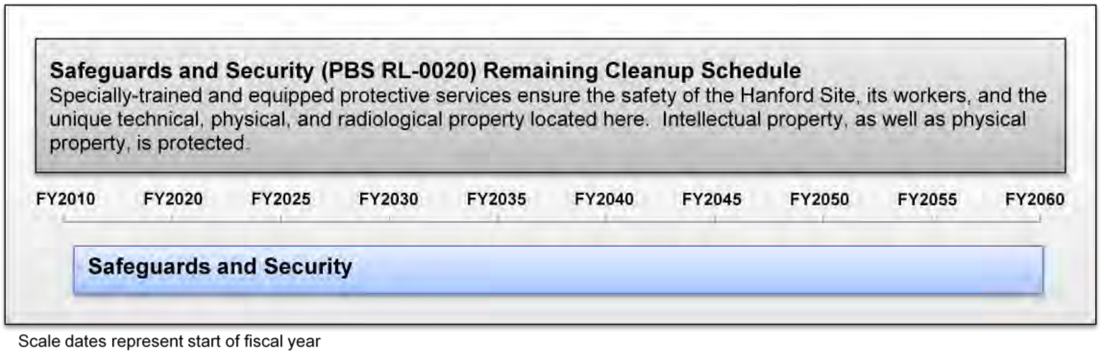


Figure 7-2. Safeguards and Security (PBS RL-0020) Remaining Cleanup Schedule.

Table 7-1. Safeguards and Security (PBS RL-0020) Level 2 Scope Summary.

Work Element	Scope Description
Safeguards and Security	This work element includes management, training, and equipment for staff; physical protective systems, such as intrusion protection, Hanford Site access, and badging; information and cyber security; personnel security; material control and accountability; and security program management.
PBS = project baseline summary.	

Figure 7-3 provides the remaining estimated costs for Safeguards and Security (PBS RL-0020) by fiscal year. Figure 7-3 shows two rising cost curves; however, annual costs are assumed to be a consistent level of effort, and escalation of the costs through time results in increasing annual costs. The drop in costs associated with the initial peak (after about 2024) is related to completion of remedial actions for all non-tank farm and non-canyon OUs, which reduces the level of Safeguards and Security needed.

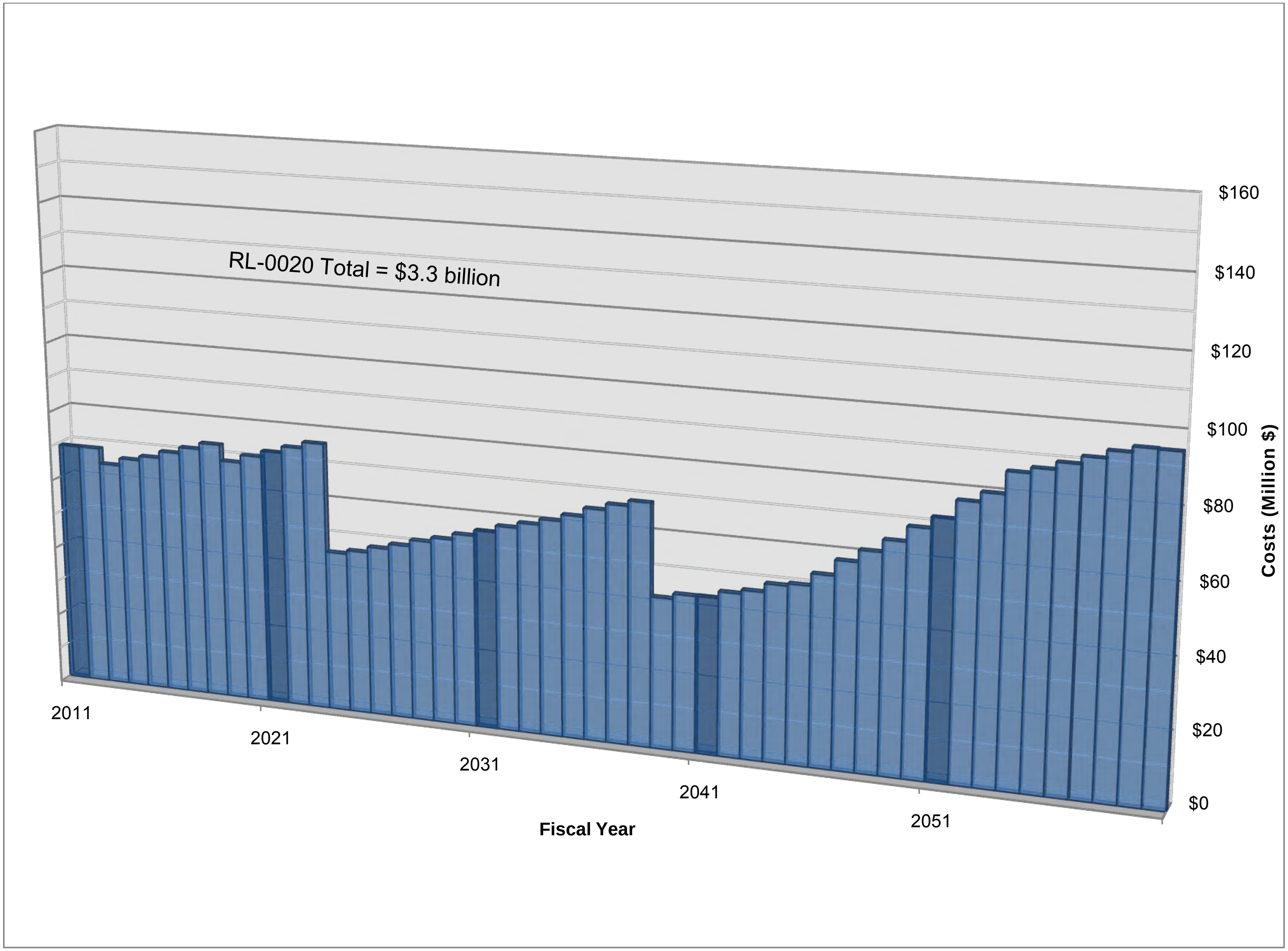
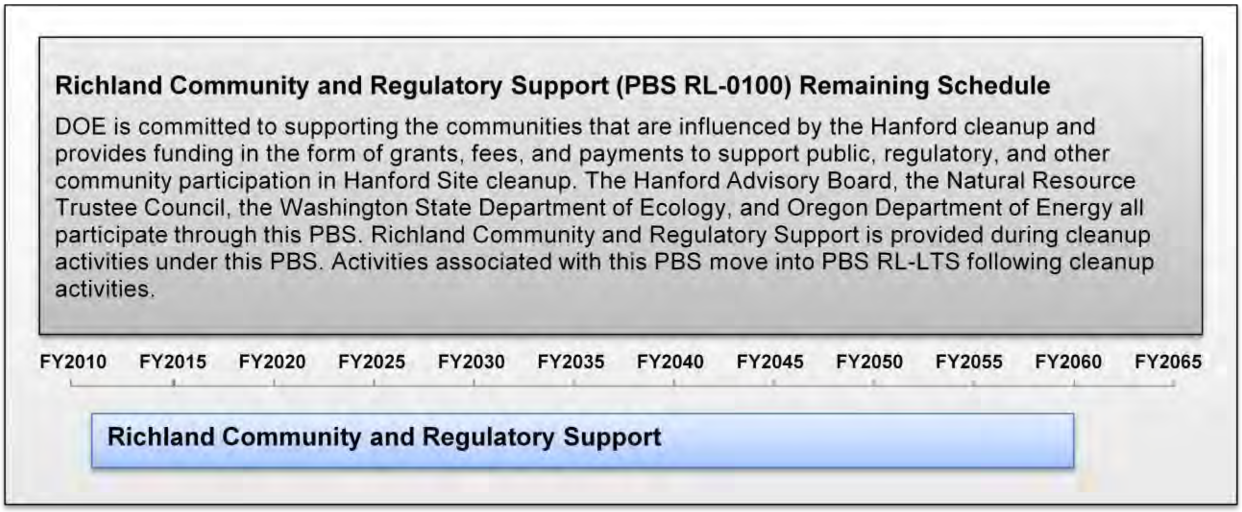


Figure 7-3. Safeguards and Security (PBS RL-0020) Remaining Estimated Costs by Fiscal Year.

7.2 RICHLAND COMMUNITY AND REGULATORY SUPPORT (PBS RL-0100)

The scope of this PBS includes grants, payment of fees, and payments in lieu of taxes. Figure 7-4 provides the remaining cleanup schedule for Richland Community and Regulatory Support (PBS RL-0100); Table 7-2 summarizes its scope of work. Additional details are provided in Appendix E.



Scale dates represent start of fiscal year

Figure 7-4. Richland Community and Regulatory Support (PBS RL-0100) Remaining Schedule.

Table 7-2. Richland Community and Regulatory Support (PBS RL-0100) Level 2 Scope Summary.

Work Element	Scope Description
Richland Community and Regulatory Support	This work element includes DOE-RL support to community activities and regulatory agencies, such as the Hanford Advisory Board, the Oregon Department of Energy, the Natural Resource Trustee Council, the Washington State Department of Ecology, and other entities through grants, permits, and payment of fees.
DOE-RL = U.S. Department of Energy, Richland Operations Office. PBS = project baseline summary.	

Figure 7-5 provides the remaining estimated costs for Richland Community and Regulatory Support (PBS RL-0100) by fiscal year.

Figure 7-5 shows two rising cost curves; however, actual annual costs are assumed to be based on a generally standard level of effort, and escalation of the costs results in increasing annual costs. The drop in costs is related to the end of a number of grants following completion of remedial actions for all non-tank farm and non-canyon OUs.

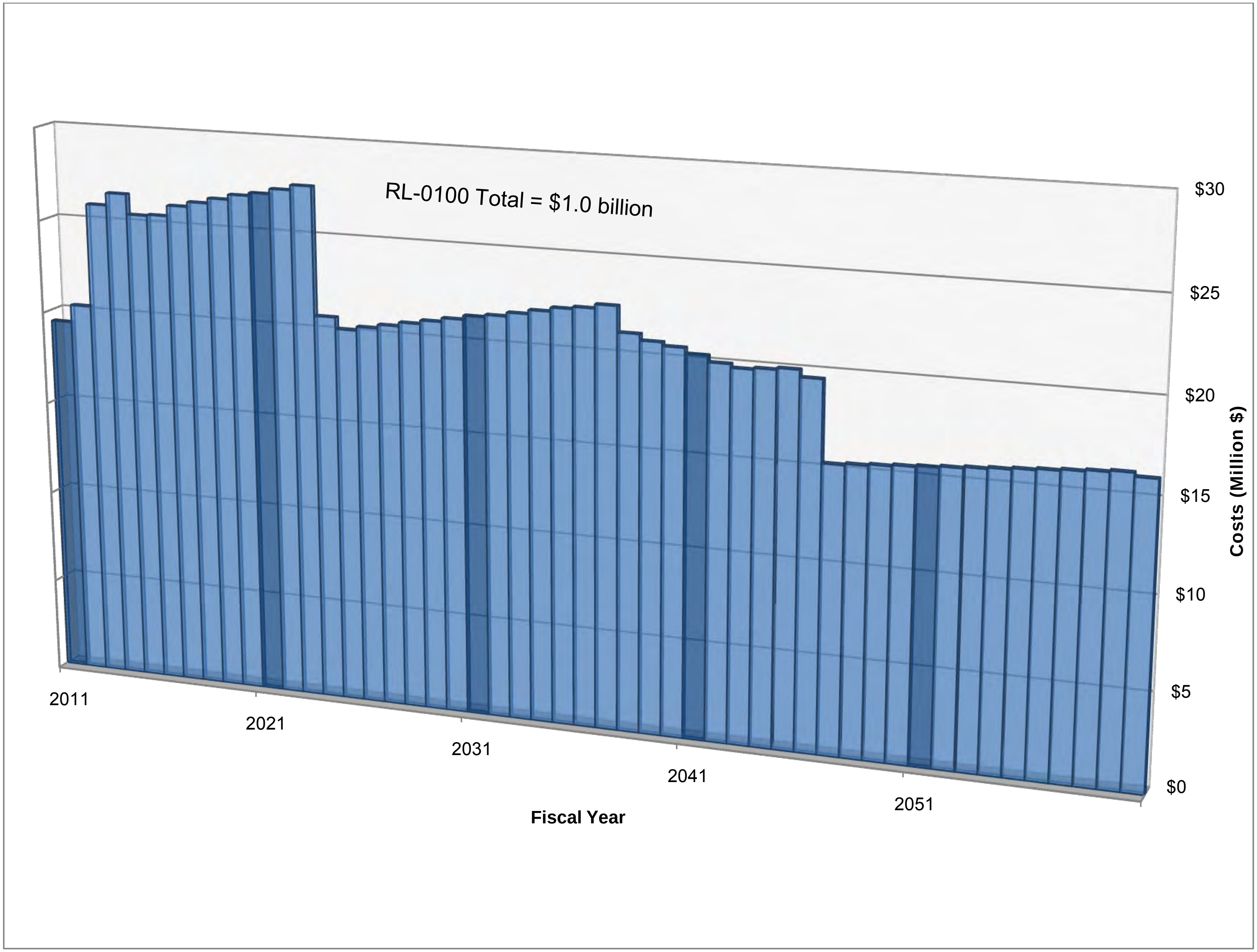


Figure 7-5. Richland Community and Regulatory Support (PBS RL-0100) Remaining Estimated Costs by Fiscal Year.

7.3 INFRASTRUCTURE AND SERVICES (PBS RL-0040)

Infrastructure and Services play a key role in completing the cleanup mission, and as noted in Chapters 3.0 and 5.0, the work scope is included within PBS RL-0040. Infrastructure and Services (PBS RL-0040) encompasses several areas of work scope.

Infrastructure and Services provides for occupational medicine for Hanford Site employees, steam systems, legal support, land transfers, baseline management and integration, acquisition support, and real property asset management.

The scope of Infrastructure Reliability Projects is to manage the repair and replacement of the Hanford Site's infrastructure systems and to provide utilities for the Site infrastructure, including roads, telecommunications, and facility renovations. The scope includes Emergency Services for fire and emergency preparedness. Operation and maintenance of the Hazardous Materials Management and Emergency Response (HAMMER) training facility also is included.

Under Real Estate and Site Planning, DOE-RL manages real property activities including land-use planning (for areas and specific parcels), management (including day-to-day implementation of DOE/EIS-0222-F, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, and disposal of real estate (land and facilities) or related interests (including deeds, easements, licenses, permits and out leases). In FY 2012, DOE-RL has planned the Real Estate and Site Planning activities in the other scope elements in this PBS.

Figure 7-6 provides the remaining schedule for Infrastructure and Services (PBS RL-0040). Table 7-3 summarizes the scope for Level 2 activities.

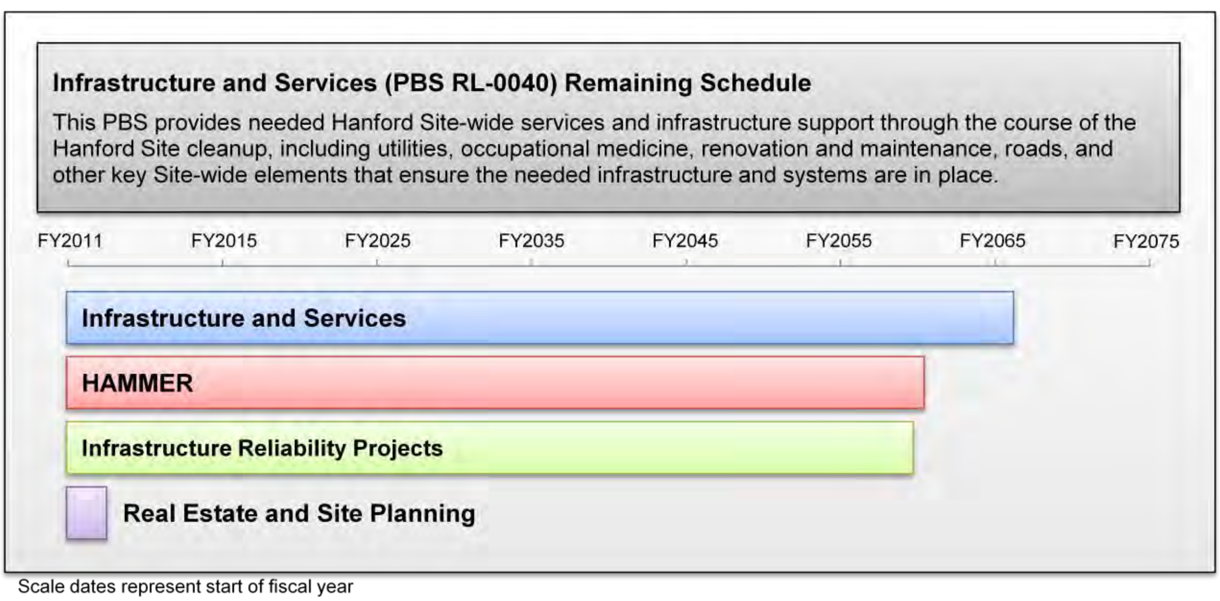


Figure 7-6. Infrastructure and Services (PBS RL-0040) Remaining Schedule.

Table 7-3. Infrastructure and Services (PBS RL-0040) Level 2 Scope Summary.

Work Element	Scope Description
Infrastructure and Services	This work element includes occupational medicine; steam systems; legal support; land transfers; cleanup baseline, integration, and development; radiochemical processing laboratory and 300 Area transition; and real property asset management.
HAMMER	This work element includes operations and maintenance activities at the HAMMER facility in support of Hanford Site and other training.
Infrastructure Reliability Projects	This work element includes repair and replacement of infrastructure systems and provides capital upgrades to the infrastructure, including larger scale expense projects. Also included are capital equipment expenditures associated with replacements for crane and rigging, electrical utilities, biological control, transportation, materials management, Hanford Fire Department, and water and sewer utilities.
Real Estate and Site Planning	This work element includes development and implementation of an integrated lifecycle approach to furnish, operate, coordinate, maintain, and right-size land-use planning and management services; operation and maintenance of Hanford Site services; and providing real property asset management services to include land-use planning, management, and disposal of real property interests, such as easements, licenses, permits, and leases; performing management of real property at the Hanford Site and coordinating the use of real property among Hanford Site contractors.

HAMMER = Volpentest HAMMER Training and Education Center.
PBS = project baseline summary.

The remaining estimated costs for Infrastructure and Services (PBS RL-0040) are shown in Figure 7-7 by fiscal year and in Figure 7-8 by work element. Costs decline sharply in about the last 20 years due to cleanup progress and reduction in waste management facilities.

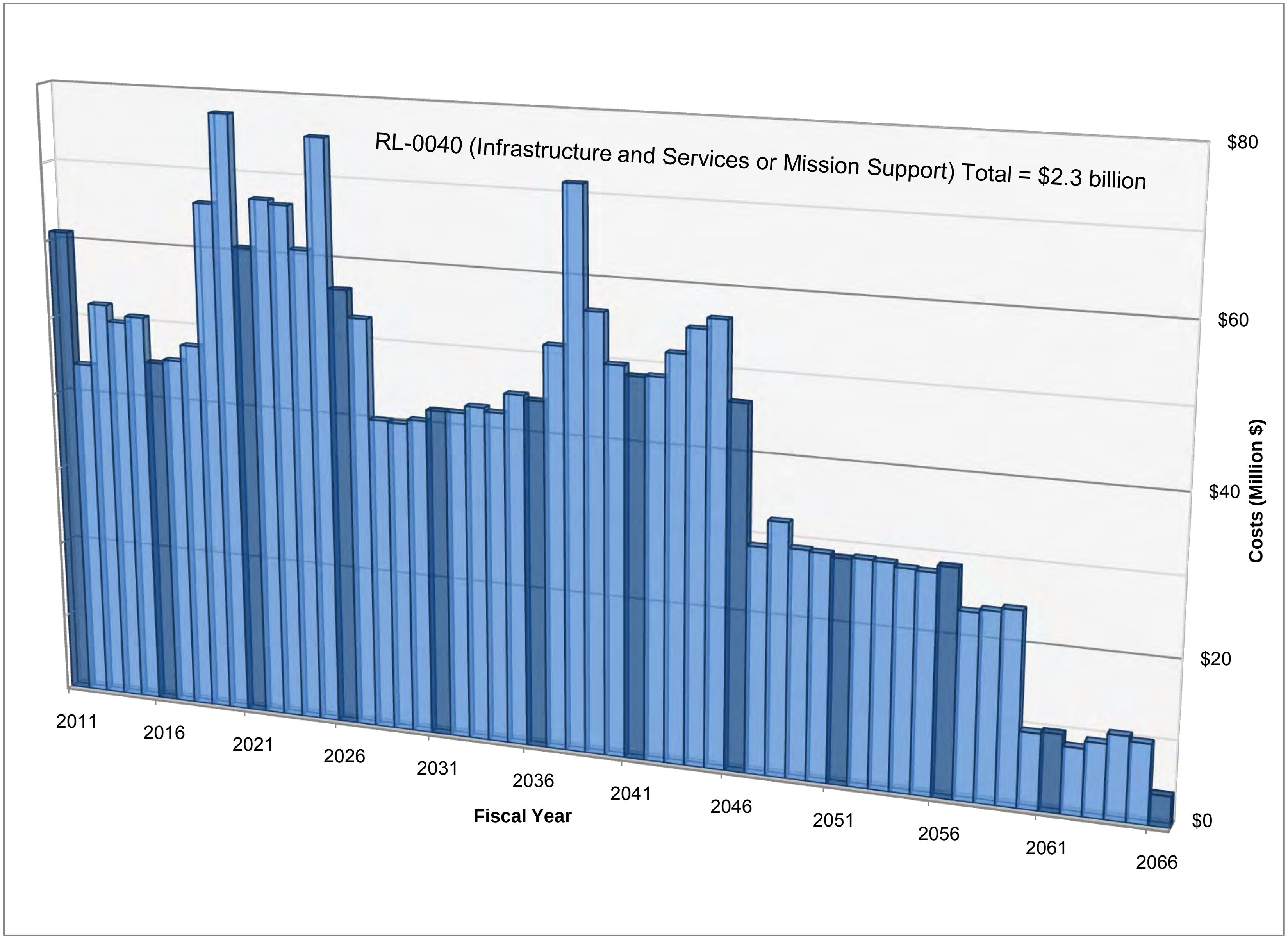


Figure 7-7. Infrastructure and Services (PBS RL-0040) Remaining Estimated Costs by Fiscal Year.

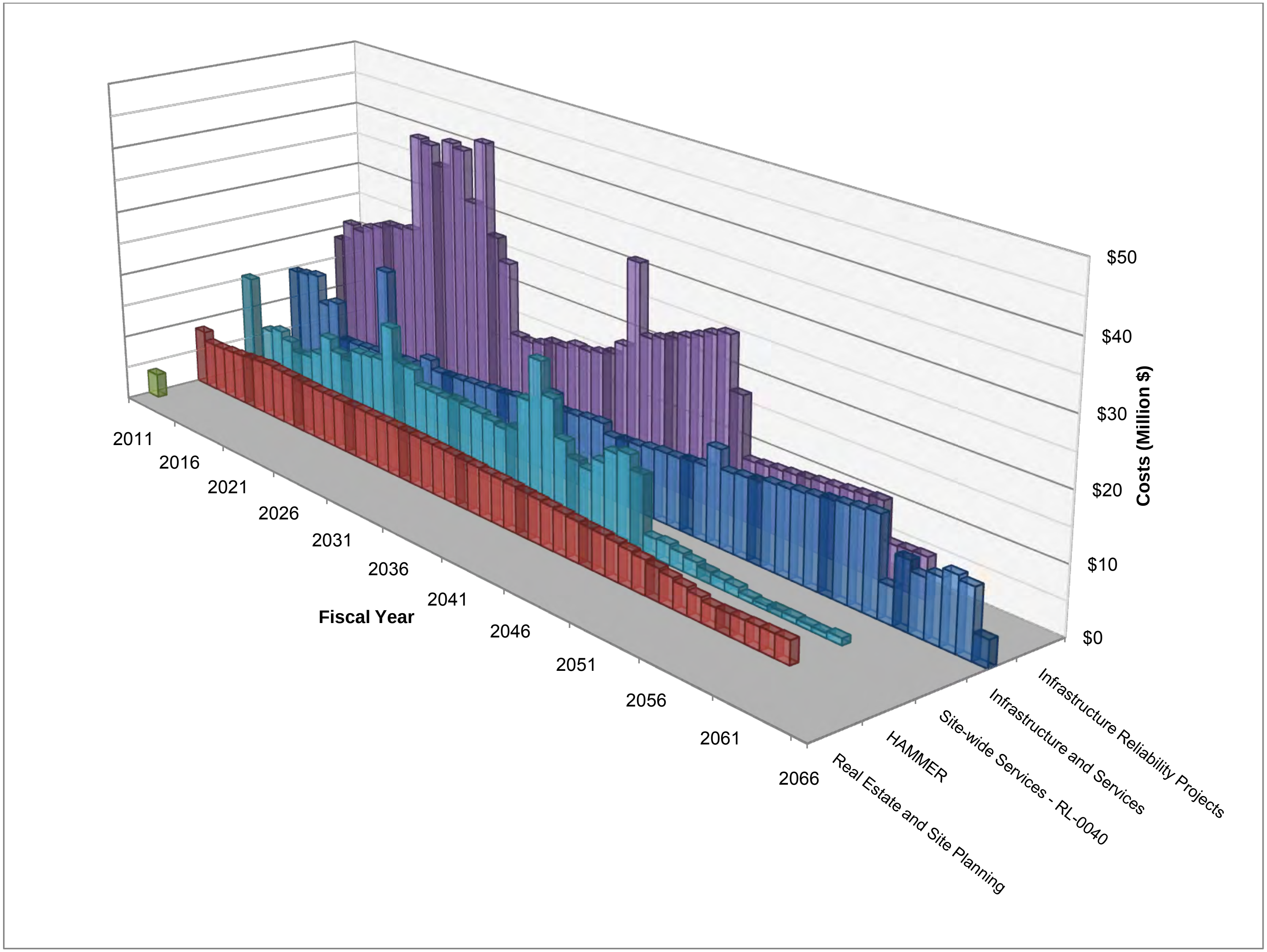


Figure 7-8. Infrastructure and Services (PBS RL-0040) Remaining Estimated Costs by Work Element.

7.4 LONG-TERM STEWARDSHIP (PBS RL-LTS)

Following the completion of Hanford Site cleanup actions, the disposal facilities and other areas will require long-term management. LTS and institutional controls activities will be required for portions of the Hanford Site to ensure protection of human health and the environment.

Institutional controls include non-engineered restrictions on activities and access to land, groundwater, surface water, waste sites, waste disposal areas, and other areas or media that contain hazardous substances to minimize the potential for human exposure to the substances. Common types of institutional controls include procedural restrictions for access, fencing, warning notices, permits, easements, deed notifications, leases and contracts, and land-use controls. The scope and duration of institutional controls will be based on a number of factors, such as residual contamination, the location of that material, reasonably anticipated future land and groundwater uses, and environmental impacts. DOE/RL-2001-41, *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions*, was developed to describe how DOE will implement and maintain the OU-specific institutional controls specified in CERCLA decision documents or the RCRA post-closure plans for the Hanford Site.

LTS refers to all activities necessary to ensure protection of human health and the environment following completion of cleanup, disposal, or stabilization at a site or a portion of a site. LTS includes engineered and institutional controls designed to contain or to prevent exposures to residual contamination and waste, such as surveillance activities, record-keeping activities, inspections, groundwater monitoring, ongoing pump-and-treat activities, cap repair, maintenance of entombed buildings or facilities, maintenance of other barriers and containment structures, access control, and posting signs. LTS begins when cleanup is completed and the selected remedy cleanup objectives and goals are met, as defined by the applicable CERCLA or RCRA decision documents, or when long-term remediation systems are constructed and operating as intended (e.g., groundwater pump-and-treat systems).

The Hanford Site LTS Program consists of the management of the post-cleanup activities, as well as addressing the management of the Site's resources and environment (e.g., cultural, biological, natural resources). The framework and approaches for LTS at the Hanford Site are described in DOE/RL-2003-39, *Hanford Long-term Stewardship Program and Transition: Preparing for Environmental Management Cleanup Completion.*

DOE/RL-2010-35, *Hanford Long-Term Stewardship Program Plan*, defines long-term, post-cleanup responsibilities; maintains the protectiveness of the cleanup remedies being conducted in accordance with regulatory requirements; and provides a framework for a Hanford Site-wide LTS Program to institutionalize LTS across the Hanford Site.

The Hanford Site LTS Program will manage the geographic areas for which cleanup has been completed in accordance with the post-cleanup requirements specified in the associated decision documents. These decisions include, but are not limited to, the CERCLA RODs and RCRA post-closure plans. In addition to managing the post-cleanup completion obligations, the Hanford Site LTS Program will manage Hanford Site natural and cultural resources through the framework of DOE/EIS-0222-F and 64 FR 61615, ―Record of Decision: Hanford Comprehensive Land Use Plan Environmental Impact Statement (HCP EIS),"and in accordance with Federal laws, executive orders, Tribal Government treaties, DOE directives, and Hanford

Site procedures. When developed, the Hanford Site LTS Program's planning basis will integrate stewardship and institutional controls planning to implement the program from present day to 2060.

Even though requirements for LTS and institutional controls will not be completely defined for many years, the scope, schedule, and costs of LTS and institutional controls, to the extent predictable, have been included in this Lifecycle Report for the period from 2061 to 2090. As decisions are made and LTS and institutional controls are better identified, more specific information will be presented as part of the cleanup actions described in respective sections of this Lifecycle Report. Figure 7-9 presents the remaining schedule and Table 7-4 provides a summary of the scope.

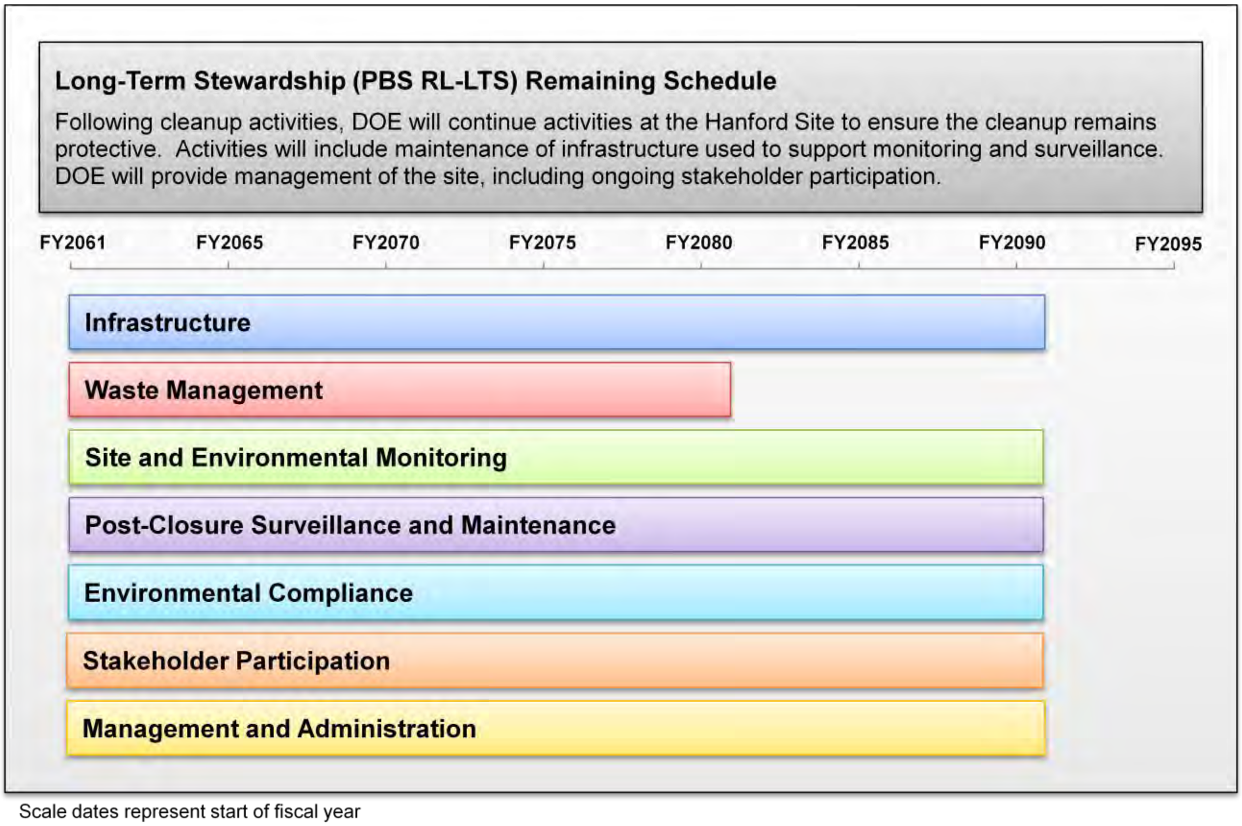


Figure 7-9. Long-Term Stewardship (PBS RL-LTS) Remaining Schedule.

Table 7-4. Long-Term Stewardship (PBS RL-LTS) Level 2 Scope Summary.

Work Element	Scope Description
Infrastructure	This work element includes operation and maintenance of Hanford Site infrastructure following cleanup activities. Specific scope will include supplying electrical and water utilities, operating and maintaining emergency services (Hanford Fire Department), and maintaining roads as needed to support Hanford Site LTS activities.
Waste Management	This work element includes operation and maintenance of 200 Area liquid effluent facilities in support of groundwater treatment and monitoring activities.
Site and Environmental Monitoring	This work element includes ongoing Hanford Site and environmental monitoring of groundwater, soil, vadose zone, and monitoring for public safety and resource protection.
Post-Closure Surveillance and Maintenance	This work element includes real estate and Hanford Site planning, land management, and surveillance and maintenance activities for the 100 and 200 Areas.
Environmental Compliance	This work element includes activities to ensure environmental compliance and protection.
Stakeholder Participation	This work element includes continued support of stakeholder participation through grants, and payment of fees in lieu of taxes.
Management and Administration	This work element provides for management and administration of these LTS activities.

LTS = long-term stewardship.
PBS = project baseline summary.

Figure 7-10 shows remaining estimated costs for PBS RL-LTS by fiscal year; Figure 7-11 shows the remaining estimated costs by work element. This PBS is assumed to run from FY 2061 through FY 2090. Annual costs decline due to effectiveness of cleanup efforts and as associated stewardship activities are reduced. Costs drop after about FY 2080 due to completion of waste management activities, after which annual cost increases are attributable to escalation.

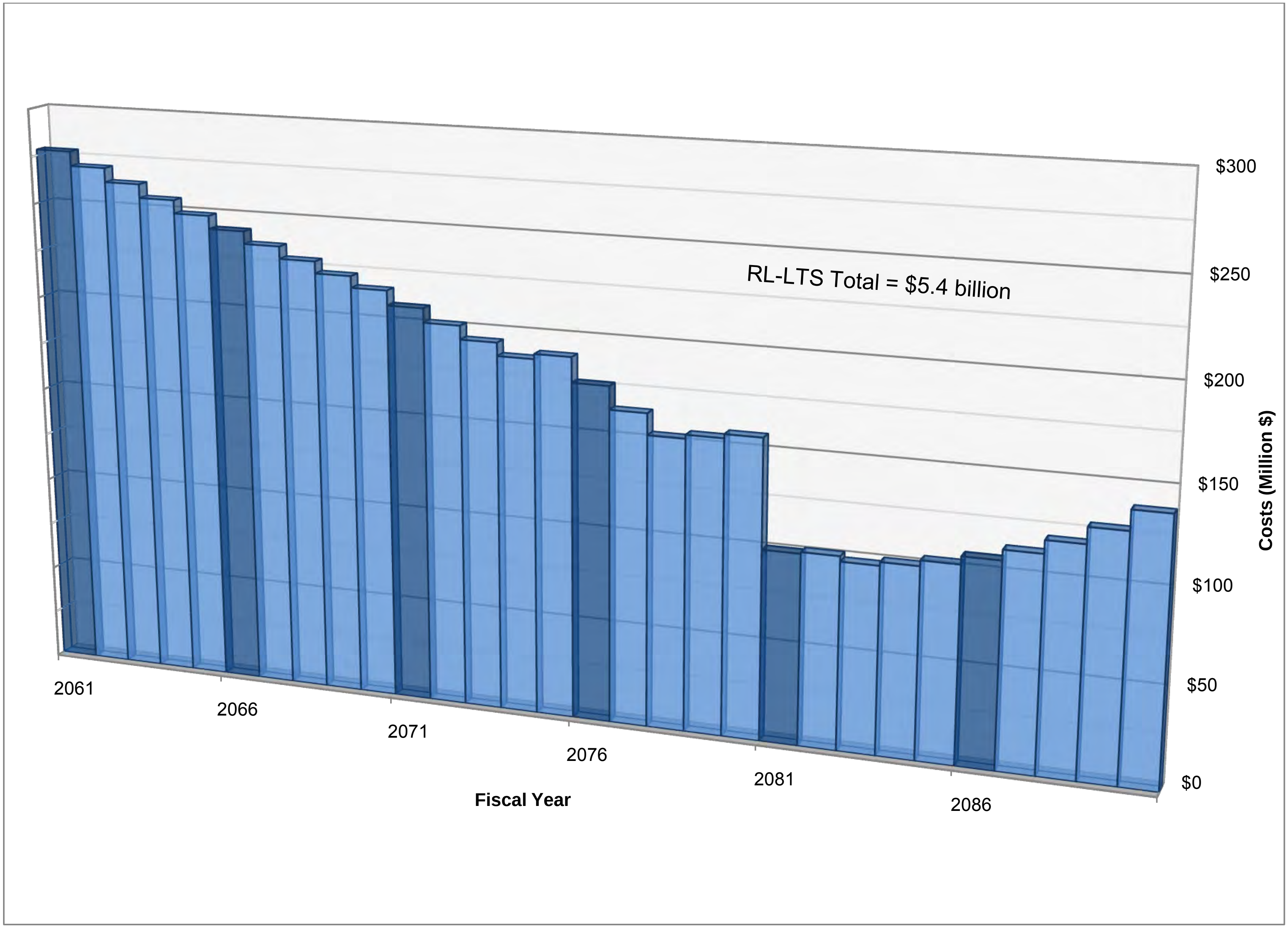


Figure 7-10. Long-Term Stewardship (PBS RL-LTS) Remaining Estimated Costs by Fiscal Year.

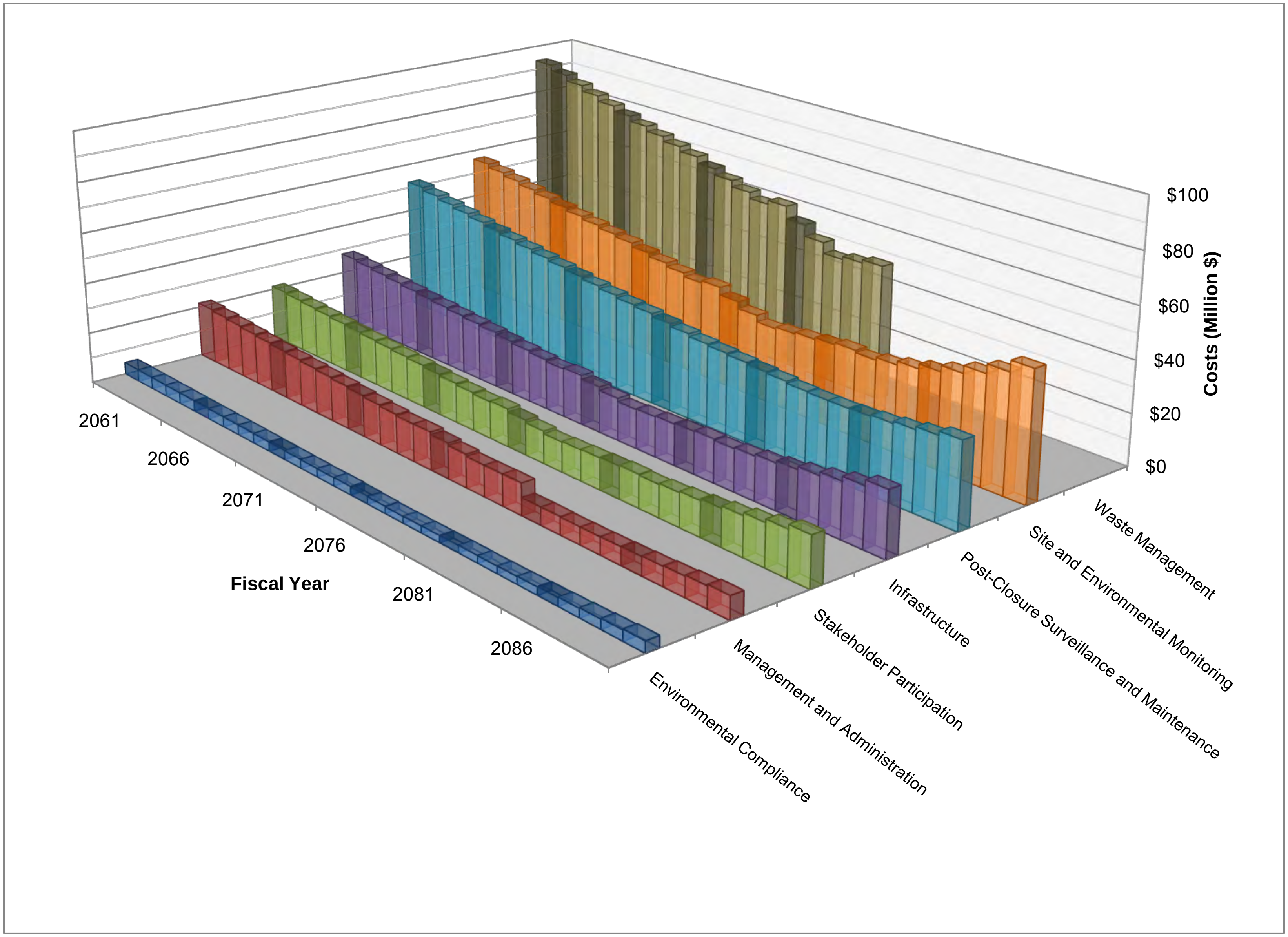


Figure 7-11. Long-Term Stewardship (PBS RL-LTS) Remaining Estimated Costs by Work Element.

8.0 REPORT LIMITATIONS

8.1 SCHEDULE AND COST LIMITATIONS

The Lifecycle Report is based on an annual compilation of scope, schedule, and cost information. In order to finish preparing the Lifecycle Report, it is necessary to select a deadline each year when the information used to prepare the report will be ―locked down.”

For the 2011 Lifecycle Report, October 25, 2010, serves as the cut-off date. Unless noted otherwise, changes in the TPA and other applicable requirements, budget requests, appropriations, program funding allocations, and other financial and schedule changes after the noted cut-off time are not reflected in the current Lifecycle Report.

8.2 OTHER LIMITATIONS

Some of the activities described in the Lifecycle Report are subject to the analysis and decision-making requirements of CERCLA, RCRA, or other applicable statutes and regulations. The information included in the Lifecycle Report is for planning purposes only, not for decision making, which will be conducted following the applicable statutory and regulatory programs. As necessary, the Lifecycle Report includes explanations regarding decisions that are not yet reflected in the scope, schedule, and cost data used for the current report.

Several non-DOE entities operate and manage property on the Hanford Site, typically under lease agreements with DOE. Examples include Energy Northwest, a consortium of public utility companies that oversee the Columbia Generating Station nuclear power reactor; the Laser Interferometer Gravitational Wave Observatory, operated by a consortium of the California Institute of Technology and the Massachusetts Institute of Technology; and the State of Washington, which in turn leases land to US Ecology, Inc., a private firm that operates burial grounds for commercial radioactive low-level waste. Operation, maintenance, and any subsequent future cleanup associated with activities at these facilities are subject to the terms and conditions of the leases (and/or other agreements) in place between the operating entities and DOE.

Potential environmental liabilities for these and similar non-DOE operations are not currently considered to be part of the Hanford Site cleanup, and so are not included in the DOE-EM program. Consequently, lifecycle scope, schedule, and cost for these non-DOE operations are not included in the Lifecycle Report.

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9.0 OPPORTUNITIES FOR IMPROVEMENT

This chapter will be used to summarize opportunities to improve the Lifecycle Report. This chapter also will serve as a place to record recommended improvements received from EPA, Tribal Governments, the State of Oregon, Ecology, stakeholders, and others to improve future editions of the report. Because the 2011 Lifecycle Report is the first report produced, this chapter does not yet include identified improvements.

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WA7890008967, 2007, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*, as amended, Washington State Department of Ecology, Richland, Washington.

WAC 173-303-140, ―Land Disposal Restrictions," *Washington Administrative Code*, Olympia, Washington.

APPENDIX A

HANFORD SITE CLEANUP ACTIONS AND PLAUSIBLE ALTERNATIVES

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TERMS

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
D&D	decontamination and decommissioning
D4	deactivation, decontamination, decommissioning, and demolition
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
DST	double-shell tank
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESD	explanation of significant differences
ETF	Effluent Treatment Facility
FFTF	Fast Flux Test Facility
HLW	high-level waste
IDF	Integrated Disposal Facility
ILAW	immobilized low-activity waste
INL	Idaho National Laboratory
ISS	interim safe storage
LAW	low-activity waste
LERF	Liquid Effluent Retention Facility
PFP	Plutonium Finishing Plant
PNNL	Pacific Northwest National Laboratory
PUREX	Plutonium Uranium Extraction (Plant)
RAO	remedial action objective
RCRA	*Resource Conservation and Recovery Act of 1976*
REDOX	Reduction-Oxidation Facility (S Plant)
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RTD	remove, treat, and dispose
SALDS	State-Approved Land Disposal Site
SSE	safe storage enclosure
SST	single-shell tank
TBD	to be determined
TC&WM EIS	Tank Closure and Waste Management Environmental Impact Statement
TPA	Tri-Party Agreement
TSD	treatment, storage, and disposal
WAC	*Washington Administrative Code*
WESF	Waste Encapsulation and Storage Facility
WRAP	Waste Receiving and Processing Plant
WTP	Waste Treatment and Immobilization Plant

APPENDIX A

HANFORD SITE CLEANUP ACTIONS AND PLAUSIBLE ALTERNATIVES

In accordance with the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989), commonly referred to as the Tri-Party Agreement (TPA), Milestone M-036-01 requires that where final cleanup decisions have not yet been made, the *Hanford Lifecycle Scope, Schedule and Cost Report* (Lifecycle Report) is to consider ranges of alternatives and present a reasonable upper bound:

> **"In circumstances where final cleanup decisions have not yet been made, the report shall be based upon the reasonable upper bound of the range of plausible alternatives or may set forth a range of alternative costs including such a reasonable upper bound."**

The TPA milestone specifies that when making assumptions (e.g., about alternative cleanup actions), the U.S. Department of Energy (DOE) is to take into account the views of the U.S. Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology), as well as the values expressed by affected Tribal Governments and Hanford stakeholders.

Cleanup decisions are made so that DOE can conduct cleanup actions at the Hanford Site. As discussed in Section A.1, the Lifecycle Report has grouped remaining Hanford Site cleanup work into approximately 39 separate cleanup actions. This approach helps focus discussions on cleanup work that remains to be performed at the Hanford Site and promotes consistency with the ongoing cleanup decision-making process under the TPA.

Because final cleanup decisions (see Appendix D) have not yet been made for much of the remaining Hanford Site cleanup work, this Lifecycle Report must consider the range of plausible alternatives (or alternative costs) and present a reasonable upper bound. DOE has decided that information about the range of plausible alternatives, rather than just a range of alternative costs, would be most useful for this Lifecycle Report. DOE also believes that in most cases, cost estimates include allowances for uncertainties in current planning that encompass a wide range of potential alternatives. Section A.2 includes information about the range of plausible alternatives for each cleanup action.

Because many final decisions remain to be made, a reasonable upper bound will need to be defined, along with schedule and costs, for a number of remaining Hanford Site cleanup actions. To give each action a sufficient level of analysis and detail, DOE has decided to take a methodical and planned approach to developing in-depth analyses of cleanup action alternatives, including definition of reasonable upper bound schedules and costs.

Section A.3 proposes a rationale and schedule for when different cleanup actions will undergo in-depth alternatives analyses in the Lifecycle Report. This approach limits the complexity of the individual reports by presenting in-depth analysis for a few select actions in each annual report. The approach also provides timely information to support budget planning and other decisions focused on more near-term actions, and provides an appropriate level of detail in a user-friendly report.

The information provided in this appendix has been developed for the sole purpose of preparing the Lifecycle Report and fulfilling the requirements of TPA Milestone M-036-01; the Lifecycle Report is not a decision-making document. Cleanup actions and decisions discussed in this appendix are still undergoing formal development, review, and eventual approval pursuant to the procedures established in the TPA and applicable Federal and State requirements.
The information in this appendix does not presume nor is it intended to prejudice the outcome of the requirements that must be followed by the TPA agencies (DOE, Ecology, and EPA). Any errors or discrepancies in this appendix will be superseded by the results of the legally applicable decision-making processes.

A.1 IDENTIFYING CLEANUP ACTIONS FOR THE HANFORD SITE

In this Lifecycle Report, the term “cleanup action” is used to conceptually describe similar, related work that enables cleanup to proceed for common or related contaminants that occur in a relatively well-defined environmental media (or waste management system) within a generally contiguous geographic area. This concept breaks down into three main ideas:

- A cleanup action should include similar, related work, which means that the work performed should be of like kind and directed at achieving a common goal. Examples of similar, related work would be installing and operating a groundwater pump-and-treat system, removing and disposing of contaminated soil in an engineered landfill, and retrieving and treating waste from underground tanks. Further, if the work does not itself achieve cleanup (e.g., maintaining overall Hanford Site infrastructure), then it is typically not considered to be a specific cleanup action.
- A cleanup action should address common or related contaminants that occur in a relatively well-defined environmental media or waste management system. In most cases around the Hanford Site, distinct industrial processes generated the materials and wastes that were managed through discharge to the environment, or treatment and storage in various containment systems. The generating processes typically produced residues that were chemically and/or radiologically similar with respect to each process (i.e., the residues were often common and related to each other) and that often ended up in the same places (e.g., burial grounds, cribs, ponds, tanks, basins).
- A cleanup action should occur within a generally contiguous geographic area. This represents primarily the need to be able to develop and implement cleanup actions in a manageable way. The Hanford Site covers a large space, and cleanup actions can be conducted more efficiently if the cleanup work is not scattered across dozens of small, widely separated locations.

This cleanup action concept is consistent with the operable unit cleanup approach taken in the TPA and enables cleanup actions and alternatives to be addressed in a manner consistent with the way cleanup decisions are being made for the Hanford Site. This approach also provides a reasonable middle ground for looking at the cleanup work that is performed on the Hanford Site. Too narrow a concept could result in individual cleanup actions covering single, discrete activities (e.g., the remediation of one ditch, the retrieval of a few drums of waste). Too broad a concept could lead to the other extreme, covering for example all the work needed for an entire portion of the Hanford Site (e.g., cleanup of all the facilities, soils, and groundwater throughout the 200 Area).

The TPA agencies applied the concepts described in the preceding paragraphs to the current Hanford Site configuration to develop a set of approximately 40 separate cleanup actions for the Lifecycle Report. Table A-1 lists the Hanford Site cleanup actions for which final cleanup decisions do not yet exist and for which alternatives will be considered in the Lifecycle Report. The path to final cleanup can be complicated and includes the consideration of cleanup alternatives, identification of a preferred alternative, including regulatory agency and public input, decision making, and finally design and implementation of the selected cleanup action. Cleanup work at the Hanford Site can be complex and extend over long periods. Frequently, interim decisions are made and incremental cleanup steps are taken, followed by improved decisions as more is learned and other, better alternatives become available. Even relatively simple cleanup actions can encompass many sequenced activities and a substantial amount of work lasting several years. Thus, many of the cleanup actions discussed in the Lifecycle Report will evolve over time and may have a different scope in future reports as progress is made in completing Hanford Site cleanup.

Table A-1. List of Remaining Hanford Site Cleanup Actions for Lifecycle Report. (2 pages)

River Corridor Cleanup Actions
• Disposition 100 Area Reactors • Disposition 100 Area K West Basin • Remediate 100 Area Contaminated Soil Sites • Restore 100-BC-5 Groundwater Operable Unit to Beneficial Use • Restore 100-KR-4 Groundwater Operable Unit to Beneficial Use • Restore 100-NR-2 Groundwater Operable Unit to Beneficial Use • Restore 100-HR-3 Groundwater Operable Unit to Beneficial Use • Restore 100-FR-3 Groundwater Operable Unit to Beneficial Use • Disposition 300 Area Facilities Retained by Pacific Northwest National Laboratory • Remediate 300 Area Contaminated Soil Sites • Restore 300 Area Groundwater to Beneficial Use
Central Plateau Cleanup Actions
• Disposition Remaining Outer Area Buildings And Facilities • Remediate Remaining Outer Area Contaminated Soil Sites (200-OA-1, 200-CW-1, and 200-CW-3 Operable Units) • Disposition Below-Grade Portions of Plutonium Finishing Plant • Disposition B Plant Canyon Building/Associated Waste Sites (200-CB-1 Operable Unit) • Disposition PUREX Canyon Building/Associated Waste Sites (200-CP-1 Operable Unit) • Disposition PUREX Storage Tunnels (200-CP-1 Operable Unit) • Disposition REDOX Canyon Building/Associated Waste Sites (200-CR-1 Operable Unit) • Disposition T Plant Canyon Building/Associated Waste Sites • Disposition Cesium/Strontium Capsules • Remediate 200-SW-1 Operable Unit • Disposition Remaining Liquid Waste Disposal Facilities • Disposition Remaining Waste Treatment, Storage, and Disposal Facilities • Remediate 200-IS-1 Operable Unit • Remediate 200-PW-1/3/6 and 200-CW-5 Operable Units • Remediate 200-SW-2 Operable Unit • Remediate Remaining 200-West Inner Area Contaminated Soil Sites (200-WA-1 Operable Unit) • Remediate Remaining 200-East Inner Area Contaminated Soil Sites (200-EA-1 Operable Unit)

Table A-1. List of Remaining Hanford Site Cleanup Actions for Lifecycle Report. (2 pages)

• Disposition Fast Flux Test Facility Complex • Disposition Remaining Buildings and Facilities Within Fast Flux Test Facility Complex • Disposition Remaining Inner Area Buildings and Facilities • Remediate Contaminated Deep Vadose Zone (200-DV-1 Operable Unit) • Restore 200-West Groundwater to Beneficial Use (200-ZP-1/200-UP-1 Operable Units) • Restore 200-East Groundwater to Beneficial Use (200-PO-1/200-BP-5 Operable Units)
Tank Waste Cleanup Actions
• Tank Retrieval and Single-Shell Tank Farm Closure • Tank Waste Treatment • Secondary Waste Treatment • Double-Shell Tank Closure • Waste Treatment and Immobilization Plant Closure
PUREX = Plutonium Uranium Extraction (Plant). REDOX = Reduction-Oxidation Facility (S Plant).

A.2 IDENTIFYING RANGES OF PLAUSIBLE ALTERNATIVES AND ANALYZING ALTERNATIVES FOR HANFORD SITE CLEANUP ACTIONS

The Lifecycle Report provides information about ranges of plausible alternatives for cleanup actions. The range of plausible alternatives for a cleanup action includes DOE's current assumptions about future efforts. Alternatives are included based on current understandings among the TPA agencies, the status of existing and forthcoming cleanup decisions, and whether current planning already adequately encompasses the range of plausible alternatives. In a series of working sessions, the TPA agencies developed the range of plausible alternatives presented in Section A.2.1.

As discussed further in Section A.2.2, a more in-depth analyses of the alternatives for individual cleanup actions will be performed in order to describe a reasonable upper bound for the scope and costs of a specific cleanup action. The TPA agencies have agreed to take a graded approach and to analyze alternatives and develop a reasonable upper bound scope and cost estimate as a sensitivity analysis for a limited set of cleanup actions in each annual Lifecycle Report. The main reasons for this approach include the following:

- Developing and analyzing alternatives for every separate cleanup action in every annual edition of the Lifecycle Report would be resource intensive and inefficient.
- Final cleanup decisions are expected soon for a number of cleanup actions, and the decision process will produce thorough and detailed analyses of potential alternatives.
- Many interim cleanup actions currently are underway, the results of which will improve the ability to analyze alternatives in future Lifecycle Reports.

In lieu of analyzing alternatives for all cleanup actions every year, the Lifecycle Report proposes a schedule and rationale for when different cleanup actions will undergo in-depth analyses. Section A.3 provides this information.

A.2.1 RANGE OF PLAUSIBLE ALTERNATIVES

Ranges of plausible alternatives have been identified for cleanup actions, consistent with existing and yet to be made cleanup decisions, ongoing interim work (if any), and status and maturity of efforts. The range of plausible alternatives has been identified to help ensure completeness with respect to the work needed to accomplish the Hanford Site cleanup mission and to provide regulatory agencies, Tribal Governments, and affected stakeholders with sufficient information to help inform and guide discussions about priorities and contents for future Lifecycle Reports.

The range of plausible alternatives for each cleanup action was developed through a series of working sessions involving the TPA agencies subject matter experts applying their knowledge of Hanford Site cleanup work and best professional judgment. Each range of plausible alternatives has alternatives that, in the opinion of the agency experts, include a maximum cleanup effort (e.g., a likely upper bound) for that cleanup action. In addition, the ranges of plausible alternatives exclude alternatives that could not be part of a reasonable upper bound (e.g., no action). Determination of the range of plausible alternatives and likely upper bounding cleanup effort took into account, among other factors, current requirements under the TPA and other environmental obligations, and the status of alternatives being considered under existing and forthcoming cleanup decisions. The range of plausible alternatives for each cleanup action also was intended to encompass the most current planning assumptions with respect to that cleanup action.

Tables A-2, A-3, and A-4 list and are organized by the identified cleanup actions for River Corridor, Central Plateau, and Tank Waste, respectively. These tables of cleanup actions and plausible alternatives provide regulatory agencies, Tribal Governments, and affected stakeholders with information to help inform and guide discussions about priorities and scoping of future cleanup work. In addition, these tables include the following information:

- For each cleanup action, a summary of the current cleanup decisions that have been made pursuant to the TPA and other environmental obligations, and a list of relevant cleanup decision documents.
- For each cleanup action, a list that encompasses the likely range of plausible alternatives.

Table A-2. Summary of Cleanup Actions and Plausible Alternatives – River Corridor. (8 pages)

CLEANUP ACTION:	RC-1 River Corridor – Disposition 100 Area Reactors (Except B Reactor)*

Cleanup Decision Summary and Relevant Decision Documents

The DOE decided the reactor blocks for Hanford's eight defunct plutonium reactors will be kept at their present sites until their radiation level lowers through natural decay and will then be buried in the Central Plateau. Action memoranda are in place for ISS of reactors and for D4 of ancillary facilities.

- CCN 059689, 1998, "Action Memorandum: USDOE Hanford 100 Area National Priorities List (NPL); 105-F and 105-DR Reactor Buildings and Ancillary Facilities; Hanford Site; Benton County, Washington," Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Richland Operations Office, Richland, Washington, July 14.
- DOE and Ecology, 2000, "Action Memorandum: United States Department of Energy Hanford 100 Area National Priorities List (NPL); 105-D and 105-H Reactor Facilities and Ancillary Facilities; Hanford Site; Benton County, Washington," U.S. Department of Energy, Richland Operations Office and Washington State Department of Ecology, Richland, Washington, December 8.
- DOE and Ecology, 2005, "Action Memorandum; United States Department of Energy, 100 Area, 105-N Reactor Facility and 109-N Heat Exchanger Building, Hanford Site, Benton County, Washington," U.S. Department of Energy, Richland Operations Office, and Washington State Department of Ecology, Nuclear Waste Program, Richland, Washington, March 10.
- DOE and EPA, 2001, "Action Memorandum; U.S. Department of Energy, Hanford 100 Area National Priorities List (NPL) 105-B Reactor Facility, Hanford Site, Benton County, Washington," U.S. Department of Energy, Richland Operations Office and U.S. Environmental Protection Agency, Richland, Washington, December 27.
- DOE and EPA, 2007, "Action Memorandum for the Non-time-critical Removal Action for the 105-KE and 105-KW Reactor Facilities and Ancillary Facilities," U.S. Department of Energy, Richland Operations Office and U.S. Environmental Protection Agency, Richland, Washington, January 4.
- EPA, 1997, "Action Memorandum; 100 B/C Area Ancillary Facilities and the 108-F Building Removal Action, U.S. Department of Energy Hanford Site, Richland, WA" (letter to J.M. Bruggeman, U.S. Department of Energy, Richland Operations Office from D. Faulk), U.S. Environmental Protection Agency, Region 10 Hanford Project Office, Richland, Washington, January 29.

Range of Plausible Alternatives

- Demolition of the reactor buildings that have not been placed in ISS, demolition of the reactor blocks in ISS, and transport of all the reactor blocks, intact on a tractor-transporter, from the present 100 Area locations to the 200-West Area for disposal.
- Complete ISS on remaining reactors; safe storage for a period of up to 75 years of surveillance, monitoring, and maintenance; at the end of the safe storage period, demolition of the reactor blocks and transport of the reactor blocks, intact on a tractor-transporter, from the present 100 Area locations to the 200-West Area for disposal.
- Complete ISS on remaining reactors; safe storage for a period of up to 75 years of surveillance, monitoring, and maintenance; at the end of the safe storage period, demolition of the reactor buildings and piece-by-piece dismantlement of the reactor cores and transport of radioactive waste to the 200-West Area for burial.
- Demolition of the reactor buildings and SSEs and filling voids beneath and around the reactor blocks; the reactor blocks, adjacent shield walls, and the spent fuel storage basin together with the contained radioactivity, gravel, and grout covered to a depth of at least 5 meters with a mound containing earth and gravel.

* B Reactor has been designated a National Historic Landmark by the U.S. Department of Interior. Ongoing efforts are to condition and maintain the facility safe for public access with potential for future long-term preservation. If the decision is made to remove/disposition B Reactor, the work would be encompassed within this overall reactor disposition cleanup action.

Table A-2. Summary of Cleanup Actions and Plausible Alternatives – River Corridor. (8 pages)

CLEANUP ACTION:	RC-2 River Corridor – Disposition 100 Area K West Basin
Cleanup Decision Summary and Relevant Decision Documents An interim ROD, ROD amendment, and action memorandum are in place for the removal, treatment, and interim on-site storage of spent nuclear fuel and sludge from the K Basins. • EPA/ROD/R10-99/059, 1999, *Interim Remedial Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 10-KR-1, 100-KR-2, I00-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington. • DOE and EPA, 2004, "Action Memorandum: Request for Time Critical Response for Treatment and Disposal of Sludge from the 105-K East North Loadout Pit, USDOE Hanford Site," U.S. Department of Energy, Richland Operations Office and U.S. Environmental Protection Agency, Richland, Washington, June 4. • EPA, 2005, *Interim Remedial Action Record of Decision Amendment, Declaration*, U.S. Department of Energy, 100 K Area K Basins, Hanford Site - 100 Area, Benton County, Washington, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.	
Range of Plausible Alternatives • Remove, treat, and transfer sludge for interim storage at T Plant; transfer fuel scrap for interim storage at Canister Storage Building; D4 K West Basin and ancillary structures; remediate below-grade portions consistent with 100 Area contaminated soil sites.* * May require removal of K Reactors to access below-grade contaminated soils. K East Basin was demolished in 2009.	

Table A-2. Summary of Cleanup Actions and Plausible Alternatives – River Corridor. (8 pages)

CLEANUP ACTION:	RC-3 River Corridor – Remediate 100 Area Contaminated Soil Sites

Cleanup Decision Summary and Relevant Decision Documents

Interim RODs, ROD amendments, and ESDs are in place to remove contaminated soil, structures, debris, and burial grounds using the observational and plug-in approaches with on-site disposal at the ERDF.

- EPA, 2004a, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA, 2007, *Explanation of Significant Difference for the Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units (100 Area Burial Grounds)*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA, 2009a, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/ROD/R10-95/126, 1995, *Declaration of the Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/AMD/R10-97/044, 1997, *Amendment to the Interim Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/ROD/R10-99/039, 1999, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/ESD/R10-00/045, 2000, *Explanation of Significant Difference for the 100 Area Remaining Sites ROD, USDOE Hanford 100 Area, 100-IU-6 Operable Unit, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/ROD/R10-00/120, 2000, *Interim Remedial Action Record of Decision for the 100-NR-1 Operable Unit, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/ESD/R10-03/605, 2003, *Explanation of Significant Differences for the 100-NR-1 Operable Unit Treatment, Storage, and Disposal Interim Action Record of Decision and 100-NR-1/100-NR-2 Operable Unit Interim Action Record of Decision*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/ROD/R10-00/121, 2000, *Declaration of the Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2 and the 100-KR-2 Operable Units*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- *Resource Conservation and Recovery Act of 1976*, 42 USC 6901, et seq.

Table A-2. Summary of Cleanup Actions and Plausible Alternatives – River Corridor. (8 pages)

Range of Plausible Alternatives

- RTD contaminated soil sites to achieve RAOs* and applicable closure performance standards**; backfill, contour, and revegetate excavations. (Note: DOE considers the interim RTD actions as the likely final actions for the waste sites that have been or will be remediated under the applicable 100 Area RODs. The 100 Area interim RODs for waste sites will be covered by the six final RODs for the River Corridor currently being worked through a final RI/FS process.)

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

* In accordance with applicable interim action RODs.

** Closure of several 100-N facilities will be according to approved RCRA closure plans.

CLEANUP ACTION:	**RC-4.1 River Corridor – Restore 100-BC-5 Groundwater Operable Unit To Beneficial Use**

Cleanup Decision Summary and Relevant Decision Documents

No cleanup decisions have been made for this operable unit. Groundwater monitoring and annual reporting continue to track groundwater contamination in this operable unit.

- WAC 173-340, "Model Toxics Control Act -- Cleanup," *Washington Administrative Code*, Olympia, Washington.
  - WAC 173-340-720, "Ground Water Cleanup Standards."

Range of Plausible Alternatives

- Install pump-and-treat system in 100-BC-5; transition to surveillance and maintenance for post-treatment groundwater monitoring.
- Incorporate bioremediation for chromium.
- Allow monitored natural attenuation to proceed under long-term stewardship with institutional controls.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

CLEANUP ACTION:	**RC-4.2 River Corridor – Restore 100-KR-4 Groundwater Operable Unit To Beneficial Use**

Cleanup Decision Summary and Relevant Decision Documents

An interim ROD is in place to clean up hexavalent chromium in the groundwater using pump-and-treat.

- EPA/ROD/R10-96/134, 1996, *Declaration of the Record of Decision for the 100-HR-3 and 100-KR-4 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- WAC 173-340, "Model Toxics Control Act -- Cleanup," *Washington Administrative Code*, Olympia, Washington.
  - WAC 173-340-720, "Ground Water Cleanup Standards."

Range of Plausible Alternatives

- Expand pump-and-treat system in 100-KR-4; transition to surveillance and maintenance for post-treatment groundwater monitoring.
- Continue operation of pump-and-treat system with incorporation of bioremediation for chromium.
- Allow monitored natural attenuation to proceed under long-term stewardship with institutional controls.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

Table A-2. Summary of Cleanup Actions and Plausible Alternatives – River Corridor. (8 pages)

CLEANUP ACTION:	RC-4.3 River Corridor – Restore 100-NR-2 Groundwater Operable Unit To Beneficial Use

Cleanup Decision Summary and Relevant Decision Documents

An action memorandum, interim ROD, and ESD are in place to clean up strontium-90 in the groundwater using pump-and-treat and physical barriers. An in situ apatite barrier and phytoremediation treatability tests are being evaluated for use in the cleanup of strontium-90 in groundwater.

- DOE/RL-2009-54, 2009, *Proposed Plan for Amendment of 100-NR-1/NR-2 Interim Action Record of Decision*, Draft B, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- Ecology and EPA, 1994, “Action Memorandum; N Springs Expedited Response Action Cleanup U.S. Department of Energy Hanford Site, Richland, WA” (letter to L.K. McClain, U.S. Department of Energy, Richland Operations Office from R.F. Smith, U.S. Environmental Protection Agency and M.A. Wilson, Washington State Department of Ecology), U.S. Environmental Protection Agency, Richland, Washington, June 27.
- EPA/ESD/R10-03/605, 2003, *Explanation of Significant Differences for the 100-NR-1 Operable Unit Treatment, Storage, and Disposal Interim Action Record of Decision and 100-NR-1/100-NR-2 Operable Unit Interim Action Record of Decision*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/ROD/R10-99/112, 1999, *Interim Remedial Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- WAC 173-340, “Model Toxics Control Act -- Cleanup,” *Washington Administrative Code*, Olympia, Washington.
  - WAC 173-340-720, “Ground Water Cleanup Standards.”

Range of Plausible Alternatives

Alternatives are being addressed as part of DOE/RL-2009-54, *Proposed Plan for Amendment of 100-NR-1/NR-2 Operable Unit Interim Action Record of Decision*; pending completion, the following reflect alternatives from the proposed plan, but are not intended to presume the outcome of the ongoing decision-making process:

- Resume operation of existing pump-and-treat system; operate and expand system as necessary until cleanup objectives are achieved; transition to surveillance and maintenance for post-treatment groundwater monitoring.
- Construct an impermeable barrier along the shoreline to re-direct groundwater flow and increase travel times for radioactive decay to achieve cleanup objectives.
- Expand the apatite permeable reactive barrier to promote sequestration of strontium-90.
- Incorporate phytotechnology.
- Use sequestration and immobilization technologies for inner portion of strontium-90 plume.
- Allow monitored natural attenuation to proceed under long-term stewardship with institutional controls.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

Table A-2. Summary of Cleanup Actions and Plausible Alternatives – River Corridor. (8 pages)

CLEANUP ACTION:	RC-4.4 River Corridor – Restore 100-HR-3 Groundwater Operable Unit To Beneficial Use

Cleanup Decision Summary and Relevant Decision Documents

An interim ROD, ROD amendment, and ESDs are in place to clean up hexavalent chromium in the groundwater using pump-and-treat and an in situ oxidation/reduction (“redox”) manipulation barrier.

- EPA/ROD/R10-96/134, 1996, *Declaration of the Record of Decision for the 100-HR-3 and 100-KR-4 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/541/R-00/122, 1999, *Interim Remedial Action Record of Decision Amendment: 100-HR-3 Operable Unit*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA, 2002, *Explanation of Significant Difference for the 100-HR-3 Operable Unit Record of Decision*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/ESD/R10-03/606, 2003, *Explanation of Significant Difference for the 100-HR-3 Operable Unit Record of Decision, USDOE Hanford 100 Area, 100-HR-3 Operable Unit, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA, 2009b, *Explanation of Significant Differences for the 100-HR-3 and 100-KR-4 Operable Units Interim Action Record of Decision, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- WAC 173-340, “Model Toxics Control Act -- Cleanup,” *Washington Administrative Code*, Olympia, Washington.
  - WAC 173-340-720, “Ground Water Cleanup Standards.”

Range of Plausible Alternatives

- Expand pump-and-treat system in 100-HR-3; transition to surveillance and maintenance for post-treatment groundwater monitoring.
- Maintain and repair in situ redox manipulation barrier.
- Incorporate bioremediation.
- Allow monitored natural attenuation to proceed under long-term stewardship with institutional controls.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

CLEANUP ACTION:	RC-4.5 River Corridor – Restore 100-FR-3 Groundwater Operable Unit To Beneficial Use

Cleanup Decision Summary and Relevant Decision Documents

No cleanup decisions have been made for this operable unit. Groundwater monitoring and annual reporting continue to track groundwater contamination.

- WAC 173-340, "Model Toxics Control Act - Cleanup," *Washington Administrative Code*, Olympia, Washington.
  - WAC 173 340 720, "Ground Water Cleanup Standards."

Range of Plausible Alternatives

- Install pump-and-treat system in 100-FR-3; transition to surveillance and maintenance for post-treatment groundwater monitoring.
- Incorporate bioremediation for chromium.
- Allow monitored natural attenuation to proceed under long-term stewardship with institutional controls.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

Table A-2. Summary of Cleanup Actions and Plausible Alternatives – River Corridor. (8 pages)

CLEANUP ACTION:	**RC-5 River Corridor – Disposition 300 Area Facilities Retained By PNNL**

Cleanup Decision Summary and Relevant Decision Documents

No cleanup decisions have been made for the facilities retained by PNNL. Action memoranda are in place for the remaining 300 Area buildings and facilities, and DOE anticipates extending those cleanup decisions to include the PNNL-retained facilities once their operations end. DOE considers D&D of buildings and other structures to be final cleanup decisions if all regulated contaminants have been removed in accordance with an applicable action memorandum. Alternatives do not need to be considered where such D&D has been completed. Decision documents for D&D of 300 Area buildings and facilities that may have future application for the PNNL-retained facilities are listed here.

- DOE and EPA, 2005, "Action Memorandum #1 for the 300 Area Facilities," U.S. Department of Energy, Richland Operations Office and U.S. Environmental Protection Agency, Richland, Washington, January 20.
- DOE and EPA, 2006, "Action Memorandum #3 for the 300 Area Facilities," U.S. Department of Energy, Richland Operations Office and U.S. Environmental Protection Agency, Richland, Washington, November 30.

Range of Plausible Alternatives

- Following end of operational period for PNNL facilities (assumed 2023), D4 all buildings and facilities to slab-on-grade; evaluate below-grade portions for residual contamination; remediate below-grade portions consistent with 300 Area contaminated soil sites if needed.

CLEANUP ACTION:	**RC-6 River Corridor – Remediate 300 Area Contaminated Soil Sites***

Cleanup Decision Summary and Relevant Decision Documents

Final and interim RODs, ESDs, and an action memorandum are in place to remove contaminated soil, structures and debris and dispose of the debris at ERDF or the Waste Isolation Pilot Plant as appropriate.

- CCN 9103432, 1991, "Action Memorandum Approval: 316-5 Process Trenches, U.S. Department of Energy (DOE) Hanford Site, Richland, Washington" (letter to W. Bixby, U.S. Department of Energy, Richland Operations Office from C.E. Findley and R. Stanley), U.S. Environmental Protection Agency, Seattle, Washington, July 15.
- EPA/ROD/R10-96/143, 1996, *Declaration of the Record of Decision for the 300-FF-1 and 300-FF-5 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/ESD/R10-00/505, 2000, *USDOE Hanford 300 Area, 300-FF-1 Operable Unit, Hanford Site, Benton County, Washington Explanation of Significant Difference (ESD)*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/ESD/R10-00/524, 2000, *Explanation of Significant Difference for the 300-FF-5 Record of Decision*, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/ROD/R10-01/119, 2001, *Declaration of the Interim Record of Decision for the 300-FF-2 Operable Unit*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA, 2004b, *Explanation of Significant Differences for the 300-FF-2 Operable Unit Record of Decision*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA, 2009c, *Explanation of Significant Differences for the 300-FF-2 Operable Unit Interim Action Record of Decision, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.

Table A-2. Summary of Cleanup Actions and Plausible Alternatives – River Corridor. (8 pages)

Range of Plausible Alternatives

- RTD contaminated soil sites to achieve remedial action objectives**; backfill, contour, and revegetate excavations. (Note: DOE considers the interim RTD actions as the likely final actions for the waste sites that have been or will be remediated under the applicable 300 Area RODs. The 300 Area interim RODs for waste sites will be covered by the six final RODs for the River Corridor currently being worked through a final RI/FS process.)

No other alternatives are contemplated at this time for 300-FF-1 Operable Unit (cleanup action has been completed in accordance with final cleanup decision/ROD for 300-FF-1 and 300-FF-5 Operable Units, EPA/ROD/R10-96/143), or for 300-FF-2 Operable Unit.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

* Includes 618-10 and 618-11 Burial Grounds, and contaminated soils associated with areas outside the FFTF complex.

** In accordance with applicable interim action RODs.

CLEANUP ACTION:	**RC-7 River Corridor – Restore 300 Area Groundwater To Beneficial Use**

Cleanup Decision Summary and Relevant Decision Documents

The interim ROD selected monitoring and institutional controls for uranium contamination in groundwater. Treatability tests to sequester uranium in the vadose zone and groundwater are being evaluated for use in the cleanup of uranium in groundwater.

- EPA/ROD/R10-96/143, 1996, *Declaration of the Record of Decision for the 300-FF-1 and 300-FF-5 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- WAC 173-340, "Model Toxics Control Act -- Cleanup," *Washington Administrative Code*, Olympia, Washington.
  - WAC 173-340-720, "Ground Water Cleanup Standards."

Range of Plausible Alternatives

- Install in situ phosphate/polyphosphate treatment to sequester uranium in the vadose zone and monitor effectiveness.
- Install in situ phosphate/polyphosphate treatment to sequester uranium in the groundwater and monitor effectiveness.
- Shear-thinning injection at top of the aquifer to sequester uranium.
- RTD of contaminated rewetted zone of the deep vadose zone.
- Transition to surveillance and maintenance for post-treatment groundwater monitoring.
- Allow monitored natural attenuation to proceed under long-term stewardship with appropriate institutional controls.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

Note: Alternatives based on pumping and treating the groundwater are not considered plausible due to high aquifer permeability and river intrusion.

D4	=	deactivate, decontaminate, decommission, and demolish.	PNNL	=	Pacific Northwest National Laboratory.
			RAO	=	remedial action objective.
D&D	=	decontamination and decommissioning.	RCRA	=	*Resource Conservation and Recovery Act.*
DOE	=	U.S. Department of Energy.	RI/FS	=	remedial investigation/feasibility study.
ERDF	=	Environmental Restoration Disposal Facility.	ROD	=	record of decision.
ESD	=	explanation of significant differences.	RTD	=	remove, treat, and dispose.
FFTF	=	Fast Flux Test Facility.	SSE	=	safe storage enclosure.
ISS	=	interim safe storage.	WAC	=	*Washington Administrative Code.*

Table A-3. Summary of Cleanup Actions and Plausible Alternatives – Central Plateau. (12 pages)

CLEANUP ACTION:	**CP-1 Central Plateau – Disposition Remaining Outer Area Buildings And Facilities**

Cleanup Decision Summary and Relevant Decision Documents

Action memoranda are in place to D4 buildings and facilities to slab-on-grade and evaluate below-grade portions for contamination. Future cleanup decisions for remaining buildings and facilities will be included in decision documents (e.g., action memoranda, RODs). DOE considers D&D of buildings and other structures to be final cleanup decisions if all regulated contaminants have been removed in accordance with an applicable action memorandum. Alternatives do not need to be considered where such D&D has been completed.

- DOE/RL-2008-80-ADD1, 2010, *Action Memorandum for the Non-Time Critical Removal Action for the 212-N, 212-P, and 212-R Facilities, Addendum 1: Disposition of Railcars*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-2010-22, 2010, *Action Memorandum for General Hanford Site Decommissioning Activities*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Range of Plausible Alternatives

- D4 all buildings and facilities to slab-on-grade; evaluate below-grade portions for residual contamination; if needed, remediate below-grade portions consistent with Central Plateau Outer Area contaminated soil sites.

CLEANUP ACTION:	**CP-2 Central Plateau – Remediate Remaining Outer Area Contaminated Soil Sites (200-OA-1, 200-CW-1, and 200-CW-3 Operable Units)**

Cleanup Decision Summary and Relevant Decision Documents

An interim ROD, ESD, and action memoranda are in place to remove contaminated soil, structures, and debris with on-site disposal at ERDF. Future cleanup decisions for remaining soil sites will be included in decision documents (e.g., action memoranda, RODs).

- EPA/ROD/R10-99/039, 1999, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA, 2009, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- DOE/RL-2009-48, 2009, *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-2009-37, 2009, *Action Memorandum for Non-Time-Critical Removal Action for 200-MG-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-2009-86, 2010, *Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Range of Plausible Alternatives

- RTD contaminated soil sites to achieve RAOs comparable to 100 Areas; backfill, contour, and revegetate excavations.
- RTD all sites except ponds; allow monitored natural attenuation for large pond sites with presence of existing vegetated soil covers.
- Allow monitored natural attenuation to proceed for all sites under long-term stewardship with appropriate institutional controls.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

Table A-3. Summary of Cleanup Actions and Plausible Alternatives – Central Plateau. (12 pages)

CLEANUP ACTION:	**CP-3 Central Plateau – Disposition Below-Grade Portions of Plutonium Finishing Plant**

Cleanup Decision Summary and Relevant Decision Documents

A non-time critical action memorandum is in place, associated TPA milestone decision documents are complete and approved, and D4 activities are being completed for above-grade structures of PFP. Final decisions and cleanup actions have not been made yet for below-grade structures and contaminated areas that are not identified in the action memorandum.

- DOE/RL-2005-13, 2005, *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Non-time Critical Removal Action memorandum for Plutonium Finishing Plant, Above-Grade Structures*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Range of Plausible Alternatives

- Evaluate below-grade portions for residual contamination; leave remaining below-grade structures and contaminated areas in-place and transition to long-term stewardship with appropriate institutional controls.
- RTD all PFP below-grade structures and contaminated areas; backfill and revegetate.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

CLEANUP ACTION:	**CP-4 Central Plateau – Disposition B Plant Canyon Building/Associated Waste Sites (200-CB-1 Operable Unit)**

Cleanup Decision Summary and Relevant Decision Documents

Several action memoranda are in place to remove contaminated soil, structures, and debris from waste sites with on site disposal at ERDF. Future cleanup decisions for remaining buildings and waste sites will be included in decision documents (e.g., action memoranda, RODs).

- DOE/RL-2009-48, 2009, *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-2009-37, 2009, *Action Memorandum for Non-Time-Critical Removal Action for 200-MG-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-2009-86, 2010, *Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Range of Plausible Alternatives

- Remove all contents and D4 B Plant Canyon Building, including below-grade foundation; remove all contaminated materials, associated waste sites, and contaminated soils to achieve RAOs; dispose all wastes and debris at approved facility.
- Condition contents for placement in spaces below canyon deck level; stabilize and fill voids; remove contaminated wastes and soils from associated waste sites and dispose at approved facility; partially demolish building to canyon deck level; place engineered barrier over demolished structure; maintain institutional controls and perform post-closure monitoring and caretaking.
- Condition contents, retrieve associated waste site contaminated soils and debris, and place in B Plant Canyon for entombment; stabilize and fill voids; surround with clean fill and place an engineered barrier over the canyon building; maintain institutional controls and perform post-closure monitoring and caretaking.
- Same as preceding (entombment) alternative, with addition of disposal capability to allow receipt of wastes from cleanup activities.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

Table A-3. Summary of Cleanup Actions and Plausible Alternatives – Central Plateau. (12 pages)

CLEANUP ACTION:	**CP-5 Central Plateau – Disposition PUREX Canyon Building/Associated Waste Sites (200-CP-1 Operable Unit)**

Cleanup Decision Summary and Relevant Decision Documents

Several action memoranda are in place to remove contaminated soil, structures, and debris from waste sites with on site disposal at ERDF. Future cleanup decisions for remaining buildings and waste sites will be included in decision documents (e.g., action memoranda, RODs).

- DOE/RL-2009-48, 2009, *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-2009-37, 2009, *Action Memorandum for Non-Time-Critical Removal Action for 200-MG-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-2009-86, 2010, *Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Range of Plausible Alternatives

- Remove all contents and D4 PUREX Canyon Building including below-grade foundation; remove all contaminated materials, associated waste sites and contaminated soils to achieve remedial action objectives; dispose all wastes and debris at approved facility
- Condition contents for placement in spaces below canyon deck level; Stabilize and fill voids; remove contaminated wastes and soils from associated waste sites and dispose at approved facility; partially demolish building to canyon deck level; place engineered barrier over demolished structure; maintain institutional controls and perform post-closure monitoring and caretaking.
- Condition contents, retrieve associated waste site contaminated soils and debris, and place in PUREX Canyon for entombment; stabilize and fill voids; surround with clean fill and place an engineered barrier over the canyon building; maintain institutional controls and perform post-closure monitoring and caretaking.
- Same as preceding (entombment) alternative, with addition of disposal capability to allow receipt of wastes from cleanup activities.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including ICs and 5-year reviews of remedy effectiveness.

Note: Cleanup decisions affecting Disposition of the PUREX Canyon Building/Associated Waste Sites and Disposition of the PUREX Storage Tunnels should be aligned, and cleanup actions should be coordinated and integrated as much as practical.

Table A-3. Summary of Cleanup Actions and Plausible Alternatives – Central Plateau. (12 pages)

CLEANUP ACTION:	**CP-6 Central Plateau – Disposition PUREX Storage Tunnels (200-CP-1 Operable Unit)**

Cleanup Decision Summary and Relevant Decision Documents

No cleanup decisions have been made for the PUREX Storage Tunnels.

- TBD – No decision documents currently available.

Range of Plausible Alternatives

- Maintain safe storage; perform hazardous waste facility closure consistent with RCRA Permit; remediate radionuclides consistent with CERCLA; conduct post-closure monitoring.
- Stabilize wastes and prepare tunnels for in-place disposal; install barrier; perform post-closure care and transition to long-term stewardship.
- Remove and dispose wastes and contaminated equipment from tunnels; evaluate tunnels for residual contamination; if needed, remediate tunnels consistent with Central Plateau 200-East Inner Area contaminated soil sites.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

Note: Cleanup decisions affecting Disposition of the PUREX Storage Tunnels and Disposition of the PUREX Canyon Building/Associated Waste Sites should be aligned, and cleanup actions should be coordinated and integrated as much as practical.

CLEANUP ACTION:	**CP-7 Central Plateau – Disposition REDOX Canyon Building/Associated Waste Sites (200-CR-1 Operable Unit)**

Cleanup Decision Summary and Relevant Decision Documents

Several action memoranda are in place to remove contaminated soil, structures, and debris from waste sites with on site disposal at ERDF. Future cleanup decisions for remaining buildings and waste sites will be included in decision documents (e.g., action memoranda, RODs).

- DOE/RL-2009-48, 2009, *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-2009-37, 2009, *Action Memorandum for Non-Time-Critical Removal Action for 200-MG-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-2009-86, 2010, *Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Range of Plausible Alternatives

- Remove all contents and D4 REDOX Canyon Building including below-grade foundation; remove all contaminated materials, associated waste sites and contaminated soils to achieve remedial action objectives; dispose all wastes and debris at approved facility.
- Condition contents for placement in spaces below canyon deck level; stabilize and fill voids; remove contaminated wastes and soils from associated waste sites and dispose at approved facility; partially demolish building to canyon deck level; place engineered barrier over demolished structure; maintain institutional controls and perform post-closure monitoring and caretaking.
- Condition contents, retrieve associated waste site contaminated soils and debris, and place in REDOX Canyon for entombment; stabilize and fill voids; surround with clean fill and place an engineered barrier over the canyon building; maintain institutional controls and perform post-closure monitoring and caretaking.
- Same as preceding (entombment) alternative, with addition of disposal capability to allow receipt of wastes from cleanup activities.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

Table A-3. Summary of Cleanup Actions and Plausible Alternatives – Central Plateau. (12 pages)

CLEANUP ACTION:	**CP-8 Central Plateau – Disposition T Plant Canyon Building/Associated Waste Sites**
Cleanup Decision Summary and Relevant Decision Documents No cleanup decisions have been made for the T Plant Canyon Building and Associated Waste Sites. Current expectations are that T Plant will be used for several more years to support other remediation and waste management work. • TBD – No decision documents currently available.	
Range of Plausible Alternatives • Continue ongoing operations until 2036; Transition to D4 in 2038; fulfill hazardous waste facility closure obligations consistent with RCRA permit • Remove all contents and D4 T Plant Canyon Building including below-grade foundation; remove all contaminated materials, associated waste sites and contaminated soils to achieve remedial action objectives; dispose all wastes and debris at approved facility. • Condition contents for placement in spaces below canyon deck level; stabilize and fill voids; remove contaminated wastes and soils from associated waste sites and dispose at approved facility; partially demolish building to canyon deck level; place engineered barrier over demolished structure; maintain institutional controls and perform post-closure monitoring and caretaking. • Condition contents, retrieve associated waste site contaminated soils and debris, and place in T Plant Canyon for entombment; stabilize and fill voids; surround with clean fill and place an engineered barrier over the canyon building; maintain institutional controls and perform post-closure monitoring and caretaking. • Same as preceding (entombment) alternative, with addition of disposal capability to allow receipt of wastes from cleanup activities. If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.	
CLEANUP ACTION:	**CP-9 Central Plateau – Disposition Cesium/Strontium Capsules**
Cleanup Decision Summary and Relevant Decision Documents No cleanup decisions have been made for final disposition of the cesium/strontium capsules. Decisions have been deferred to future decision-making processes. • TBD – No decision documents currently available.	
Range of Plausible Alternatives • Package and transport capsules from WESF to dry storage; store capsules pending final disposition; direct dispose of capsules at a geologic repository. • Incorporate capsules into immobilized high-level waste glass at WTP. • Store capsules at Hanford Site for 300 years (approximately 10 half-lives); after natural decay, direct dispose of capsules as mixed low-level radioactive waste. • As a Greening of America initiative, utilize the Cs/Sr capsules for thermal generation of electricity/steam in future operations such as the WTP and Balance of Facilities supporting the WTP.	

Table A-3. Summary of Cleanup Actions and Plausible Alternatives – Central Plateau. (12 pages)

CLEANUP ACTION:	CP-10 Central Plateau – Remediate 200-SW-1 Operable Unit*

Cleanup Decision Summary and Relevant Decision Documents

No cleanup decisions have been made for the 200-SW-1 Operable Unit.

- TBD – No decision documents currently available.

Range of Plausible Alternatives

The following reflect alternatives being considered as part of DOE/EA-1707D, *Interim Action Environmental Assessment for Closures of the Non-Radioactive Dangerous Waste Landfill and Solid Waste Landfill*; the following alternatives are not intended to presume the outcome of the ongoing environmental assessment process:

- Install an evapotranspiration barrier over both landfills; upgrade monitoring and infrastructure systems; perform post-closure monitoring and caretaking.
- Partial RTD with removal of waste material from both landfills and impacted soils as deep as 10 feet below the waste material; backfill and revegetate; if necessary (e.g., contaminated residues remain), perform post-closure monitoring and caretaking.
- Remove all waste material from both landfills; excavate and RTD all contaminated soils, to groundwater if necessary; backfill and revegetate.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

* Includes Non-Radioactive Dangerous Waste Landfill (NRDWL) and Solid Waste Landfill (SWL)

CLEANUP ACTION:	CP-11 Central Plateau – Disposition Remaining Liquid Waste Disposal Facilities*

Cleanup Decision Summary and Relevant Decision Documents

No cleanup decisions have been made for the Remaining Liquid Waste Disposal Facilities.

TBD – No decision documents currently available.

Range of Plausible Alternatives

- Closure of facilities will be according to approved operating plans and closure plans.
- If needed, may remediate contaminated soils under zone closure; May include partial RTD with various capping alternatives; Monitoring and institutional controls after closure may be required.
- RTD all contaminated soils; Backfill and revegetate.
- Allow monitored natural attenuation to proceed under long-term stewardship with appropriate institutional controls.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

* Includes State-Approved Land Disposal Site; State Waste Discharge Permit Sites; 100-N Sewage Lagoon; On-Site Sewage Systems; National Pollutant Discharge Elimination System Outfalls; and Underground Injection Control Well Sites.

CLEANUP ACTION:	CP-12 Central Plateau – Disposition Remaining Waste Treatment, Storage and Disposal Facilities*

Cleanup Decision Summary and Relevant Decision Documents

No cleanup decisions have been made for the Remaining Waste Treatment, Storage And Disposal Facilities.

- TBD – No decision documents currently available.

Range of Plausible Alternatives

- Closure of facilities will be according to approved operating plans and closure plans (e.g., RCRA Closure Plans); consequently, cleanup actions will be determined and accomplished in accordance with applicable regulatory and permit/license requirements. No other alternatives are being considered.

* Includes LERF/ETF, WESF, WRAP, 222-S Laboratory, IDF, and Inert Waste Landfill/Pit 9.

Table A-3. Summary of Cleanup Actions and Plausible Alternatives – Central Plateau. (12 pages)

CLEANUP ACTION:	CP-13 Central Plateau – Remediate 200-IS-1 Operable Unit
Cleanup Decision Summary and Relevant Decision Documents The 200-IS-1 Operable Unit waste sites include tanks (except those considered to be included in the Tank Farms), pipelines, pits, diversion boxes, and associated ancillary equipment. Several pipelines are being addressed (in part) per 200-MG-1 removal actions; Final remediation decisions will be addressed in RODs; TSD ancillary equipment will be addressed in future RCRA Closure Plan(s); Other media may be addressed via CERCLA process. • TBD – No decision documents currently available.	
Range of Plausible Alternatives • RTD all contaminated equipment, materials, debris and soils to a depth that is determined by the TPA agencies to be protective of human health and ecological resources (depth TBD); backfill and revegetate. • RTD all contaminated equipment, materials, debris and soils; backfill and revegetate. • Stabilize select equipment in-place using technologies yet to be determined. • Leave everything in-place; maintain under long-term stewardship with appropriate institutional controls. If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.	
CLEANUP ACTION:	**CP-14 Central Plateau – Remediate 200-PW-1/3/6 and CW-5 Operable Units**
Cleanup Decision Summary and Relevant Decision Documents An expedited response action is in place for cleanup of carbon tetrachloride at several 200-PW-1 waste sites, but otherwise no cleanup decisions have been made to remediate the 200-PW-1/3/6 and 200-CW-5 Operable Units. • CCN 9200423, 1992, "Action Memorandum: Expedited Response Action Proposal for 200-West Area Carbon Tetrachloride Plume" (letter to R.D. Izatt, U.S. Department of Energy, Richland Operations Office from R.F. Smith and R. Stanley), U.S. Environmental Protection Agency and Washington State Department of Ecology, Richland, Washington, January 21.	
Range of Plausible Alternatives Alternatives have been evaluated in two feasibility studies*; The following reflect alternatives from the feasibility studies, but are not intended to presume the outcome of the ongoing decision making process: • RTD contaminated soil, sludge, and/or debris to achieve remedial action objectives. • Install an engineered surface barrier. • Perform in situ vitrification. • Conduct soil vapor extraction at carbon tetrachloride disposal sites. • Maintain existing soil cover; allow monitored natural attenuation to proceed under long-term stewardship with institutional controls. If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness. * DOE/RL -2004-24, 2010, *Feasibility Study for the 200-CW-5 Cooling Water Operable Unit, Draft* C, REISSUE, U.S. Department of Energy, Richland Operations Office, Richland, Washington. *DOE/RL-2007-27, 2009, *Feasibility Study for the Plutonium/Organic Rich Process Condensate/Process Waste Group Operable Unit: Includes the 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units*, Draft B, REISSUE, U.S. Department of Energy, Richland Operations Office, Richland, Washington.	

Table A-3. Summary of Cleanup Actions and Plausible Alternatives – Central Plateau. (12 pages)

CLEANUP ACTION:	**CP-15 Central Plateau – Remediate 200-SW-2 Operable Unit**
Cleanup Decision Summary and Relevant Decision Documents No cleanup decisions have been made to remediate the 200-SW-2 Operable Unit. (Note that this operable unit is not a single contaminated site, but is actually comprised of a large number of land disposal units.) • TBD – No decision documents currently available.	
Range of Plausible Alternatives • Excavation, treatment (as necessary), and disposal of all waste from within individual landfills. • Excavation, treatment (as necessary), and disposal of waste from selected sections of individual landfills followed by capping of remaining waste; includes continued cap maintenance and monitoring. • Capping of individual landfills; includes continued cap maintenance and monitoring. • In situ treatment/stabilization (e.g., vitrification or grouting) of portions of individual landfills followed by capping; includes continued cap maintenance and monitoring. If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.	
CLEANUP ACTION:	**CP-16 Central Plateau – Remediate Remaining 200-West Inner Area Contaminated Soil Sites (200-WA-1 Operable Unit)**
Cleanup Decision Summary and Relevant Decision Documents Several action memoranda are in place to remove contaminated soil, structures, and debris from 200-West Inner Area soil sites with disposal at ERDF. Future cleanup decisions for remaining waste sites will be included in decision documents (e.g., action memoranda, RODs). • DOE/RL-2009-37, 2009, *Action Memorandum for Non-Time-Critical Removal Action for 200-MG-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. • DOE/RL-2009-86, 2010, *Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.	
Range of Plausible Alternatives • RTD approximately half of waste sites and cap remainder. • RTD all waste sites; Backfill and revegetate. • Cap and maintain under long-term stewardship with monitoring and appropriate institutional controls. If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.	

Table A-3. Summary of Cleanup Actions and Plausible Alternatives – Central Plateau. (12 pages)

CLEANUP ACTION:	CP-17 Central Plateau – Remediate Remaining 200-East Inner Area Contaminated Soil Sites (200-EA-1 Operable Unit)

Cleanup Decision Summary and Relevant Decision Documents

Several action memoranda are in place to remove contaminated soil, structures, and debris from 200-East Inner Area soil sites with disposal at ERDF. Future cleanup decisions for remaining waste sites will be included in decision documents (e.g., action memoranda, RODs).

- DOE/RL-2009-37, 2009, *Action Memorandum for Non-Time-Critical Removal Action for 200-MG-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL-2009-86, 2010, *Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Range of Plausible Alternatives

- RTD approximately half of waste sites and cap remainder.
- RTD all waste sites; Backfill and revegetate.
- Cap and maintain under long-term stewardship with monitoring and appropriate institutional controls.

If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.

CLEANUP ACTION:	CP-18 Central Plateau – Disposition Fast Flux Test Facility (FFTF) Complex

Cleanup Decision Summary and Relevant Decision Documents

In 1995 DOE determined the FFTF would be deactivated. Other decisions have been deferred to future decision-making processes.

- TBD – No decision documents currently available.

Range of Plausible Alternatives

The following reflect alternatives being considered as part of DOE/EIS-0391, *Tank Closure and Waste Management Environmental Impact Statement*; the following alternatives are not intended to presume the outcome of the ongoing environmental impact process:

- Entombment – Consolidate buildings and wastes, compact, and fill void spaces within the reactor containment building and contaminated ancillary buildings; install a landfill barrier over remaining structures and extend as needed to cover contaminated below-grade portions
- Removal – Remove contaminated equipment and structures; reduce above-grade portions of reactor containment building and ancillary buildings to slab-on-grade; backfill with soil, compact and stabilize remaining below-grade portions; Contour and revegetate.
- Remove and treat remote-handled special components at Hanford or INL; dispose of treated components at IDF or Nevada Test Site.
- Store sodium; convert to caustic sodium hydroxide solution at Hanford or INL; reuse caustic sodium hydroxide solution for tank corrosion control or processing tank waste at WTP.
- Leave structures in place with inert gas blanket for sodium residuals; transition to long-term stewardship with appropriate institutional controls.

Table A-3. Summary of Cleanup Actions and Plausible Alternatives – Central Plateau. (12 pages)

CLEANUP ACTION:	CP-19 Central Plateau – Disposition Remaining Buildings and Facilities Within FFTF Complex

Cleanup Decision Summary and Relevant Decision Documents

In 1995 DOE determined the FFTF would be deactivated. Other decisions have been deferred to future decision-making processes.

- TBD – No decision documents currently available.

Range of Plausible Alternatives

- D4 all buildings and facilities to slab-on-grade; evaluate below-grade portions for residual contamination; If needed, remediate below-grade portions consistent with contiguous contaminated soil sites.
- Leave structures in-place and transition to long-term stewardship with appropriate institutional controls.

CLEANUP ACTION:	CP-20 Central Plateau –Disposition Remaining Inner Area Buildings And Facilities

Cleanup Decision Summary and Relevant Decision Documents

Cleanup decisions have been made for D&D of some of the Remaining Inner Area Buildings and Facilities, and the applicable Action Memorandum is expected to cover future D&D activities. DOE considers D&D of buildings and other structures to be final cleanup decisions if all regulated contaminants have been removed in accordance with an applicable Action Memorandum. Alternatives do not need to be considered where such D&D has been completed. (Note that cleanup decisions have been or will be made for the Canyon Buildings and Associated Waste Sites; see separate cleanup actions for these facilities.)

- DOE/RL-2010-22, 2010, *Action Memorandum for General Hanford Site Decommissioning Activities*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Range of Plausible Alternatives

- D4 all buildings and facilities to slab-on-grade; evaluate below-grade portions for residual contamination; if needed, remediate below-grade portions consistent with contiguous contaminated soil sites.
- Leave structures in-place and transition to long-term stewardship with appropriate institutional controls.

CLEANUP ACTION:	CP-21 Central Plateau – Remediate Contaminated Deep Vadose Zone (200-DV-1 Operable Unit)

Cleanup Decision Summary and Relevant Decision Documents

No cleanup decisions have been made for the Deep Vadose Zone.

- TBD – No decision documents currently available.

Range of Plausible Alternatives

- Implement results of treatability testing in accordance with CERCLA and/or RCRA final decisions.
- RTD all contaminated soils, to groundwater if necessary and technically practical; backfill and revegetate.
- In-place treatment to destroy, immobilize, or capture, treat and dispose contaminants.
- Soil flushing with pump and treat or pore water removal.
- Install surface barriers.
- Allow monitored natural attenuation to proceed under long-term stewardship with appropriate institutional controls.

Table A-3. Summary of Cleanup Actions and Plausible Alternatives – Central Plateau. (12 pages)

CLEANUP ACTION:	**CP-22 Central Plateau – Restore 200-West Groundwater To Beneficial Use (200-ZP-1/200-UP-1 Operable Units)**

Cleanup Decision Summary and Relevant Decision Documents

Interim RODs are in place for cleanup of high concentrations of selected contaminants and a final ROD is in place for the 200-ZP-1 operable unit to address all contaminants.

- EPA/ROD/R10-95/114, 1995, *Declaration of the Interim Record of Decision for the 200-ZP-1 Operable Unit*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA/ROD/R10-97/048, 1997, *Declaration of the Record of Decision, USDOE Hanford 200 Area, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA, 2009d, *Explanation of Significant Differences for the Interim Action Record of Decision for the 200-UP-1 Groundwater Operable Unit, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- EPA, 2008, *Record of Decision Hanford 200 Area 200-ZP-1 Superfund Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
- WAC 173-340, "Model Toxics Control Act -- Cleanup," *Washington Administrative Code*, Olympia, Washington.
  - WAC 173-340-720, "Ground Water Cleanup Standards."

Range of Plausible Alternatives

- Expand 200-ZP-1 extraction, treatment and injection capacity; Install extraction and transfer system for 200-UP-1; Operate pump and treat to achieve remedial action objectives; Continue monitoring.
- For 200-UP-1 Only – Allow monitored natural attenuation to proceed under long-term stewardship with appropriate institutional controls.

DOE/RL-2009-122, *Remedial Investigation/Feasibility Study for the 200-U-1 Groundwater Operable Unit*, includes an evaluation of three remedial alternatives. Each of these alternatives would use pump-and-treat, monitored natural attenuation, and hydraulic containment to address technetium-99, uranium, and iodine-129 contamination within different time periods.

CLEANUP ACTION:	**CP-23 Central Plateau – Restore 200-East Groundwater To Beneficial Use (200-PO-1/200-BP-5 Operable Units)**

Cleanup Decision Summary and Relevant Decision Documents

No cleanup decisions have been made for 200-East Groundwater.

- WAC 173-340, "Model Toxics Control Act -- Cleanup," *Washington Administrative Code*, Olympia, Washington.
  - WAC 173-340-720, "Ground Water Cleanup Standards."

Range of Plausible Alternatives

- Install pump and treat system for 200-BP-5 Operable Unit; implement monitored natural attenuation for 200-PO-1 Operable Unit; Perform well support and maintenance activities.
- Allow monitored natural attenuation to proceed under long-term stewardship with appropriate institutional controls.
- Install pump and treat system for 200-BP-5 and selective pump and treat for 200-PO-1 hot spots.

Note: 400 Area groundwater cleanup actions are included as part of 200-PO-1 Operable Unit.

Table A-3. Summary of Cleanup Actions and Plausible Alternatives – Central Plateau. (12 pages)

DOE/EA-1707D, 2010, *Interim Action Environmental Assessment for Closures of the Non Radioactive Dangerous Waste Landfill and Solid Waste Landfill*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/EIS-0391, 2009, *Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site*, Richland Washington, Draft, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2009-122, 2010, *Remedial Investigation/Feasibility Study for the 200-UP-1 Groundwater Operable Unit, Draft A*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*.
D&D = decontamination and decommissioning.
D4 = deactivation, decontamination, decommissioning, and demolition.
DOE = U.S. Department of Energy.
ERDF = Environmental Restoration Disposal Facility.
ESD = explanation of significant difference.
FFTF = Fast Flux Test Facility.
IDF = Integrated Disposal Facility.
INL = Idaho National Laboratory.
PFP = Plutonium Finishing Plant.
PUREX = Plutonium-Uranium Extraction (Plant).
RAO = remedial action objective.
RCRA = *Resource Conservation and Recovery Act of 1976*.
ROD = record of decision.
RTD = remove, treat, and dispose.
TBD = to be determined.
TPA = Tri-Party Agreement.
TSD = treatment, storage, and disposal.
WESF = Waste Encapsulation and Storage Facility.
WTP = Waste Treatment and Immobilization Plant.

Table A-4. Summary of Cleanup Actions and Plausible Alternatives – Tank Waste. (3 pages)

CLEANUP ACTION:	**TW-1 Tank Waste – Tank Retrieval and Single-Shell Tank Farm Closure**
Cleanup Decision Summary and Relevant Decision Documents In the February 26, 1997 Federal Register, DOE decided to retrieve and treat tank waste (62 FR 8693). Further decisions have been deferred to future decision-making processes.	
Range of Plausible Alternatives • Retrieve SST wastes (assumes two retrieval technologies) to meet milestones in the Consent Decree and TPA Settlement Package (DOE and Ecology 2010); achieve designated retrieval objectives or limits of technology; remediate structures and soils and install cover/cap to meet closure performance standards; maintain post-closure care and monitoring consistent with RCRA Permit. The following reflect alternatives being considered as part of the TC&WM EIS (DOE/EIS-0391); the following alternatives are not intended to presume the outcome of the ongoing environmental impact process: • Grout, cap and close SSTs with residual waste in-place; Monitor and implement institutional controls after closure; Eventual transition to long-term stewardship. • Construct new DST capacity sufficient to complete SST retrieval; close SSTs and implement post-closure care, monitoring, and institutional controls; eventual transition to long-term stewardship. • RTD some SSTs and ancillary facilities, residual waste, and contaminated soils; Backfill and revegetate. If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.	
CLEANUP ACTION:	**TW-2 Tank Waste – Tank Waste Treatment**
Cleanup Decision Summary and Relevant Decision Documents In the February 26, 1997 Federal Register, DOE decided to retrieve, separate, vitrify, and dispose of the tank waste (62 FR 8693). The immobilized LAW would be prepared for onsite disposal and the vitrified HLW would be placed in interim storage pending future disposal at a national geologic repository. Further decisions have been deferred to future decision-making processes.	
Range of Plausible Alternatives • Pretreat, condition and immobilize tank wastes in the WTP to meet TPA milestones and comply with RCRA Permit; operate supplemental treatment systems (assumed to be second LAW) to augment WTP capacity; place immobilized waste in canisters; transfer immobilized LAW for disposal at the IDF; provide capacity to store all immobilized HLW in Hanford Shipping Facility (new) until a final repository is available. • Perform blending and waste characterization at a new Enhanced Waste Receiving Facility.	
CLEANUP ACTION:	**TW-3 Tank Waste – Secondary Waste Treatment**
Cleanup Decision Summary and Relevant Decision Documents No cleanup decisions have been made. Decisions have been deferred to future decision-making processes. • TBD – No decision documents currently available.	
Range of Plausible Alternatives • Recycle liquid waste streams within WTP; manage residual liquid wastes at LERF/ETF/SALDS; treat solid wastes from WTP and ETF and dispose at the IDF; manage and disposition other secondary waste (e.g., failed melters). Other plausible alternatives will be determined at a later date. Note: Any radioactive HLW will be stored and eventually shipped to a geologic repository.	

Table A-4. Summary of Cleanup Actions and Plausible Alternatives – Tank Waste. (3 pages)

CLEANUP ACTION:	TW-4 Tank Waste – Double-Shell Tank Closure
Cleanup Decision Summary and Relevant Decision Documents No cleanup decisions have been made. Decisions have been deferred to future decision-making processes.	
Range of Plausible Alternatives • Retrieve DST wastes consistent with TPA; achieve designated retrieval objectives or limits of technology; remediate structures and soils and install cover/cap to meet closure performance standards; maintain post-closure care and monitoring consistent with RCRA Permit. • RTD DSTs and ancillary facilities, residual waste, and contaminated soils; backfill and revegetate. • Stabilize, cap and close DSTs with residual waste in-place; monitor and implement institutional controls after closure; eventual transition to long-term stewardship. If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.	
CLEANUP ACTION:	**TW-5 Tank Waste – WTP Closure**
Cleanup Decision Summary and Relevant Decision Documents The RCRA Hanford Dangerous Waste Permit, Operable Unit-10, Chapter 11 states “Clean closure is the goal for the WTP. The closure plan will be revised if efforts to achieve the clean closure standards for the WTP structures or soil are unsuccessful. The “modified closure” approach may be followed if feasible, as provided in Condition II.K.3 of the Hanford RCRA Permit. It may also be closed as a landfill, as provided in Condition II.K.4 of the Hanford RCRA Permit, if the clean closure standards are not technically or economically feasible. The revised closure plan will be accompanied by a written request for modification of the permit.” Further decisions have been deferred to future decision-making processes. • WA7890008967, 2007, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*, as amended, Washington State Department of Ecology, Richland, Washington.	
Range of Plausible Alternatives • Demolish ancillary facilities/structures to the primary containment structure; seal containment structure and construct a soil-based environmental barrier over the containment structure; remediate structures and soils; maintain post-closure care and monitoring consistent with RCRA Permit. • D4 all buildings and facilities to slab-on-grade; evaluate below-grade portions for residual contamination; if needed, remediate below-grade portions. • Perform clean closure of WTP and all ancillary facilities/structures. • Leave structures in-place and transition to long-term stewardship with appropriate institutional controls. If residual contamination remains after cleanup actions are completed, cleanup work will transition to long-term stewardship, including institutional controls and 5-year reviews of remedy effectiveness.	
62 FR 8693, “Record of Decision for the Tank Waste Remediation System, Hanford Site, Richland, WA,” *Federal Register*, (February 26, 1997). DOE/EIS-0391, 2009, *Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site*, Richland Washington, Draft, U.S. Department of Energy, Richland Operations Office, Richland, Washington. FR 8693, “Record of Decision for the Tank Waste Remediation System, Hanford Site, Richland, WA,” *Federal Register*, (February 26, 1997). *Resource Conservation and Recovery Act of 1976*, 42 USC 6901, et seq. Settlement Consent Decree between Washington State Department of Ecology and U.S. Department of Energy, order signed October 25, 2010, in *State of Washington v. Chu*, United States District Court, Eastern District of Washington, Case No. CV-08-5085-FVS. WA7890008967, 2007, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*, as amended, Washington State Department of Ecology, Richland, Washington.	

Table A-4. Summary of Cleanup Actions and Plausible Alternatives – Tank Waste. (3 pages)

DST	=	double-shell tank.	RCRA	=	*Resource Conservation and Recovery Act of 1976.*
ETF	=	Effluent Treatment Facility.	SALDS	=	State-Approved Land Disposal Site.
HLW	=	high-level waste.	SST	=	single-shell tank.
IDF	=	Integrated Disposal Facility.	TC&WM EIS	=	Tank Closure and Waste Management Environmental Impact Statement.
ILAW	=	immobilized low-activity waste.	TPA	=	Tri-Party Agreement.
LAW	=	low-activity waste.	WTP	=	Waste Treatment and Immobilization Plant.
LERF	=	Liquid Effluent Retention Facility.			

A.2.2 DOE'S APPROACH FOR ANALYZING ALTERNATIVES AND DESCRIBING THE REASONABLE UPPER BOUND

TPA Milestone M-036-01 refers to a "reasonable upper bound" with respect to presenting information about cleanup alternatives, but the milestone does not include a ready definition for "reasonable upper bound." To ensure the Lifecycle Report provides information that meets the requirement and intent of the milestone, DOE has relied on the following conceptual framework.

The reasonable upper bound for a range of alternatives or alternative costs describes a cleanup action alternative that most people can agree:

- Is near or at the maximum feasible extent of the available engineered solutions.
- Provides an acceptable level of health and environmental protection when complete.
- Is appropriate relative to the effort expended and the benefits achieved.

Applying this concept presumes the ability to satisfy several related and dependent conditions:

- First, that mutual agreement can be achieved among responsible individuals who have sufficient information available to them, and are able to objectively consider the relevant science and applicable standards within the context of fiscal and public policy considerations.
- Second, that potential health and environmental concerns are sufficiently understood, and that an alternative will be effective at reducing the potential concerns as claimed.
- Last, that an alternative exists that bounds the upper range of a set of choices, and this upper-bounding alternative can provide tangible advantages that the other available choices would not.

DOE will apply these conditions and the framework outlined above in the process of analyzing alternatives and identifying the reasonable upper bound for the cleanup actions that are evaluated in-depth in the Lifecycle Report.

The purpose of analyzing and selecting alternatives is to formally evaluate alternative project solutions (e.g., designs) so that the alternative that best meets the project need is selected. DOE has applied a systematic process for individual cleanup actions to more definitively describe a range of plausible alternatives; identify a reasonable upper bound for that range of alternatives; and develop schedule and cost information associated with implementing that upper bounding cleanup alternative. For the process followed for the cost estimate alternative analyses presented in this year's Lifecycle Report, DOE has adapted and broadly applied the approach it follows in developing and selecting alternatives for other types of engineering and construction projects. This approach is summarized further below, and includes the following main steps:

1. Describe the functional requirements the project must meet.
2. Identify any constraints that could affect the project's conduct.
3. Develop and analyze potential solutions until a preferred project alternative emerges.

Alternative development and analysis begins with preparation of functional requirements to describe what the project is expected to do. The functional requirements define the objectives or standards that must be achieved, and focus primarily on physical, transformational, safety, environmental, operational, and other essential characteristics of a project's function. A graded approach is followed so that more effort is expended on developing functional requirements for complex, highly hazardous, and first-of-kind projects than for simple projects that have been implemented many times before.

After the functional requirements are developed, project constraints are identified, and applied to compare and evaluate different potential solutions. Constraints are anything that may impact or alter the implementation of a proposed solution. Examples of constraints include:

- **Time.** If a potential solution cannot be implemented on the required schedule, then that alternative is not feasible, regardless of its merits.
- **Organizational/Human Factors.** If a potential solution requires more expertise than is available within reasonable or existing cost and schedule limits, then that alternative may not be as good as a less technically challenging, but adequate solution.
- **Regulatory Requirements.** For environmental cleanup projects, the final closure may drive alternative selection, as only one or two concepts may deliver the mandatory final closure (e.g., approved *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) records of decision). Similarly, stewardship and ownership issues of the site during or after project completion can affect alternative selection.
- **Stakeholder Issues.** Some alternatives, regardless of how “good” they may be, will be unacceptable to important project stakeholders. In such cases, another less controversial solution will have to be found.
- **Risk.** All alternatives will contain risks. Other factors being approximately equal, that solution with the lowest risk would be preferred.
- **Estimated Cleanup Cost.** A potential solution with higher initial cost, but lower costs over the life of the project may be preferable to an alternative with cheaper construction costs, but higher estimated cleanup cost.

Once the main requirements and constraints are known, a number of alternative solutions can be developed that could accomplish the project need. The number and variety of alternatives will be influenced by technical issues and stakeholder interests.

Next, potential solutions (i.e., cleanup alternatives) that meet the project need are further analyzed to determine an optimal balance between meeting the functional requirements and performing the work in accordance with funding, schedule, and other constraints. For the Lifecycle Report, this analysis also includes assessing which alternative scenario is most likely to represent the reasonable upper bound of the plausible alternatives.

When complete, the process should show that a reasonably full range of design concepts, stakeholder values, safety, technology development, implementability, regulatory requirements, and other relevant factors were considered in the development of the reasonable upper bound for the range of plausible alternatives. Documentation of the alternatives analyzed, the reasonable upper bound selection, schedule and cost information about the reasonable upper bound, and rationale for the selection will be included in the Lifecycle Report for those alternatives that have been analyzed in the current year’s report.

It is important to note that the rigorous and extensive system DOE usually applies for formal construction project development has been adapted, rather than fully applied, to analyze alternatives and develop reasonable upper bounds for the Lifecycle Report. Nor should the process applied in the Lifecycle Report be confused with the very scrupulous cleanup study and approval system in place for complying with CERCLA and RCRA regulations. Those requirements are intended to lead to formal, public decision making and employ a series of incremental review and authorization steps intended to achieve compliance with statutory and regulatory obligations. The Lifecycle Report does not equal those formal legal procedures and does not result in analyses that are of the same rigor and completeness as will occur when the CERCLA and RCRA processes are followed.

A.3 RATIONALE AND ANTICIPATED SCHEDULE FOR ANNUAL SELECTION OF CLEANUP ACTIONS TO BE ANALYZED

As discussed in Appendix D, many final Hanford Site cleanup decisions are yet to be made. The TPA Milestone M-036-01 requirement to include alternatives in the Lifecycle Report where there are no final cleanup decisions creates a substantial obligation when so many decisions are not yet final.

Rather than be overwhelmed with analyzing alternatives for an exhaustive list of non-final decisions or, alternatively, have to prepare a complete but less substantive set of analyses, DOE has chosen to focus in each annual edition of the Lifecycle Report on a limited number of cleanup actions where final decisions have not been made. DOE believes that this selective approach has several advantages, in that it:

- Allows more attention to be paid to higher priority cleanup actions.
- Provides more time to consider alternatives and assumptions that better reflect the values of affected parties.
- Enables more thorough development of the bases and assumptions for assembling each set of plausible alternatives and for defining the reasonable upper bound.
- Can focus on cleanup action alternatives when timing coincides better with relevant decision making processes, including the Federal budget cycle.
- Should promote more insightful and productive dialogues about Hanford Site planning and decision making.
- Makes effective and optimal use of available resources.

Each year, DOE will consider the following and similar criteria to select those cleanup actions for which alternatives will be developed and analyzed in the Lifecycle Report. These criteria are not exclusive and no priority is implied by the order in which they are presented.

- **Status of Current Actions.** A number of interim actions are underway even in the absence of final decisions. In some cases, significant progress is being made consistent with the expectations and values of the regulatory agencies, Tribal Governments, and affected Hanford stakeholders. DOE believes there would be little value in analyzing alternatives for many of these instances, particularly when cleanup is proceeding with broad external support. In contrast, analyses of alternatives would be more useful where there has been little or no progress or agreement on how to proceed with cleanup.

- **Decision-making Timeframe.** At any given time, there are many cleanup decision-making processes at varying stages of progress. The development of alternatives can help inform these decision making processes, but can be less or more helpful at different times in each decision process. DOE prefers to analyze alternatives that will be supportive of decision-making timeframes.
- **Alternatives Availability.** In some cases, no or very few alternatives may be available for consideration, while in other cases, a large range of options may be available to consider. DOE expects that generally it would not be helpful to analyze alternatives when essentially no choices exist, and that analyses could be quite helpful in framing and/or narrowing choices when there are many potential alternatives and/or a wide variety of interests and values to be considered.
- **Existing Knowledge Base.** Some Hanford Site cleanup actions are already the subject of extensive studies, while others are not well understood. DOE believes it will generally be more helpful to put attention where little is known about particular cleanup actions and for which more and better knowledge could improve decision making. However, there may be instances where a large base of knowledge exists, and the Lifecycle Report could help in aggregating and synthesizing this information into a single discussion.
- **Risk/Benefit.** Cleanup actions will have varying effects on reducing health and environmental risks and achieving benefits for the public, workers, and environment. In selecting cleanup actions to evaluate, DOE will generally prefer those that could contribute most positively to ameliorating Hanford Site risks and gaining health and environmental benefits.
- **Budget Planning.** Information in the Lifecycle Report will be used to help with planning and requesting funding for future cleanup actions. DOE will be more likely to develop information about cleanup action alternatives when such information will best coincide with and be most supportive of budget planning cycles.

In addition to the criteria listed above, DOE intends to consider recommendations from EPA and Ecology, government-to-government consultations (e.g., Tribal Nations, Oregon), input from Hanford stakeholders, and advice and comments received on previous Lifecycle Reports.

Consistent with the criteria described above, DOE has developed an anticipated schedule for performing in-depth analyses of plausible alternatives for each of the approximately 40 cleanup actions currently remaining at the Hanford Site. Table A-5 presents this schedule along with an explanation of the rationale for analyzing alternatives in the recommended Lifecycle Report year.

Table A-5. Anticipated Schedule for Detailed Analyses of Cleanup Action Alternatives. (4 pages)

<table>
<tr><th colspan="2">2011 HANFORD LIFECYCLE SCOPE, SCHEDULE, AND COST REPORT</th></tr>
<tr><td colspan="2">Cleanup Actions for which Alternatives have been Analyzed
• River Corridor – Disposition 100 Area Reactors
• Central Plateau – Remediate 200-SW-2 Operable Unit</td></tr>
<tr><th colspan="2">2012 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT</th></tr>
<tr><th>Cleanup Actions</th><th>Rationale/Bases for Analyzing Alternatives This Report Year</th></tr>
<tr><td>• Tank Waste – Tank Retrieval and Single-Shell Tank Farm Closure
• Tank Waste – Tank Waste Treatment
• Tank Waste – Secondary Waste Treatment</td><td>By the end of 2011, ORP will issue ORP-11242, River Protection Project System Plan, Revision 6, which will include a number of tank waste management scenarios. The scenarios are expected to provide information that could be included in the 2012 Lifecycle Report for analyzing plausible alternatives related to these three tank waste cleanup actions.</td></tr>
<tr><th colspan="2">2013 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT</th></tr>
<tr><th>Cleanup Actions</th><th>Rationale/Bases for Analyzing Alternatives This Report Year</th></tr>
<tr><td>• River Corridor – Restore 100 Area Groundwater To Beneficial Use (100-BC-5, 100-KR-4, 100-NR-2, 100-HR-3 and 100-FR-3 Operable Units)
• River Corridor – Restore 300 Area Groundwater To Beneficial Use</td><td>Cleanup is proceeding consistent with existing interim decision and is reflected in current planning bases. Sufficient information about effectiveness of interim actions should be available by 2013 to determine whether additional alternatives should be analyzed. Timing would also take advantage of forthcoming CERCLA 5-year review (expected to be issued in 2012 timeframe).</td></tr>
<tr><td>• Central Plateau (Outer Area) – Remediate Remaining Contaminated Soil Sites (200-OA-1, 200-CW-1, and 200-CW-3 Operable Units)</td><td>An RI/FS and proposed plan are due by April 30, 2012 (TPA Milestone M-015-38B), and an ROD may be approved as early as 2013. Sufficient information about the alternatives evaluated should be available to determine whether additional alternatives should be analyzed in the 2013 Lifecycle Report.</td></tr>
<tr><td>• Central Plateau – Remediate Tanks, Pipelines, Pits, Boxes, Septic Tank and Drain Fields (200-IS-1 Operable Unit)
• Central Plateau – Remediate Remaining 200-East Inner Area Contaminated Soil Sites (200-EA-1 Operable Unit)</td><td>The waste sites to be included in the 200-IS-1 and 200-EA-1 Operable Units are subject to ongoing TPA negotiations that are expected to be resolved in the 2011 – 2012 timeframe. CERCLA/RCRA decision document submittals are scheduled to occur by June 30, 2014 (TPA milestone M-015-92B). Analyzing potential alternatives in the 2013 Lifecycle Report could provide information that would help inform the decision process.</td></tr>
</table>

Table A-5. Anticipated Schedule for Detailed Analyses of Cleanup Action Alternatives. (4 pages)

2014 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT	
Cleanup Actions	**Rationale/Bases for Analyzing Alternatives This Report Year**
• Central Plateau – Disposition B Plant Canyon Building/ Associated Waste Sites (200-CB-1 Operable Unit) • Central Plateau – Disposition PUREX Canyon Building/ Associated Waste Sites (200-CP-1 Operable Unit) • Central Plateau – Disposition REDOX Canyon Building/ Associated Waste Sites (200-CR-1 Operable Unit)	Based on new TPA milestones for these canyon facilities, it is unlikely that extensive evaluation of alternatives will have been performed yet (e.g., in feasibility studies). There is potential that more information may be available for B Plant by mid-2013, and that it could be relevant and useful for analyzing alternatives for all three of these canyon facilities. It may be reasonable to develop a consolidated analysis of alternatives in the 2014 Lifecycle Report that could benefit future planning and budget requests.
• Central Plateau – Disposition FFTF Complex	It is expected that the TC&WM EIS (DOE/EIS-0391) will address decisions related to this cleanup action and that a final ROD will be issued before work for the 2014 Lifecycle Report must begin. If, instead, cleanup decisions have not been made by mid-2013, it may be timely to reassess whether the FFTF cleanup action could be analyzed.
• Central Plateau – Remediate Remaining 200-West Inner Area Contaminated Soil Sites (200-WA-1 Operable Unit)	The waste sites to be included in the 200-WA-1 Operable Unit are subject to ongoing TPA negotiations that are expected to be resolved by 2012. CERCLA decision document submittals are scheduled to occur by June 30, 2013 (TPA milestone M-015-91B), and a ROD may be approved as early as 2014. Sufficient information about the alternatives evaluated should be available to determine whether additional alternatives should be analyzed in the 2014 Lifecycle Report.
2015 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT	
Cleanup Actions	**Rationale/Bases for Analyzing Alternatives This Report Year**
• River Corridor – Disposition 100 Area K West Basin • River Corridor – Remediate 100 Area Contaminated Soil Sites • River Corridor – Remediate 300 Area Contaminated Soil Sites • Central Plateau – Disposition Below-Grade Portions of PFP • Central Plateau – Remediate 200-SW-1 Operable Unit	Cleanup is proceeding consistent with existing decisions (e.g., interim ROD, Action Memorandum, RCRA interim status/final permit) and is reflected in current planning documents. Final decisions could be made within a year or two of 2015 timeframe and are expected to be compatible with interim decisions. Prior to developing 2015 Lifecycle Report, decide whether alternatives should be analyzed based on status of final cleanup decision making.
2016 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT	
Cleanup Actions	**Rationale/Bases for Analyzing Alternatives This Report Year**
• Central Plateau – Disposition Cesium/Strontium Capsules	Capsules are currently in safe storage and no immediate action is required. Other activities at the DOE complex will provide data and potential problem resolutions that will enhance consideration of alternatives for management and disposition of cesium/strontium capsules.
• Central Plateau – Remediate 200-PW-1/3/6 and CW-5 Operable Units	An ongoing Feasibility Study process is already looking at potential alternatives and providing in-depth comparison and analysis of costs. Review progress of this existing effort to determine need to perform additional analyses in 2016 Lifecycle Report.

Table A-5. Anticipated Schedule for Detailed Analyses of Cleanup Action Alternatives. (4 pages)

2017 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT	
Cleanup Actions	**Rationale/Bases for Analyzing Alternatives This Report Year**
• Central Plateau – Remediate Contaminated Deep Vadose Zone (200-DV-1 Operable Unit) • Central Plateau – Restore 200-West Groundwater To Beneficial Use (200-ZP-1/200-UP-1 Operable Units) • Central Plateau – Restore 200-East Groundwater To Beneficial Use (200-PO-1/200-BP-5 Operable Units)	Treatability studies are commencing for Central Plateau deep vadose zone. Cleanup actions for Central Plateau groundwater are proceeding consistent with existing decisions and are reflected in current planning documents. Deferral to 2017 would allow treatability testing to be completed and final decisions to be made and coincide with subsequent CERCLA 5-year review. Sufficient information should be available to decide whether 2017 Lifecycle Report needs to analyze additional alternatives to support out-year budget planning for Central Plateau deep vadose zone remediation and groundwater restoration.
2018 OR LATER	
Cleanup Actions	**Rationale/Bases for Analyzing Alternatives This Report Year**
• River Corridor – Disposition 300 Area Facilities Retained By PNNL	Facilities will be maintained operational by PNNL. 2023 is assumed date to start closure and disposition of the facilities. Earlier analysis of alternatives would be premature and not needed for out-year budget planning.
• Central Plateau (Outer Area) – Disposition Remaining Outer Area Buildings And Facilities (200-OA-1 Operable Unit)	The few remaining structures in the outer area do not present imminent or significant threats to health or environment. Cleanup actions are likely to be non-controversial and focused on RTD, with scope, schedule and cost sufficiently accounted for in planning documents. Analysis of alternatives before 2018 are not likely to contribute more useful information for out-year budget planning.
• Central Plateau – Disposition PUREX Storage Tunnels (200-CP-1 Operable Unit)	Available knowledge base is not sufficient to support detailed analyses. Availability of feasible alternatives extremely limited. Likely cleanup actions are expected to be 15+ years in the future so earlier planning and budget development would be premature.
• Central Plateau – Disposition T Plant Canyon Building/ Associated Waste Sites • Central Plateau – Disposition Remaining Liquid Waste Disposal Facilities • Central Plateau – Disposition Remaining Waste Treatment, Storage and Disposal Facilities	These facility operations are integral to the long-term cleanup mission and will continue well after 2020. Any likely cleanup actions are not expected for at least 20+ years in the future so earlier analyses would be premature and not needed before 2018 for out-year budget planning.
• Central Plateau – Disposition Remaining Buildings and Facilities Within FFTF Complex • Central Plateau –Disposition Any Remaining Inner Area Buildings And Facilities	Continuing with the current planning bases and uncertainties is sufficient for health and environmental protection and for scope and budget planning prior to 2018. Information about conditions after other cleanup actions have occurred (e.g., disposition of FFTF) would be insufficient for useful analyses. It would be premature to analyze alternatives for these cleanup actions before the 2018 Lifecycle Report.
• Tank Waste – Double-Shell Tank Closure • Tank Waste – WTP Closure	Closure is not expected to begin any sooner than 2034 (for DST closure) and 2050 (for WTP closure). No imminent or significant health or environmental concerns have been identified that need to be addressed. Earlier planning and budget development would be unnecessary and could probably not account credibly for future decisions and conditions.

Table A-5. Anticipated Schedule for Detailed Analyses of Cleanup Action Alternatives. (4 pages)

CLEANUP ACTIONS FOR WHICH ALTERNATIVES WOULD NOT BE ANALYZED
River Corridor – B Reactor Preservation B Reactor has been designated a National Historic Landmark so no cleanup actions are anticipated. Minor conditioning and maintenance activities will be performed consistent with National Park Service decision making under the *National Environmental Policy Act* and/or *National Historic Preservation Act*.
Disposition Remaining 100 Area Buildings and Facilities and Disposition Remaining 300 Area Buildings and Facilities (except for facilities retained for use by PNNL) Although cleanup actions are still ongoing for these buildings and facilities, all excess buildings and facilities in the 100 and 300 Areas are expected to undergo D&D in accordance with applicable action memoranda. DOE considers D&D of buildings and other structures to be final cleanup decisions if all regulated contaminants have been removed in accordance with an applicable Action Memorandum so alternatives do not need to be analyzed.
River Corridor – Remediate Remaining Contaminated Sites Within Hanford Reach National Monument National Monument remediation is being implemented to fulfill obligations established under a Presidential Proclamation which establishes a *de facto* final decision. RTD and decontamination in the Monument areas are expected to be substantially complete by 2012 (Some residual cleanup in the 100 Area portions of the Monument will be addressed after 2012).
Central Plateau – Disposition U Plant (Canyon Building/Associated Waste Sites) U Plant remediation has been approved in accordance with a CERCLA Final ROD. If performed, further analysis of alternatives should be done as part of the process under which the current final cleanup decisions were made.
Central Plateau – Manage ERDF ERDF has been approved in accordance with a CERCLA Final ROD and closure and post-closure care are already part of the operating documentation. Alternatives need not be analyzed, unless future decisions are made that modify the current final ERDF decisions.

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National Environmental Policy Act of 1969, 42 USC 4321, et seq.
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Presidential Proclamation 7319, 2000, *Establishment of the Hanford Reach National Monument*, William J. Clinton, June 9.
Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq.

CERCLA	=	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*.	PUREX	=	Plutonium-Uranium Extraction (Plant).
D&D	=	decontamination and decommissioning.	RCRA	=	*Resource Conservation and Recovery Act of 1976*.
DOE	=	U.S. Department of Energy.	RI/FS	=	remedial investigation/feasibility study.
DST	=	double-shell tank.	ROD	=	record of decision.
ERDF	=	Environmental Restoration Disposal Facility.	RTD	=	remove, treat, and dispose.
FFTF	=	Fast Flux Test Facility.	TPA	=	Tri-Party Agreement.
PNNL	=	Pacific Northwest National Laboratory.	WTP	=	Waste Treatment and Immobilization Plant.

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APPENDIX B

TRIBES AND STAKEHOLDER VIEWS AND VALUES

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TERMS

Board	Hanford Advisory Board
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
TPA	Tri-Party Agreement
USDOE	U.S. Department of Energy

APPENDIX B

TRIBES AND STAKEHOLDER VIEWS AND VALUES

B.1 CLEANUP VALUES OF AFFECTED GOVERNMENTS

In addition to working with the State of Washington and the U.S. Environmental Protection Agency (EPA), the U.S. Department of Energy (DOE) has government-to-government relationships with affected Tribal Nations and the State of Oregon. This *Hanford Lifecycle Scope, Schedule and Cost Report* (Lifecycle Report) takes into account the values of affected governments where assumptions have been made regarding work scope, priorities, and schedule for cleanup at the Hanford Site. DOE regularly consults with Tribal Governments, and will continue to update information about their values in the Lifecycle Report.

B.1.1 CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

The following is excerpted from the *Confederated Tribes of the Umatilla Indian Reservation Hanford Policy* (Resolution # 07-009A), January 1, 2007:

> "Hanford lands and resources should be restored to their pre-Hanford environmental conditions, or equivalent to those that existed at the time of the Treaty of 1855.
>
> The Columbia River including the Hanford Reach should be protected from all pollution associated from the historic operations of the Hanford Nuclear Reservation and wherever and for as long as those pollutants may pose a threat to the CTUIR.
>
> Hanford and Hanford-affected lands and resources should not be further developed and no new nuclear missions or expansion of nuclear energy, nor new or expanded nuclear fuel storage undertaken unless explicitly permitted by the CTUIR Board of Trustees through government-to-government consultation.
>
> As the USDOE Environmental Management Program completes its clean-up, the CTUIR should get first right of refusal if any land is removed from federal ownership or transferred to another entity.
>
> The USDOE should meet or exceed all federal and State laws with respect to health and safety, transportation safety, disposal, restoration, protection of biological species, protection of cultural resources, Tri-Party Agreement milestones, and other relevant laws.
>
> Infrastructure must be removed from the Hanford site. This includes, but is not limited to, buildings, pipelines, waste storage tanks, and most (but not all) roads.
>
> Irreversible actions must not be used as interim solutions such that further remediation in the future would be made more difficult.
>
> All sources of contamination that will impact groundwater will be removed and all groundwater contamination will be removed.

> The DOE should fulfill its mission in full compliance with applicable federal and State laws and regulations. Administratively seeking to change or re-interpret existing law is illegal and is an illegal abrogation of CTUIR rights."

B.1.2 NEZ PERCE TRIBE

The following is excerpted from *Nez Perce Hanford End-State Vision* (Resolution NP-05-411), adopted September 27, 2005:

> "The Nez Perce Tribe believes that the ultimate goal of the Hanford cleanup should be to restore the land to uncontaminated pre-Hanford conditions for unrestricted use. This includes air, soil, groundwater, and surface water. Tribal members, ecological resources, and cultural resources within Usual and Accustomed areas should not be exposed to any potential adverse risk above that which has always existed for the tribe prior to the establishment of the federal government projects and facilities at Hanford in 1942."

B.2 HANFORD ADVISORY BOARD ADVICE

On November 6, 2009, the Hanford Advisory Board provided consensus advice (No. 223), *Lifecycle Cost and Schedule Report of the Proposed Consent Decree and the Tri-Party Agreement (TPA) Modifications*.

HANFORD ADVISORY BOARD

A Site Specific Advisory Board, Chartered under the Federal Advisory Committee Act

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November 6, 2009

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Seattle, WA 98101

Re: Lifecycle Cost and Schedule Report of the Proposed Consent Decree and the Tri-Party Agreement (TPA) Modifications

Dear Mr. Brockman, Ms. Olinger, Ms. Zehm and Ms. Pirzadeh,

Background

The Hanford Advisory Board (Board) previously provided advice to the Tri-Party Agencies to not negotiate any delays to cleanup milestones prior to preparing a Lifecycle Cost and Schedule Report (Advice #203).

"The Board believes that the Tri-Parties should not agree to significant delays in existing TPA milestones until the proposed Hanford Lifecycle report is issued."

The Board recommended that the report be the basis for any negotiations because it was intended to provide a review of all work required for Hanford cleanup, with the costs of alternatives (e.g., retrieving wastes from soil sites or tank farms) identified. This report would allow for public review of the potential for accelerating the schedules, discussion of the scope of work required, and comparison of Department of Energy's (DOE) baselines and TPA proposed long-term milestones.

The description of the report in the settlement package with the consent decree and TPA modifications would require DOE to present project specific cost, assumptions and data only on alternatives for those projects in a two to five year window. Longer term projects (those that start or take longer than the upcoming five years) in the report would reflect only the current DOE baseline, about which the Board has raised serious concerns. Excluding detail for all longer term projects (over five years out) would not allow the Board, the regulators, or the public to review assumptions for projects of high concern and to examine the potential to accelerate major milestones for those projects.

Under the current description, the report would not allow examination of:

- the costs, assumptions and potential to accelerate cleanup of contaminated Central Plateau soils for units which are not slated to begin cleanup in the next five years;
- if DOE's plans for these units include retrieving plutonium or transuranic wastes disposed in the soil prior to 1970;
- whether tank closure includes cleanup of contamination from leaks and discharges in tanks farms (rather than capping), what the costs of alternatives would be, and whether the work or portions of it may be accelerated to be completed faster than proposed.

Advice

The Board advises that the proposed Lifecycle Cost and Schedule Report should be adequately described in the settlement package with the consent decree and TPA to accomplish the following:

- Provide adequate information for the public and the regulators to review the long-term costs, schedule, and assumptions on which these are based for each project and milestone.
  - To serve the stated goal, the report should provide more information on alternatives and assumptions for all cleanup projects in addition to the full project cost and annual budget projected which DOE is required to report to Congress pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act.
  - The description of the report in the settlement package with the consent decree and TPA modifications should include DOE providing project specific cost,

assumptions, schedules and dates beyond a two to five year window for all elements necessary to complete the cleanup mission.

- Provide the information necessary to determine if schedules and milestones could be accelerated through review of project schedules and annual costs.
- Update the report annually. Where possible, connect project specific costs, schedules and assumptions to the milestones or other regulatory requirements. This should allow the public to ascertain what it would cost to accelerate a project to accomplish a specific, understood outcome.
- Provide enough information to help the public assess whether proposed delays to TPA milestones could be avoided or reduced if budgets were not constrained, or if work were re-prioritized.
- Allow for public review of DOE's baseline assumptions to see if public values are reflected in accomplishing cleanup; such as the degree of cleanup, whether wastes are retrieved instead of capped in place, and whether structures are removed instead of being left in place. This would allow the public, the regulators and the tribes to offer informed alternatives with cost estimates and potential schedules.

Sincerely,

Susan Leckband

Susan Leckband, Chair
Hanford Advisory Board

This advice represents Board consensus for this specific topic. It should not be taken out of context to extrapolate Board agreement on other subject matters.

cc: Steve Pfaff, Co-Deputy Designated Official, U.S. Department of Energy, Office of River Protection
Doug Shoop, Co-Deputy Designated Official, U.S. Department of Energy, Richland Operations Office
Dennis Faulk, Environmental Protection Agency
Jane Hedges, Washington State Department of Ecology
Catherine Brennan, U.S. Department of Energy Headquarters
The Oregon and Washington Delegations

B.3 REFERENCES

HAB 223, 2009, "Life Cycle Cost and Schedule Report for the Proposed Consent Decree and the Tri-Party Agreement (TPA) Modifications," (letter to D. Brockman, S. Olinger, P. Zehm, and M. Pirzadeh from S. Leckband), Hanford Advisory Board Consensus Advice #223, Richland, Washington, November 6.

Resolution 07-009A, 2007, *Confederated Tribes of the Umatilla Indian Reservation Hanford Policy*, Confederated Tribes of the Umatilla Indian Reservation, Richland, Washington.

Resolution NP-05-411, 2005, *Nez Perce Hanford End-State Vision*, Nez Perce Tribe, Lapwai, Idaho.

APPENDIX C

APPLICATION OF KEY TRI-PARTY AGREEMENT REQUIREMENTS

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TERMS

DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
TPA	Tri-Party Agreement

APPENDIX C

APPLICATION OF KEY TRI-PARTY AGREEMENT REQUIREMENTS

The U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and Washington State Department of Ecology (Ecology) encountered several issues while preparing the initial *Hanford Lifecycle Scope, Schedule and Cost Report* (Lifecycle Report). The DOE, EPA, and Ecology worked together to ensure a common understanding of the issues; these mutual understandings are summarized in this appendix, which will be updated as necessary to reflect changes and evolution in these understandings.

C.1 LIFECYCLE REPORT PROCESS TIMEFRAMES

Pursuant to the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989), commonly referred to as the Tri-Party Agreement (TPA), Milestone M-036-01 requires that after DOE submits the Lifecycle Report, EPA and Ecology can provide comments, and the TPA agencies (DOE, EPA, and Ecology) will work together to revise the report. The milestone does not indicate how long this comment/revision period can take, nor does it specify whether the milestone is completed when the Lifecycle Report is submitted or when EPA and Ecology's comments are incorporated and DOE issues a revised Lifecycle Report. Depending on how long the comment/revision process takes, there is a risk of missing milestone due dates and/or overlapping from a previous report into the period for the next report.

Discussions among the TPA agencies concluded that for each year, TPA Milestone M-036-01 should be considered complete on the date DOE submits to EPA and Ecology the annual Lifecycle Report for that year. The comment and revision process will continue to be a requirement under the milestone, but milestone completion occurs on the date the report is submitted. In addition, the TPA agencies concluded that there should be no time limit placed on the comment period (in keeping with the Lifecycle Report being a "living document"), but that revision of the most recent Lifecycle Report (if determined to be necessary) would be limited to a reasonable period after the report's submittal. The general expectation is that comments will be accepted but not accounted for until the next annual submittal of the Lifecycle Report.

C.2 TYPE OF TRI-PARTY AGREEMENT DOCUMENT

Most documents required by the TPA are classified as Primary, Secondary, or Other. The document type, or classification, generally is based on the significance of the document for making cleanup decisions, and is used to direct documents through particular procedures for review, comment, and dispute resolution and for administrative recordkeeping. TPA Milestone M-036-01 does not specify what type of TPA document the Lifecycle Report is, and the TPA document classifications do not clearly align with the nature of the Lifecycle Report as an advisory, but not decision-making, document.

The TPA agencies agreed that this matter would be best resolved through the project management processes laid out in the TPA. The TPA agencies will decide on the type of document, the formal methods for resolving issues and disagreements, and how to satisfy public involvement consistent with the *Community Relations Plan for the Hanford Federal Facility*

Agreement and Consent Order (Ecology et al. 2002). This paragraph will be updated to describe the document type and management process once agreement is reached by the TPA agencies.

C.3 FINAL CLEANUP DECISIONS

TPA Milestone M-036-01 requires the Lifecycle Report to consider alternatives for circumstances where "final cleanup decisions" have not yet been made. Discussions among the TPA agencies revealed a variety of opinions about what constitutes a "final" versus "non-final" cleanup decision. For example, many legally final decisions are still subject to periodic review and could change based on new information or conditions. There also are final decisions that have been made under other Federal and State programs and for other DOE operations that directly or indirectly affect decisions about the Hanford Site cleanup mission.

The TPA agencies concluded that it is important to document the decisions considered relevant to the Hanford Site cleanup mission and to indicate which ones are considered final. This information has been provided in Appendix D of the Lifecycle Report.

C.4 GRADED APPROACH TO DEVELOPING CLEANUP ALTERNATIVES

TPA Milestone M-036-01 requires that where final cleanup decisions have not yet been made, the Lifecycle Report is to consider ranges of alternatives and present a reasonable upper bound. Final cleanup decisions have not been made for many Hanford Site cleanup actions, which implies that there are a lot of alternatives to be considered. Further, the milestone does not specify what the scope of an "alternative" should include. At one extreme, an alternative could cover a single, discrete activity (e.g., remediation of one ditch), or at another extreme could cover all the work needed for an entire portion of the Hanford Site (e.g., cleanup of all the 300 Area).

Discussions among the TPA agencies concluded that alternatives should be addressed in a manner consistent with the way final and interim cleanup decisions are already being made for the Hanford Site. This approach bundles similar work that enables cleanup to proceed for common or related contaminants that occur in a relatively well-defined environmental media (or waste management system) within a generally contiguous geographic area. Examples of cleanup actions for which alternatives may be considered include dispositioning the 100 Area reactors, remediating all contaminated soils in the outer portions of the 200 Area, and restoring 300 Area groundwater to beneficial use. This is a practical scale at which alternatives can be addressed in the Lifecycle Report.

The TPA agencies also determined that the number of cleanup actions for which final decisions do not yet exist is large, and that the Lifecycle Report effort could quickly become overwhelming if it were to address all the potential alternatives at once. In addition, the TPA agencies recognized that it would be neither helpful nor necessary, for purposes of supporting budget planning and other decisions, to immediately perform detailed analyses on every potential alternative. As a result, the Lifecycle Report proposes a schedule and rationale for when different cleanup actions will undergo in-depth alternatives analyses.

Appendix A of the Lifecycle Report provides additional information on how cleanup action alternatives have been identified and scheduled for consideration.

C.5 RANGE OF PLAUSIBLE ALTERNATIVES AND REASONABLE UPPER BOUND

TPA Milestone M-036-01 states that "where final cleanup decisions have not yet been made, the report will be based upon the reasonable upper bound of the range of plausible alternatives or a range of alternative costs including a reasonable upper bound." The milestone does not define what a "range of plausible alternatives" is or what would be a "reasonable upper bound." Numerous discussions among the TPA agencies produced general consensus on how to address these concepts, and they are discussed further in Section 1.6 and Appendix A of the Lifecycle Report.

C.6 DISTINGUISHING PLAUSIBLE ALTERNATIVES FROM STANDARD PLANNING UNCERTAINTIES

DOE's planning typically includes "built-in" construction or operating uncertainties in anticipation of identified risks and opportunities. While having the appearance of being different alternatives, these cost and/or schedule uncertainties often present predictable variations for a particular cleanup approach. Developing an alternative analysis on the basis of planned cost and/or schedule uncertainties would be redundant, and would not be useful in considering and evaluating ranges of plausible alternatives for cleanup actions.

The TPA agencies generally have agreed that cost and/or schedule uncertainties, management reserve, and other standard planning practices used to account for risks and opportunities will not normally constitute distinct alternatives. For example, an alternative based on removal, treatment, and disposal of contaminated soils would be a distinct alternative, but allowances for uncertainties that cover larger than expected excavation work (e.g., that twice as much soil must be removed than originally planned) would not be a distinct alternative. Where alternatives are presented in the Lifecycle Report, the discussion will be clear on how cost and/or schedule uncertainty is part of the planned costs (to avoid double counting) and, where this is not the case, whether and how costs have been specifically developed in planning for project uncertainty and risk.

C.7 ALTERNATIVES AND ACCELERATED CLEANUP ACTIONS

During discussions with the Hanford Advisory Board, Hanford stakeholders, and others, terms like "acceleration" and "accelerated scenarios" have been used when describing the need to consider alternatives and types of alternatives that are of interest. The TPA agencies recognize that many parties are interested in being able to consider the acceleration of different cleanup actions. However, the TPA agencies have determined that in most cases, acceleration is not in fact a separate alternative to a cleanup action, and that acceleration only hastens a cleanup action alternative that already has been or is being developed in support of a cleanup decision (whether interim or final). Thus, project acceleration will not normally be included in this Lifecycle Report, and existing decision-making processes (e.g., under *Comprehensive Environmental Response, Compensation, and Liability Act* and *Resource Conservation and Recovery Act*) will be relied on to consider the timing and schedule for implementing proposed alternatives.

Nevertheless, the TPA agencies do reserve the option to consider in the Lifecycle Report specific cleanup action alternatives even though they may chiefly or only affect cleanup schedules.

C.8 COST INFORMATION DECISIONS AND DOCUMENTATION

The TPA agencies discussed a number of issues related to how cost information should be developed and documented in the Lifecycle Report. These discussions resulted in several important decisions, as follows.

- In order to prepare schedule and cost information about future work, DOE and its contractors make assumptions about anticipated activities. Their planning assumes reasonable outcomes for decisions that have not yet been made, accounts for uncertainties where existing information is inadequate, and allows work to proceed without precluding other future choices. In effect, such planning is one available cleanup action alternative, and is used to develop future funding requests. To promote clarity and understanding about the Hanford Site cleanup mission, the Lifecycle Report will include information about assumptions used to develop DOE's planning and associated costs.
- The requirements for long-term stewardship and institutional controls will not be well defined for many years, and will depend greatly on the outcome of existing and future cleanup decisions. Even so, the costs of long-term stewardship and institutional controls, to the extent predictable, will be included in the Lifecycle Report. Chapter 7.0 addresses this subject, although the information provided is likely to be broad and generic, reflecting the uncertainty and long time horizons involved. As decisions are made and long-term stewardship and institutional controls are better identified, more specific cost information will be presented in the Lifecycle Report as part of the related cleanup actions.
- The TPA agencies recognize that Natural Resource Damage Assessment costs eventually need to be included in the Lifecycle Report. However, the general opinion is that it would be premature to include such cost estimates, and that time should be allowed for the Hanford Natural Resource Trustee Council to begin developing reasonable methods and bases for calculating Natural Resource Damage Assessment costs at the Hanford Site. However, the costs associated with supporting the Natural Resource Trustee Council will be included.

C.9 REFERENCES

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq.

Ecology, EPA, and DOE, 1989, *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, as amended.

Ecology, EPA, and DOE, 2002, *Community Relations Plan for the 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.

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

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APPENDIX D

HANFORD SITE CLEANUP DECISIONS

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TERMS

2,4-D	2,4-dichlorophenoxyacetic acid.
AM	Action Memorandum.
ARAR	applicable or relevant and appropriate requirement.
CCN	correspondence control number
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
D&D	decontamination and decommissioning
D4	deactivation, decontamination, decommissioning, and demolition
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
Ecology	Washington State Department of Ecology
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
ERA	expedited response action
ERDF	Environmental Restoration Disposal Facility
ESD	explanation of significant differences
ETF	Effluent Treatment Facility
FFTF	Fast Flux Test Facility
HCP-EIS	Hanford Comprehensive Land-Use Plan Environmental Impact Statement
HLW	high-level waste
IC	institutional controls
INL	Idaho National Laboratory
ISS	interim safe storage
MCL	maximum contaminant limit
OU	operable unit
PCB	polychlorinated biphenyl
PFP	Plutonium Finishing Plant
PUREX	Plutonium Uranium Extraction (Plant)
RCRA	*Resource Conservation and Recovery Act of 1976*
RD/RAWP	remedial design/remedial action work plan
ROD	record of decision
RTD	remove, treat, and dispose
SST	single-shell tank
TCRA	time critical removal action
TPA	Tri-Party Agreement
TSD	treatment, storage, and disposal
WIPP	Waste Isolation Pilot Plant
WTP	Waste Treatment and Immobilization Plant

APPENDIX D

HANFORD SITE CLEANUP DECISIONS

Pursuant to the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989), commonly referred to as the Tri-Party Agreement (TPA), Milestone M-036-01 requires the U.S. Department of Energy (DOE) to prepare an annual *Hanford Lifecycle Scope, Schedule and Cost Report* (Lifecycle Report). The Lifecycle Report is expected to reflect all actions necessary for DOE to meet all applicable environmental obligations as it completes the Hanford Site cleanup mission. These environmental obligations are established in accordance with various decision-making processes that DOE, the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), and other agencies conduct under Federal and State regulatory programs.

A number of decisions affecting the Hanford Site cleanup mission have been made, and actions to implement these decisions have been completed, or are or will soon be under way. Many other cleanup decisions, however, cannot be made yet, are in preliminary planning stages, and/or are the subject of final agreements that are being developed. The absence of final decisions is addressed in the TPA Milestone M-036-01:

> **"In circumstances where final cleanup decisions have not yet been made, the report shall be based upon the reasonable upper bound of the range of plausible alternatives or may set forth a range of alternative costs including such a reasonable upper bound."**

Several sections of this Lifecycle Report present cleanup action alternatives for "…circumstances where final cleanup decisions have not yet been made…." (TPA Milestone M-036-01). Any discussion of alternatives in this report needs to begin with an understanding of what "final cleanup decisions" are, which in turn requires answering several related questions:

- What is a decision?
- What is a cleanup decision?
- What makes some decisions final and others not?

This Appendix D to the Lifecycle Report provides current information about decisions that affect the Hanford cleanup mission, and when these decisions might be considered to be final cleanup decisions for Lifecycle Report purposes. Specifically:

- **Section D.1** provides a general overview of the principal processes that are employed at the Hanford Site to reach decisions about cleanup actions.
- **Section D.2** describes in more detail the Federal and state decisions that can affect Hanford Site cleanup, the legal and/or regulatory authorities on which the decision making is based, and the types of documents used to embody and formalize these decisions.
- **Section D.3** summarizes the current decisions that, for purposes of this Lifecycle Report, are considered to be Hanford Site cleanup decisions and which of these cleanup decisions can be identified as final cleanup decisions.

This appendix will be updated to reflect new and changed final cleanup decisions, and to provide a basis each year for determining cleanup actions to evaluate in the latest Lifecycle Report.

D.1 PRINCIPAL HANFORD SITE CLEANUP DECISION MAKING PROCESSES

To implement the Hanford Site cleanup mission, DOE, with EPA and Ecology, reach decisions about what actions need to be performed to protect public and worker health and the environment. Cleanup decisions are based on a variety of legal and regulatory authorities such as the *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA) and the *Resource Conservation and Recovery Act of 1976* (RCRA) that require the consideration of various alternatives before selecting cleanup actions. In some cases, the agencies develop interim or partial decisions that enable cleanup work to proceed pending the ability to make final decisions (e.g., to alleviate urgent concerns, acquire better information, develop technological advances, obtain needed funding).

The TPA is the primary legal framework that DOE, EPA, and Ecology are using to achieve cleanup of the Hanford Site. Cleanup decisions made through the TPA integrate and implement primarily the following regulatory processes:

- CERCLA processes will support remedial decision making for most past-practice waste sites, canyon facilities, and structures that contain radioactive contamination or other hazardous substances. The TPA also identifies a subset of waste sites as RCRA past-practice sites. Consistent with EPA directives and guidance, the TPA establishes the expectation that either a RCRA corrective action or a CERCLA remedial action will lead to an equivalent cleanup result. In practice, this expectation becomes complicated when radioactive materials are present because RCRA authority does not extend to radionuclides. Regardless of this issue with RCRA, Hanford Site cleanup of radionuclides in RCRA waste sites will be protective and consistent with CERCLA cleanup practices.
- RCRA closure processes generally will be used to achieve final closure decisions for active RCRA treatment, storage, and disposal (TSD) facilities. RCRA corrective action processes also are applicable when RCRA wastes from past hazardous waste practices must be cleaned up. EPA has delegated implementation of the RCRA program to the State of Washington. Ecology implements the program via RCRA-equivalent state regulations and through facility specific permits. RCRA closure and post-closure requirements are contained in the Hanford Site RCRA Permit (WA7890008967, 2007, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*).

The clear intent of the TPA is to minimize duplication and overlap of regulatory authorities while ensuring compliance with applicable requirements. As noted above, RCRA authority does not extend to the cleanup of radionuclides, while CERCLA does. The TPA states that the cleanup process selected for an operable unit (OU) will be sufficiently comprehensive to satisfy the technical requirements of both authorities and the respective regulations.

In addition to CERCLA and RCRA, DOE is responsible for regulating the radioactive materials that it manages, including setting standards that affect cleanup decisions for radionuclides.

DOE O 435.1, *Radioactive Waste Management*, defines additional requirements and processes that are applicable to cleaning up radioactive facilities and media. DOE develops and implements cleanup decisions under this regulatory program.

Land use is also an important factor in making cleanup decisions because remedial action objectives are to reflect the reasonably anticipated future land uses(s). These future land-use assumptions allow risk assessments and feasibility studies to focus on developing practical and cost-effective remedial alternatives. These alternatives should then support future site activities that are consistent with the reasonably anticipated future land use. DOE is responsible for designating land uses on the Hanford Site and for identifying future land uses that will guide risk assessments and cleanup decisions. Pursuant to a record of decision (ROD) published on November 2, 1999 (64 FR 61615, "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)") and amended ROD published on September 26, 2008 (73 FR 55824, "Amended Record of Decision for the Hanford Comprehensive Land-Use Plan Environmental Impact Statement"), DOE has adopted and implemented a comprehensive land-use plan for the Hanford Site. As DOE's decision stated:

> "The purpose of this land-use plan and its implementing policies and procedures is to facilitate decision making about the site's uses and facilities over at least the next 50 years. The Department's decision seeks to balance the Department's continuing land-use needs at Hanford with its desire to preserve important ecological and cultural values of the site and allow for economic development in the area." (64 FR 61615 – 61616)

An area as large and complex as the Hanford Site has an extraordinary number of decisions that need to be made to carry out the cleanup mission. While many cleanup decisions have been made, only some of these decisions are considered to be final; many are either interim decisions, or decisions that lay the groundwork for future final decisions. The rest of this Appendix D provides a more extensive discussion of the decisions that have been made and that affect cleanup of the Hanford Site, and includes several tables that list and summarize the effects of these decisions.

D.2 DECISIONS THAT CAN AFFECT HANFORD SITE CLEANUP

For purposes of TPA Milestone M-036-01 and this Lifecycle Report, a cleanup decision should:

1. Be promulgated under applicable statutory and/or regulatory authorities of responsible Federal and state agencies, and
2. Establish an enforceable environmental obligation which results in actions or events that affect cleanup of the Hanford Site.

Not all decisions meet both of these criteria. There are many statutory/regulatory authorities that apply to Hanford but that do not establish environmental obligations. Examples include requirements related to property and services acquisition, software design, cyber security, occupational medicine, equal opportunity, or privacy protection. Alternatively, there are many statutes and regulations that establish environmental obligations for the Hanford Site, but not all of them promulgate decisions that affect cleanup of the Site. Some examples include requirements for pesticide or herbicide application, drinking water purveyor reporting, storm water management, greenhouse gas and ozone depleting substances, emergency planning and community right-to-know, and selection of green products.

Statutory/regulatory authorities that result in decisions that can affect Hanford Site cleanup are identified and discussed in more detail in the following sections.

D.2.1 COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 DECISIONS

CERCLA, as modified by the *Superfund Amendments and Reauthorization Act 1986,* established the Federal program to clean up uncontrolled or abandoned waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment. EPA has lead authority for CERCLA and administers its requirements under 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan." The most common documentation used to implement cleanup decisions under CERCLA includes the following.

- **CERCLA ROD.** The CERCLA ROD is a public document, developed from information generated during the remedial investigation/feasibility study that explains which remediation alternatives will be used to clean up a site. An ROD contains information about the site history, site description, site characteristics, community participation, enforcement activities, past and present activities, contaminated media, the contaminants present, scope and role of response action, and the remedy selected for cleanup. Records of decision can be final or interim; interim records of decision are used to allow cleanup actions to proceed until a final decision can be reached.
- **Explanation of Significant Differences and ROD Amendment.** Documents used to modify or clarify an existing ROD. The explanation of significant difference is used when changes to a component of a remedy do not fundamentally alter the overall cleanup approach. The amendment is used when there are fundamental changes, or a number of significant changes, that together have the effect of a fundamental change to the remedy selected in the ROD.
- **Action Memorandum.** A public document used to exercise the CERCLA removal authority and enable cleanup action to proceed where a site presents a relatively time-sensitive, non-complex problem that can and should be readily addressed.

A number of CERCLA documents have been completed that include or have resulted in decisions that affect Hanford Site cleanup. These CERCLA documents and summaries of the relevant cleanup decisions are listed in Section D.3.

D.2.2 PERMITS, LICENSES, AND OTHER STATUTORY/REGULATORY PROGRAM APPROVALS

RCRA, as modified by the *Hazardous and Solid Waste Amendments of 1984*, gave EPA the authority to control the generation, transportation, and TSD of hazardous waste. The amendments expanded the scope of RCRA to require corrective action for certain releases of hazardous waste constituents to the environment from RCRA facilities regardless of time of release (similar to CERCLA remedial action). Unlike CERCLA, EPA may delegate authority for implementing RCRA to the states, and in Washington, Ecology has lead authority for most elements of RCRA. The principal documents used to implement Hanford Site cleanup decisions under RCRA include:

- **Final Status Permit.** A final status permit includes explicit descriptions of the conditions and requirements that must be met by a facility at which TSD of regulated hazardous waste (or dangerous waste, in Washington State) occur. A TSD facility may receive a final status permit even though it is closed and not operating, if there are ongoing caretaking activities that must be maintained after closure (i.e., during the post-closure care period). At the Hanford Site, a single final status permit covers the entire Hanford Site, but it is being issued in phases because of the number of TSD facilities that exist. The final status permit includes decisions about how Federal and state statutes, regulations, and guidance have been interpreted and applied to the specific activities conducted at each TSD facility.
- **Closure/Post-Closure Plan.** Some Hanford Site TSD facilities have closed or may close before they are covered under the final status permit. In such cases, a closure plan must be prepared to describe the activities necessary to close the TSD facility and address any remaining dangerous wastes. If dangerous waste will remain after closure, a post-closure plan is also required to address residual contamination. Ecology must approve closure and post-closure plans before they are implemented, and in the process decisions will be made and included in the closure/post-closure plans about how to close the TSD facility and, where required, conduct post-closure care.
- **Corrective Action.** Corrective actions, to clean up releases from RCRA TSD facilities, may be required before a final status permit is issued. Decisions about the degree and methods for cleanup will be made and implemented through a corrective action plan that is approved by Ecology.

In addition to RCRA, there are numerous other programs, authorized under existing Federal and state statutes and regulations that require permits, licenses and other approvals that can affect cleanup at the Hanford Site. These other decision documents establish, among other conditions, limits on emissions of radionuclides and other hazardous constituents to the air, water, and ground. Section D.3 lists the various permits, licenses, and other types of approvals authorized under applicable regulatory and statutory programs that include or have resulted in decisions affecting Hanford Site cleanup.

D.2.3 TRI-PARTY AGREEMENT DECISIONS

Among other functions, the TPA helps define how the CERCLA and RCRA programs will be implemented when they have overlapping authorities. The TPA is used to determine which decision-making process and documentation (e.g., CERCLA ROD, RCRA permit) will be used to establish cleanup actions for the different waste sites and facilities across the Hanford Site, but it is that subsequent documentation (not the TPA itself) where the cleanup decisions are formally established. The TPA itself does, however, include some decisions that affect cleanup at the Hanford Site. These may include, for example, provisions that set specific waste retrieval objectives and technology performance standards for certain types of cleanup actions. These TPA-based decisions are listed in Section D.3.

D.2.4 OTHER FEDERAL AND STATE DECISIONS

There are a variety of other decisions embodied in executive, legislative, and judicial documents that can affect cleanup of the Hanford Site. Section D.3 lists the various Executive Orders, Presidential Proclamations, Congressional Acts, judicial orders and decrees, and other types of Federal and state decisions that may affect Hanford Site cleanup.

D.3 SUMMARY OF HANFORD SITE CLEANUP DECISIONS – FINAL AND NOT YET FINAL

The statutory/regulatory authorities discussed in Section D.2 have resulted in a multitude of national, regional, and/or state decisions across numerous projects and programs. Some of these decisions do establish environmental obligations that affect the Hanford Site cleanup mission. These Hanford Site cleanup decisions are summarized in this Section D.3.

While some decisions more clearly affect the Hanford Site than others, care has been taken to include decisions that have indirect effects on Hanford cleanup. Examples of such indirect decisions might include those that define national standards for risk-based exposure limits, enable offsite activities that contribute contaminants to Hanford environmental media, or constrain the ability to disposition materials or wastes at or from the Hanford Site.

As stated earlier in this appendix, the Lifecycle Report is required to consider cleanup alternatives “where final cleanup decisions have not yet been made” (TPA Milestone M-36-01, third paragraph) at the Hanford Site. Some cleanup decisions may appear to be final but are not:

- They may be only interim remedies until a final cleanup decision can be made, or
- They may only be partial actions within a much larger cleanup effort.

Even where final decisions have been made, there are legal mandates to perform periodic reviews to ensure that selected remedies continue to be effective; new decisions may be needed depending on how well cleanup actions are working.

To stay as simple as possible, the term final has been interpreted literally. For purposes of this Lifecycle Report, a cleanup decision will be treated as a final cleanup decision if:

- The decision is embodied in a statutory/regulatory document that is titled final (e.g., final permit, final ROD); or
- The decision is explicitly represented as final in a document, and such representation is compliant with the statutory/regulatory authority that produced the document.

The Hanford Site cleanup decisions summarized in Tables D-1, D-3, and D-5 indicate whether the decision is considered to be final by inclusion of the word **FINAL** after the decision title in the first column.

In addition to decisions that have been made, whether final or not, there are many cleanup decisions that are yet to be made for the Hanford Site. By definition, the absence of a decision means there is not a final cleanup decision. It would not be possible to develop an exhaustive list of all the decisions that still need to be made to complete the Hanford cleanup mission. However, as these decisions are reached, they will be incorporated into this section of the Lifecycle Report.

Table D-1. CERCLA Records of Decision and Associated Changes. (6 pages)

Record of Decision Title	ROD Type	Area	Date Approved	Initial Decision	Revision Title	Revision Type	Revision Date	Revised Decision
Record of Decision, USDOE Hanford 1100 Area (EPA/ROD/R10-93/063) **FINAL**	CERCLA Final ROD	1100	Sep-93	Cap Horn Rapids Landfill; offsite disposal of PCB-contaminated soils; offsite incineration of bis (2-ethylhexyl)phthalate contaminated soils; monitored natural attenuation of groundwater contamination				
Declaration of the Interim Record of Decision for the Environmental Restoration Disposal Facility (EPA/ROD/R10-95/100) **FINAL**	CERCLA Final ROD	200-West	Jan-95	Initial construction of 2 cells; maximum size of 1.6 sq mi; landfill construction in accordance with RCRA; capped at completion	*USDOE Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington, Explanation of Significant Difference (ESD)* (EPA/ESD/R10-96/145)	ESD	Jul-96	Allow disposal of investigation-derived waste and RCRA past-practice waste to ERDF; allow disposal of non-process inactive TSD waste to ERDF; allow use of ERDF leachate for dust suppression and compaction activities at ERDF.
					U.S. Department of Energy, Environmental Restoration Disposal Facility, Hanford Site – 200 Area, Benton County, Washington, Amended Record of Decision, Decision Summary and Responsiveness Summary, (see also proposed plan for amendment) (EPA/AMD/R10-97/101)	ROD Amendment	Sep-97	Authorizes two additional disposal cells and the option of treating waste as needed by containerization and encapsulation at ERDF instead of at the OU.
					U.S. Department of Energy, Environmental Restoration Disposal Facility, Hanford Site – 200 Area, Benton County, Washington, Amended Record of Decision, Decision Summary and Responsiveness Summary, (see also proposed plan for amendment) (EPA/AMD/R10-99/038)	ROD Amendment	Mar-99	Establishes conditional approval for delisting of the ERDF leachate.
					U.S. Department of Energy, Environmental Restoration Disposal Facility, Hanford Site – 200 Area, Benton County, Washington, Amended Record of Decision, Decision Summary and Responsiveness Summary, (see also proposed plan for amendment) (EPA/AMD/R10-02/030)	ROD Amendment	Jan-02	Authorizes four additional disposal cells and the option of staging waste at ERDF pending treatment and/or disposal.

Table D-1. CERCLA Records of Decision and Associated Changes. (6 pages)

Record of Decision Title	ROD Type	Area	Date Approved	Initial Decision	Revision Title	Revision Type	Revision Date	Revised Decision
					U.S. Department of Energy, Environmental Restoration Disposal Facility, Hanford Site - 200 Area, Benton County, Washington, Amended Record of Decision, Decision Summary and Responsiveness Summary (EPA 2007)	ROD Amendment	May-07	Allows specific Hanford-generated waste, such as waste associated with surveillance and maintenance of Hanford facilities, environmental research and development activities, sample analyses, liquid effluent waste treatment, infrastructure support, and environmental monitoring programs, be disposed at ERDF; identifies a plug-in approach for ERDF disposal of additional similar Hanford cleanup waste generated in support of RCRA and CERCLA cleanup actions.
					Declaration: U.S. Department of Energy, Environmental Restoration Disposal Facility, Hanford Site - 200 Area, Benton County, Washington (EPA 2009a)	ROD Amendment and ESD	Aug-09	Amendment allows for ERDF expansion of an area equal to four cells or two super cells; the ESD updates the cell design to allow super cell concept and allows for ERDF expansion via EPA approval and fact sheets rather than ROD amendments.
Declaration of the Interim Record of Decision for the 200-ZP-1 Operable Unit (EPA/ROD/R10-95/114)	CERCLA Interim Action ROD	200-West; 200-ZP-1 OU	May-95	Pump and treat to address carbon tetrachloride, chloroform, and trichloroethylene; treatment with air stripping and vapor phase activated carbon; interim action to continue until final action instituted; reinjection of treated water.				
Record of Decision, Hanford 200 Area, 200-ZP-1 Operable Unit Superfund Site, Benton County, Washington (EPA 2008) <u>**FINAL**</u>	CERCLA Final ROD	200-West; 200-ZP-1 OU	Sep-08	Pump and treat to address carbon tetrachloride, nitrate, chromium, trichloroethylene, iodine-129, technetium-99, and tritium; monitored natural attenuation; flow-path control through injection of treated water; and institutional controls.				
Declaration of the Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington (EPA/ROD/R10-95/126)	CERCLA Interim Action ROD	100; 100-BC-1, 100-DR-1, and 100-HR-1 OUs	Sep-95	Remove contaminated soil, structures and debris using the Observational Approach; treatment, by thermal desorption to remove organics and/or soil washing for volume reduction, or as needed to meet waste disposal criteria; disposal of contaminated materials at ERDF; backfill of excavated areas followed by revegetation.	*Amendment to the Interim Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington* (See also Draft B ESD and Proposed Amendment documents preceding this ROD amendment) (EPA/AMD/R10-97/044)	ROD Amendment	Apr-97	Incorporates 34 additional waste sites into ROD; refines remedial cost estimate for original 37 sites and additional 34 sites based on actual data, streamlining, and lessons learned; documents that soil washing is not effective treatment.
Declaration of the Record of Decision for the 100-IU-1, 100-IU-3, 100-IU-4, and 100-IU-5 Operable Units, Hanford Site, Benton County, Washington (EPA/ROD/R10-96/151) <u>**FINAL**</u>	CERCLA Final ROD	100; 100-IU-1, 100-IU-3, 100-IU-4, and 100-IU-5 OUs	Feb-96	No action				

Table D-1. CERCLA Records of Decision and Associated Changes. (6 pages)

Record of Decision Title	ROD Type	Area	Date Approved	Initial Decision	Revision Title	Revision Type	Revision Date	Revised Decision
Declaration of the Record of Decision for the 100-HR-3 and 100-KR-4 Operable Units, Hanford Site, Benton County, Washington (EPA/ROD/R10-96/134)	CERCLA Interim Action ROD	100-H, 100-K	Mar-96	Interim action to remove hexavalent chromium from groundwater; 30 extraction wells; ion exchange treatment; reinject treated effluent; monitor; institute institutional controls.	*Interim Remedial Action Record of Decision Amendment for the 100-HR-3 Operable Unit, Hanford Site, Benton County, Washington, Hanford Site, Benton County, Washington* (EPA/AMD/R10-00/122)	ROD Amendment	Oct-99	Implements In Situ Redox Manipulation barrier for second chromium plume in 100-HR-3 OU; existing pump and treats remain in operation.
					Explanation of Significant Difference for the 100-HR-3 Operable Unit Record of Decision (EPA 2002)	ESD	Oct-02	Provides justification for increased schedule and cost from the 1999 Amendment associated with a greater number of wells and aquifer thickness that affected implementation of the ISRM barrier.
					Explanation of Significant Difference for the 100-HR-3 Operable Unit Record of Decision (EPA/ESD/R10-03/606)	ESD	Mar-03	Provides justification for increased schedule and cost from the 1999 Amendment associated with a greater number of wells and aquifer thickness that affected implementation of the ISRM barrier.
					Explanation of Significant Differences for the 100-HR-3 and 100-KR-4 Operable Units Interim Action Record of Decision, Hanford Site, Benton County, Washington (EPA 2009b)	ESD	Aug-09	Provides justification for increased cost and the location of reinjection wells from the 1999 Amendment associated with operation beyond the initial 5-year estimate and the need to control plume migration.
Declaration of the Record of Decision for the 300-FF-1 and 300-FF-5 Operable Units, Hanford Site, Benton County, Washington, (EPA/ROD/R10-96/143) Note: The ROD is only **FINAL** for the 300-FF-1 OU; it is an interim action for 300-FF-5 OU.	CERCLA Final ROD	300; 300-FF-1 and 300-FF-5 OUs	Jul-96	300-FF-1: removal of contaminated soil and debris; disposal to ERDF; backfill and recontouring; institutional controls. 300-FF-5: monitoring and institutional controls for groundwater.	*USDOE Hanford 300 Area, 300-FF-1 Operable Unit, Hanford Site, Benton County, Washington Explanation of Significant Difference (ESD)* (EPA/ESD/R10-00/505)	ESD	Jan-00	Provides a site-specific land disposal restriction treatability variance for lead contamination found in the 628-4 or Landfill 1D waste site.
					Explanation of Significant Difference for the 300-FF-5 Record of Decision (EPA/ESD/R10-00/524)	ESD	Jun-00	Expanded scope of 300-FF-5 ROD to include all of the groundwater in 300 Area, including the 300-FF-2 sites and any sites plugged into the 300-FF-1 ROD.

Table D-1. CERCLA Records of Decision and Associated Changes. (6 pages)

Record of Decision Title	ROD Type	Area	Date Approved	Initial Decision	Revision Title	Revision Type	Revision Date	Revised Decision
Declaration of the Record of Decision, USDOE Hanford 200 Area, Hanford Site, Benton County, Washington (EPA/ROD/R10-97/048)	CERCLA Interim Action ROD	200-West; 200-UP-1 OU	Feb-97	Extract from high concentration zone of uranium and technetium-99 plumes and treat at Effluent Treatment Facility.	*Explanation of Significant Differences for the Interim Action Record of Decision for the 200-UP-1 Groundwater Operable Unit, Hanford Site, Benton County, Washington* (EPA 2009c)	ESD	Feb-09	Adds National MCL of 30 ug/L for uranium as ARAR for treating extracted water; replaces 190 gal/min pumping requirement with a pumping requirement from existing and new wells consistent with approved RD/RAWP until uranium and tech-99 concentrations are less than 10 times the MCL for 4 consecutive quarters; also adds sampling requirements and updates cost estimates and institutional control requirements.
Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington (EPA/ROD/R10-99/039)	CERCLA Interim Action ROD	100, 200 North	Jul-99	RTD for 46 sites; plug-in approach for remaining 100 Area and 200 North sites; plug-in approach for newly identified 100 Area sites; disposal of debris from B, D, H, and K reactors to ERDF; provides decision framework for leaving waste in place, generally below 15-ft depth.	*Explanation of Significant Difference for the 100 Area Remaining Sites ROD, USDOE Hanford 100 Area, 100-IU-6 Operable Unit, Hanford Site, Benton County, Washington* (EPA/ESD/R10-00/045)	ESD	Jun-00	Plugs in 600-23 and JA Jones #1 waste sites to the Remaining Sites ROD.
					Explanation of Significant Differences for the 100 Area Remaining Sites Interim Record of Decision (EPA 2004)	ESD	Feb-04	Adds 28 sites to ROD; adds 10 CFR 1022 and 40 CFR Part 6, Appendix A as ARARs to ROD; revises annual institutional controls report date to be coincident with the Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions due date.
					Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington (EPA 2009d)	ESD	Aug-09	Authorizes addition of 200-CW-3 OU wastes sites, 99 newly discovered waste sites, and 87 candidate sites using the "plug-in" approach in the ROD, as well as any additional newly discovered waste sites that will be documented in the Administrative Record and in an annual fact sheet.
Declaration of the Record of Decision for the 100-KR-2 Operable Unit, Hanford Site, Benton County, Washington (EPA/ROD/R10-99/059)	CERCLA Interim Action ROD	100-K	Sep-99	Remove spent nuclear fuel from basins; remove sludge from basins; treat and remove water from the basins; remove debris from the basins; deactivate the basins; and institute institutional controls.	*Interim Remedial Action Record of Decision Amendment, Declaration, U.S. Department of Energy; 100 K Area K Basins, Hanford Site - 100 Area , Benton County, Washington* (EPA 2005)	ROD Amendment	Jun-05	Modifies the remedy for sludge by including sludge treatment prior to interim storage; modifies the remedy for debris by including grouting in place some of the basin debris followed by removal with the removal of the basins.

Table D-1. CERCLA Records of Decision and Associated Changes. (6 pages)

Record of Decision Title	ROD Type	Area	Date Approved	Initial Decision	Revision Title	Revision Type	Revision Date	Revised Decision
Interim Remedial Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units, Hanford Site, Benton County, Washington (EPA/ROD/R10-99/112)	CERCLA Interim Action ROD	100-N	Sep-99	Institutional controls for shoreline site; in situ and RTD with ex situ bioremediation for petroleum sites; RTD for remainder of sites in 100-NR-1; maintain ERA P&T for 100-NR-2.	*Explanation of Significant Differences for the 100-NR-1 Operable Unit Treatment, Storage, and Disposal Interim Action Record of Decision and 100-NR-1/100-NR-2 Operable Unit Interim Action Record of Decision* (EPA/ESD/R10-03/605)	ESD	May-03	Removes July 31 annual institutional controls reporting requirement and consolidates the reporting with the site-wide IC annual report; eliminates the requirement to evaluate application of 30 in of irrigation water to determine if remaining contaminants will impact groundwater; identifies need for additional ICs to preclude access to contaminated groundwater which will be incorporated into site-wide IC document.
Interim Remedial Action Record of Decision Declaration, U.S. Department of Energy 100 Area, 100-NR-1 Operable Unit, Hanford Site, Benton County, Washington (EPA/ROD/R10-00/120)	CERCLA Interim Action ROD for 2 RCRA TSDs and an associated site	100-N	Jan-00	RTD of 116-NR-1 and 116-NR-3 Cribs with ERDF disposal; backfill and revegetate; any pipelines will be removed or sampled and left in place based on sample results.	*Explanation of Significant Differences for the 100-NR-1 Operable Unit Treatment, Storage, and Disposal Interim Action Record of Decision and 100-NR-1/100-NR-2 Operable Unit Interim Action Record of Decision* (EPA/ESD/R10-03/605)	ESD	May-03	Removes July 31 annual institutional controls reporting requirement and consolidates the reporting with the site-wide IC annual report; eliminates the requirement to evaluate application of 30 in of irrigation water to determine if remaining contaminants will impact groundwater; identifies need for additional ICs to preclude access to contaminated groundwater which will be incorporated into site-wide IC document.
Declaration of the Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2 and the 100-KR-2 Operable Units (EPA/ROD/R10-00/121)	CERCLA Interim Action ROD	100	Sep-00	Remove contaminated soil, structures, and debris; treat as needed; dispose to ERDF; backfill and revegetate. Applies to 45 100-Area burial grounds.	*Explanation of Significant Difference for the Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units (100 Area Burial Grounds)* (EPA 2007b)	ESD	Nov-07	Established limit of RTD excavation at the 118-B-1 Burial Ground considering the balancing factors in the ROD and required additional institutional controls for protection of groundwater and the Columbia River.
Declaration of the Interim Record of Decision for the 300-FF-2 Operable Unit (EPA/ROD/R10-01/119)	CERCLA Interim Action ROD	300; 300-FF-2 OU	Apr-01	Remove contaminated soil, structures, and debris; treat as needed; dispose to ERDF, WIPP, or other; backfill and revegetate; establish institutional controls; continued groundwater monitoring; and define plug-in approach.	*Explanation of Significant Differences for the 300-FF-2 Operable Unit Record of Decision* (EPA 2004)	ESD	May-04	Modified the uranium soil cleanup level from 350 to 267 pCi/g based on an engineering study to ensure protectiveness of the groundwater and river; modified the land-use assumption for 8 outlying waste sites from industrial to unrestricted and changed the cleanup levels for these sites to those consistent with the 100 Area cleanups.

Table D-1. CERCLA Records of Decision and Associated Changes. (6 pages)

Record of Decision Title	ROD Type	Area	Date Approved	Initial Decision	Revision Title	Revision Type	Revision Date	Revised Decision
					Explanation of Significant Differences for the 300-FF-2 Operable Unit Interim Action Record of Decision, Hanford Site, Benton County, Washington (EPA 2009e)	ESD	Aug-09	Incorporates 14 plug-in sites into the ROD and subsequent ESDs; incorporates 2 newly discovered sites into the ROD and subsequent ESDs; allows future newly discovered sites to be incorporated into the ROD and ESDs as long as cost impacts are within specified limits.
Record of Decision 221-U Facility (Canyon Disposition Initiative), Hanford Site, Washington (EPA 2005) **FINAL**	CERCLA Final ROD	200-West	Oct-05	Removal of waste from vessels and equipment in the facility with levels of transuranic isotopes greater than 100 nCi/g and eventual disposal of that waste at WIPP; removal of liquids from the facility or treatment to remove liquids; partial removal of contaminated equipment and piping from the gallery side of the facility and disposal at ERDF; demolition and subsequent stabilization of the railroad tunnel, 271-U, 276-U, 291-U, and 292-U structures and the 291-U-1 and 296-U-10 stacks and disposal at ERDF; construction of an engineered barrier; planting of semiarid-adapted vegetation on the barrier; institutional controls; post-closure care; and ongoing barrier performance and groundwater monitoring.				

ARAR	=	applicable or relevant and appropriate requirement.	PCB	=	polychlorinated biphenyl.
CERCLA	=	*Comprehensive Environmental Response, Compensation, and Liability Act.*	RCRA	=	*Resource Conservation and Recovery Act of 1976*.
EPA	=	U.S. Environmental Protection Agency.	RD/RAWP	=	remedial design/remedial action work plan.
ERDF	=	Environmental Restoration Disposal Facility.	ROD	=	record of decision.
ESD	=	explanation of significant differences.	RTD	=	remove, treat, dispose.
IC	=	institutional controls.	TSD	=	treatment, storage, and disposal.
MCL	=	maximum contaminant limit.	WIPP	=	Waste Isolation Pilot Plant.
OU	=	operable unit.			

Unless otherwise noted in Table D-2, decisions made through Action Memoranda are considered final. These Action Memoranda are available in the TPA Administrative Record (http://www2.hanford.gov/arpir/). These decisions focus mainly on the D4 of buildings, which are generally considered final actions since the buildings are demolished and the waste disposed to approved facilities, or on the removal, treatment, and disposal (RTD) of contaminated soil from waste sites, which are also generally considered final actions for individual waste sites. However, slabs and contaminated soils underlying buildings will likely go through additional decision making as part of appropriate source OUs. Similarly, waste sites that undergo RTD as a removal action will likely have a final ROD covering the decision, even though no additional cleanup activities are anticipated.

Table D-2. CERCLA Action Memoranda. (9 pages)

Title	Date	Type of Action	Removal Action/Decision
"Action Memorandum Approval: 316-5 Process Trenches, U.S. Department of Energy (DOE) Hanford Site, Richland, Washington" (CCN 9103432)	Jul-91	ERA	The Action Memorandum (AM) provides for excavation of soil from the 316-5 Process Trenches and interim stabilization pending further remedial action as part of the 300-FF-1 OU. This AM was initially not a final action; however, the ROD for 300-FF-1 OU, which covers these trenches, is a final CERCLA action.
"Action Memorandum: Expedited Response Action Proposal for 200 West Area Carbon Tetrachloride Plume" (CCN 9200423)	Jan-92	ERA	The AM identifies installation of a soil vapor extraction system with granular activated carbon recovery and offsite granular activated carbon regeneration at 216-Z-1A initially followed by systems at 216-Z-18 and 216-Z-9. While this ERA is not a final decision; a final decision has been made through the CERCLA remedial process for 200-ZP-1 OU.
"Action Memorandum Approval: Sodium Dichromate Barrel Landfill, U.S. Department of Energy Hanford Site, Richland, WA" (CCN 9307470)	Mar-93	ERA	The AM identifies excavation and disposal of drums and homestead debris from the landfill with sampling of any other wastes encountered during excavation; the expedited reaction would result in cleanup of the landfill to unrestricted levels.
"Action Memorandum: Expedited Response Action Proposal; Riverland Site, U.S. Department of Energy Hanford Site, Richland, Washington" (CCN 9305567)	Jun-93	ERA	The AM provides for cleanup of the Riverland Site, part of the 100-IU-1 OU, through excavation to address pesticide and hydrocarbon contamination, ordnance survey and removal, and sandblasting to decontaminate concrete.
"Action Memorandum: North Slope (Wahluke Slope) Expedited Response Action Cleanup Plan, U.S. Department of Energy Hanford Site, Richland, WA" (Ecology and EPA 1994a)	Mar-94	ERA	The AM provides for mitigation of physical hazards, excavation of the worst-case landfill, characterization of the other landfills, and if needed, excavation of other landfills based on characterization results; includes investigation and as needed, mitigation of ordinance burial pits. As stated in the AM, the intent of this action is to provide for the final removal action taken at the 100-IU-3 OU (the Wahluke Slope).

Table D-2. CERCLA Action Memoranda. (9 pages)

Title	Date	Type of Action	Removal Action/Decision
"Action Memorandum, USDOE Hanford 100 Area NPL,100-IU-3 Operable Unit (Wahluke Slope), Hanford Site, Adams, Grant, and Franklin Counties, Washington" (Ecology and DOE 1997)	Jul-97	TCRA	The AM addresses contaminated soils and drums at the 2,4-D Burial Ground in the 200-IU-3 OU. The removal action includes excavation of dioxin-contaminated soil for offsite disposal; bioremediation of 2,4-D contaminated soil; and excavation, cleaning, and disposal of the drums to ERDF. Under the 1994 AM for the Wahluke Slope, the 2,4-D Burial Ground was only identified for sampling. Subsequently, additional contamination was found, prompting this additional AM. Completion of this AM action allows continuation of the deletion process for the OU from the NPL.
"Action Memorandum; N Springs Expedited Response Action Cleanup U.S. Department of Energy Hanford Site, Richland, WA" (Ecology and EPA 1994b)	Sep-94	ERA	The AM identifies a pump-and-treat system combined with a vertical barrier for implementation at N Springs. These systems comprise a component of the overall cleanup of N Springs but were also intended to provide additional information to the ongoing CERCLA and RCRA processes. This ERA is not a final decision.
"Action Memorandum: Expedited Response Action Proposal; 100-BC-1 Demonstration Project; U.S. Department of Energy Hanford Site; Richland, Washington" (EPA and Ecology 1995)	Jun-95	ERA	The AM allows contaminated soils from waste sites 116-B-4, 116-B-5, and 116-C-1 to be excavated and temporarily stored in a safe fashion pending the start of ERDF operations; the actions under this AM would also provide additional information to support remedial design, including cost information, for the 100-BC-1 OU. The ERA was not intended as a final decision; the 100-BC-1 OU has been incorporated into an interim ROD and is undergoing a final ROD process.
"Action Memorandum, 183-H Solar Evaporation Basin Waste Expedited Response Action Cleanup Plan" (CCN 040739)	Nov-96	ERA	The AM identifies ERDF as the disposal location for 183-H Solar Evaporation Basin waste generated through cleanup activities.
"Action Memorandum; U.S. Department of Energy, 200 West Area, Central Waste Complex, 183-H Solar Evaporation Basin Waste, Hanford Site, Benton County, Washington" (DOE et al. 2003)	Jun-03	Non-time-critical removal action	The AM allows for the treatment and disposal to ERDF of wastes generated during the RCRA closure of 183-H basins
"Action Memorandum, N Area Waste Expedited Response Action Cleanup Plan" (CCN 038546)	Nov-96	ERA	The AM identifies ERDF as the disposal location for contaminated sediment and debris from the Emergency Dump Basin, facility deactivation waste, and environmental investigation waste from the 100-N Area.

Table D-2. CERCLA Action Memoranda. (9 pages)

Title	Date	Type of Action	Removal Action/Decision
"Action Memorandum; 100 B/C Area Ancillary Facilities and the 108-F Building Removal Action, U.S. Department of Energy Hanford Site, Richland, WA" (EPA 1997)	Jan-97	Non-time-critical removal action	The AM identifies D4 with ERDF disposal for the following facilities in the 100-B and 100-F Areas: 111-B, 115-B, 118-C-4, 119-B, 105-C reactor waste, and 108-F. B Reactor and the ISS of 105-C Reactor are not included in the AM. This action is considered final for the ancillary facilities and demolished portions of the reactor. Additional decisions are expected on the reactor core that is in ISS.
"Memorandum: Removal Action at the 233-S Plutonium Concentration Facility, United States Department of Energy (USDOE) Hanford Site, Benton County, Washington" (DOE and EPA 1997)	Mar-97	Non-time-critical removal action	The AM identifies decontamination and demolition as the preferred alternative for the 233-S and 233-SA buildings, including subsurface systems and structures to a depth of 3 ft (further actions beyond the 3-ft depth would be deferred to the associated source OU). Waste meeting the criteria would be disposed to ERDF; other waste would be disposed as appropriate.
"Action Memorandum: USDOE Hanford 100 Area National Priorities List (NPL), 105-F and 105-DR Reactor Buildings and Ancillary Facilities, Hanford Site, Benton County, Washington" (CCN 059689)	Jul-98	Non–time-critical removal action	The AM identifies ISS for the 105-F and 105-DR reactor cores and decontamination and demolition for the reactor components up to the cores and for the 116-D, 116-DR, 117-DR, and 119-DR ancillary facilities. Demolition will extend generally to 3 ft below ground level; however, substructures and/or soil beneath the facilities that exceed cleanup levels will be excavated. This action is considered final for the ancillary facilities and demolished portions of the reactors. Additional decisions are expected on the reactor cores that are in ISS.
"Action Memorandum: USDOE Hanford 100 Area National Priorities List, 100-N Area Ancillary Facilities; Hanford Site, Benton County, Washington" (DOE, EPA, and Ecology 1998)	Dec-98	Non–time-critical removal action	The AM provides for D&D of the inactive contaminated ancillary facilities in the 100-N Area, the facilities in the buffer zone, the Hanford Generating Plant, and the solid waste management units inside the Hanford Generating Plant support facilities (D&D of 105-N and 109-N are excluded from the AM). Contaminated soils under the facilities would be addressed through the 100-N Area decision documents for waste sites.
"Action Memorandum: U.S. Department of Energy, Hanford 300 Area National Priorities List (NPL), 331-A Virology Laboratory Building, Hanford Site, Benton County, Washington" (DOE and EPA 2000)	Feb-00	Non-time-critical removal action	Per the AM, the walls and floors of the 331-A building would be demolished and the concrete slab would be scraped to remove physical hazards; wastes would be disposed to ERDF. The concrete slab and underlying soils would remain in place.

Table D-2. CERCLA Action Memoranda. (9 pages)

Title	Date	Type of Action	Removal Action/Decision
"Action Memorandum: United States Department of Energy Hanford 100 Area National Priorities List (NPL); 105-D and 105-H Reactor Facilities and Ancillary Facilities; Hanford Site; Benton County, Washington" (DOE and Ecology 2000)	Dec-00	Non-time-critical removal action	The AM identifies ISS for the 105-F and 105-DR Reactor cores and decontamination and demolition for the reactor components up to the cores and for the 116-D, 116-DR, 117-DR, and 119-DR ancillary facilities. Demolition will extend generally to 3 ft below ground level; however, substructures and/or soil beneath the facilities that exceed cleanup levels will be excavated. This action is considered final for the ancillary facilities and demolished portions of the reactors. Additional decisions are expected on the reactor cores that are in ISS.
"Action Memorandum; U.S. Department of Energy, Hanford 100 Area National Priorities List (NPL), 105-B Reactor Facility, Hanford Site, Benton County, Washington" (DOE and EPA 2001)	Dec-01	Non-time-critical removal action	The AM identifies appropriate actions at B Reactor to mitigate the threat to Site workers, public health or welfare or the environment by removing hazardous substances from the facility; these actions are consistent with increased public access to the reactor building; surveillance and maintenance activities would continue. Any wastes generated during the mitigation activities would be disposed to ERDF.
"Action Memorandum; U.S. Department of Energy, 200 Area, Burial Ground 218-W-4C Waste Retrieval, Hanford Site, Benton County, Washington" (DOE et al. 2004)	Apr-04	TCRA	The AM provides for the treatment and disposal of low-level and mixed low-level waste at ERDF from the M-091 TRU retrieval activities at the 218-W-4C Burial Ground. TRU is excluded from the AM.
"Action Memorandum: Request for Time Critical Response for Treatment and Disposal of Sludge from the 105-K East North Loadout Pit, USDOE Hanford Site" (DOE and EPA 2004)	Jun-04	TCRA	The AM requires the treatment of 105-K East North Loadout Pit waste prior to temporary storage at Hanford and ultimate disposal at WIPP.
Action Memorandum for the Non-Time Critical Removal Action for the 224-B Plutonium Concentration Facility (DOE/RL-2004-36)	Jun-04	Non-time-critical removal action	The AM provides for removing the nonradiological and radiological hazardous substances from the 224-B Facility, removing equipment and associated piping, decontaminating the structure and/or stabilizing the contamination, demolishing the structure to slab, disposing of the waste generated, and stabilizing the area. Samples will be used to determine the need for additional cleanup of the remaining slab and any subsurface soils; however, these cleanup actions are not included in the AM, but deferred to future activities.

Table D-2. CERCLA Action Memoranda. (9 pages)

Title	Date	Type of Action	Removal Action/Decision
"Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Time Critical Removal Action Memorandum for Removal of the 232- Contaminated Waste Recovery Process Facility at the Plutonium Finishing Plant" (04-AMCP-0486)	Nov-04	Non-time-critical removal action	The AM provides for the remaining contaminated equipment to be removed and the building decontaminated, stabilized, and dismantled leaving the building slab, which will be addressed under a future CERCLA action.
Action Memorandum for the Non-Time-Critical Removal Action for the U Plant Ancillary Facilities (DOE/RL-2004-67)	Dec-04	Non-time-critical removal action	The AM provides for removing the non-radiological and radiological hazardous substances from the U Plant Ancillary Facilities, removing equipment and associated piping, decontaminating the structures and/or stabilizing the contamination, demolishing the structures to slab, disposing of the waste generated, and stabilizing the area around U Plant. The AM provides of listing of the specific facilities included. Slabs and underlying soils would be addressed as needed through future CERCLA actions.
"Action Memorandum #1 for the 300 Area Facilities" (DOE and EPA 2005a)	Jan-05	Non–time-critical removal action	The AM provides for the D4 of 72 buildings and structures in the northern part of the 300 Area with D4 wastes going to ERDF. An additional 10 buildings and structures were included in the EE/CA that supports the AM; however, those buildings and structures were demolished and found to have not hazardous materials prior to the AM.
"Action Memorandum #2 for the 300 Area Facilities" (DOE and EPA 2006a)	May-06	Non-time-critical removal action	The AM provides for the D4 of the 324 and 327 Buildings and ancillary facilities in the 300 Area with D4 wastes going to ERDF. The AM provides a list of the ancillary facilities. In general, slabs and subsurface structures would be removed along with about 1 m of surrounding soil; however, on a case-by-case basis, the slabs and/or below-grade structures and soils can be deferred to CERCLA actions associated with the 300-FF-2 OU.
"Action Memorandum #3 for the 300 Area Facilities," (DOE and EPA 2006b)	Nov-06	Non-time-critical removal action	The AM provides for the D4 of 110 buildings and structures in the southern part of the 300 Area with D4 wastes going to ERDF. An additional 30 buildings and structures were included in the EE/CA that supports the AM; however, those buildings and structures are not included in the AM because DOE has identified alternative uses for them.

Table D-2. CERCLA Action Memoranda. (9 pages)

Title	Date	Type of Action	Removal Action/Decision
"Action Memorandum; United States Department of Energy, 100 Area, 105-N Reactor Facility and 109-N Heat Exchanger Building, Hanford Site, Benton County, Washington" (DOE and Ecology 2005)	Mar-05	Non-time-critical removal action	The AM provides for the D&D of portions of the 105-N and 109-N facilities and construction of a protective cover over the 105-N Reactor block and the 109-N steam generator cells and pipe gallery, placing them into ISS; waste would generally be disposed to ERDF. The final D&D of these facilities would be conducted in the future to allow for decay of radionuclides in the reactor block. AM identifies the ISS period as 64 years. This action is considered final for the demolished portions of the reactor and heat exchange building. Additional decisions are expected on the reactor core and building that are in ISS.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Non-time Critical Removal Action memorandum for Plutonium Finishing Plant, Above-Grade Structures (DOE/RL-2005-13)	May-05	Non-time-critical removal action	The AM provides for removing the non-radiological and radiological hazardous substances from the PFP above-grade structures, removing equipment and associated piping, decontaminating the structures and/or stabilizing the contamination, demolishing the structures to slab, disposing of the waste generated, and stabilizing and/or covering the area around PFP. The AM provides a listing of the specific structures included. Slabs and underlying soils would be addressed as needed through future CERCLA actions.
"Action Memorandum for the Non-Time-Critical Removal Action for the 100-K Area Ancillary Facilities" (DOE and EPA 2005b)	Jun-05	Non-time-critical removal action	The AM provides for the D4 of 27 buildings and structures in the northern part of the 100-K Area with D4 wastes going to ERDF. In general, slabs and subsurface structures would be removed along with about 1 m of surrounding soil; however, on a case-by-case basis, the slabs and/or below-grade structures and soils can be deferred to CERCLA actions associated with the 100-KR-1 and 100-KR-2 source OUs.
Action Memorandum for the Non-Time-Critical Removal Action for the 224-T Plutonium Concentration Facility (DOE/RL-2004-68)	Jun-05	Non-time-critical removal action	The AM provides for removing the nonradiological and radiological hazardous substances from the 224-T Facility, removing equipment and associated piping, decontaminating the structure and/or stabilizing the contamination, demolishing the structure to slab, disposing of the waste generated, and stabilizing the area. Samples will be used to determine the need for additional cleanup of the remaining slab and any subsurface soils; however, these cleanup actions are not included in the AM, but deferred to future activities.

Table D-2. CERCLA Action Memoranda. (9 pages)

Title	Date	Type of Action	Removal Action/Decision
Action Memorandum for the Time-Critical Removal Action for Support Activities to 200-UW-1 Operable Unit (DOE/RL-2005-71)	Sep-05	TCRA	The AM provides for activities in support of the U Canyon barrier construction, including removal of part of the 200-W-42 pipeline, rerouting TEDF line and stabilizing/removing a waste water line; complete or partial removal of a concrete slab; removal and sealing of 3 vent risers; and relocation of miscellaneous markers or utilities. The TCRA was used to accelerate work consistent with weather conditions and to take advantage of availability of specialize resources. This action is not considered final; the decision process is ongoing for the waste sites in the U Plant Area. The U Plant barrier ROD, however, is considered final.
"Transmittal of the Action Memorandum for the Non-Time-Critical Removal Action for the 105-KE and 105-KW Reactor Facilities and Ancillary Facilities" (07-AMRC-0086)	Jan-07	Non-time-critical removal action	The AM identifies ISS for the 105-KE and 105-KW Reactor cores and decontamination and demolition for the reactor components up to the cores and for the remaining buildings and structures in the 100-K Area. Subsurface structures will generally be removed to 3 ft below ground level; however, substructures and/or soil beneath the facilities that exceed cleanup levels will be evaluated through source OU cleanup activities. This action is considered final for the ancillary facilities and demolished portions of the reactors. Additional decisions are expected on the reactor cores that are in ISS.
Action Memorandum for the Non-Time-Critical Removal Action for the Northern Part of the BC Controlled Area (UPR-200-E-83) (DOE/RL-2008-21)	May-08	Non-time-critical removal action	The AM provides for the removal, treatment as needed, and disposal, generally to ERDF, of UPR-200-E-83 Zone A soils to a depth of 6 inches, or until PRGs are met, and Zone B soils in areas of elevated radioactivity above PRGs. Excavation activities must consider old growth vegetation and avoid destruction of existing plant life.
Action Memorandum for the Non-Time-Critical Removal Action for the 212-N, -P and -R Facilities (DOE/RL-2008-80)	May-09	Non-time-critical removal action	The AM provides for removing the nonradiological and radiological hazardous substances from the 212-N, -P, and -R Facilities by removing equipment and associated piping, decontaminating the structures and/or stabilizing the contamination, demolishing each basin and underlying soils to a depth of 1 m, disposing of the waste generated, and stabilizing the surrounding area. Samples will be collected from the underlying soils to evaluate the need for additional cleanup activities
Action Memorandum for the Non-Time-Critical Removal Action for the 212-N, 212-P, and 212-R Facilities, Addendum 1: Disposition of Railcars (DOE/RL-2008-80-ADD1)	Dec-10	Non-time-critical removal action	The AM provides for D4 of 16 railcars located in 200 North Area with disposal to ERDF and includes an option to evaluate some of the cars for movement to the B Reactor for preservation. The AM identifies a pathway for addressing contaminated soils either by removal at the time of D4 or transfer to another OU for continued CERCLA action.

Table D-2. CERCLA Action Memoranda. (9 pages)

Title	Date	Type of Action	Removal Action/Decision
Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit (DOE/RL-2009-48)	Jul-09	Non-time-critical removal action	The AM provides for cleanup of 11 waste sites in the 100-MG-1 OU using either a confirmatory sampling/no further action alternative (8 sites) or a removal, treatment, disposal alternative (3 sites). Cleanup levels will be consistent with existing 100 Area cleanup levels. Should the confirmatory sites not meet cleanup levels, they will then be addressed by the RTD alternative.
Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit (DOE/RL-2009-86)	Apr-10	Non-time-critical removal action	The AM provides for cleanup of 37 waste sites in the 100-MG-1 OU using either a confirmatory sampling/no further action alternative (21 sites) or a removal, treatment, disposal alternative (16 sites). Cleanup levels will be consistent with existing 100 Area cleanup levels. Should the confirmatory sites not meet cleanup levels, they will then be addressed by the RTD alternative. The remainder of the 200-MG-1 OU sites are not included in the AM because contamination may exceed 15 ft below ground surface; they will be address through the CERCLA remedial process.
Investigation-Derived Waste Purgewater Management Action Memorandum (DOE/RL-2009-39)	Aug-09	Non-time-critical removal action	The AM provides for additional purgewater management capacity by relining an existing unit and installing up to 3 new units, each with leak-detection systems. The purgewater management units will be operated in compliance with requirements, monitored during operations, and disassembled and dispositioned to appropriate requirements following the operational period.
Action Memorandum for Non-Time-Critical Removal Action for 200-MG-2 Operable Unit (DOE/RL-2009-37)	Oct-09	Non-time-critical removal action	The AM provides for cleanup of 34 waste sites in the 100-MG-2 OU using either a confirmatory sampling/no further action alternative (16 sites) or an RTD alternative (18 sites). Should the confirmatory sites not meet cleanup levels, they will then be addressed by the RTD alternative. The remainder of the 200-MG-2 OU sites are not included in the AM because contamination may exceed 15 ft below ground surface; they will be address through the CERCLA remedial process.
Action Memorandum for General Hanford Site Decommissioning Activities (DOE/RL-2010-22)	Apr-10	Non-time-critical removal action	The AM establishes D4 for excess industrial buildings and structures and cleanup of miscellaneous debris; provides for removal of contaminated soil or evaluation of contaminated soils for inclusion as a waste site through WIDS; identifies ERDF as the preferred disposal location for wastes meeting ERDF disposal criteria; allows for the possibility of using certain wastes in other remedial actions, such as fill material beneath barriers; and allows for incorporation of additional, similar buildings and structures into the AM.

Table D-2. CERCLA Action Memoranda. (9 pages)

Title	Date	Type of Action	Removal Action/Decision

2,4-D	=	2,4-dichlorophenoxyacetic acid.	ISS	=	interim safe storage.
AM	=	Action Memorandum.	OU	=	operable unit.
CCN	=	correspondence control number.	PFP	=	Plutonium Finishing Plant.
CERCLA	=	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*.	PRG	=	preliminary remediation goal.
			RCRA	=	*Resource Conservation and Recovery Act of 1976.*
D4	=	deactivate, decontaminate, decommission, and demolish.	RAL	=	remedial action level.
			ROD	=	record of decision.
D&D	=	decontamination and decommissioning.	RTD	=	remove, treat, and dispose.
			TCRA	=	time critical removal action.
EE/CA	=	engineering evaluation/cost analysis.	TPA	=	Tri-Party Agreement.
			TRU	=	transuranic.
ERA	=	expedited response action.	WIPP	=	Waste Isolation Pilot Plant.
ERDF	=	Environmental Restoration Disposal Facility.			

Table D-3. Permits, Licenses, and Other Statutory/Regulatory Program Decisions Affecting Hanford Site Cleanup Mission. (3 pages)

Document	Summary
*Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste (*WA7890008967) (modified September 30, 2009) **FINAL**	This dangerous waste permit, for the treatment, storage, and disposal of dangerous waste at the Hanford Facility, is the RCRA Permit for the Hanford Facility. The permit allows a step-wise permitting process of the Hanford Facility to ensure the proper implementation of the TPA. In order to accomplish this, the permit consists of six parts. **Part I, Standard Conditions** **Part II, General Facility Conditions** **Part III, Unit-Specific Conditions for Operating Units** • Operating Unit 2, PUREX Storage Tunnels • Operating Unit 3, Liquid Effluent Retention Facility and 200 Area Effluent Treatment Facility • Operating Unit 4, 242-A Evaporator • Operating Unit 5, 325 Hazardous Waste Treatment Units • Operating Unit 10, Waste Treatment and Immobilization Plant • Operating Unit 11, Integrated Disposal Facility • Operating Unit 15, 331-C Storage Unit • Operating Unit 16, 400 Area Waste Management Unit **Part IV, Unit-Specific Conditions for Corrective Action** • Corrective Action Unit 1, 100-NR-1 Operable Unit **Part V, Unit-Specific Conditions for Units Undergoing Closure** • Closure Unit 1, 1325-N Liquid Waste Disposal Facility • Closure Unit 2, 1301-N Liquid Waste Disposal Facility • Closure Unit 3, 1324-N Surface Impoundment and 1324-NA Percolation Pond **Part VI, Unit-Specific Conditions for Units in Post-Closure** • Post closure Unit 1, 300 Area Process Trenches • Post closure Unit 2 ,183-H Solar Evaporation Basins
Prevention of Significant Deterioration Permit No. PSD-X80-14, issued to the U.S. Department of Energy, Richland Operations Office by the U.S. Environmental Protection Agency, Region 10 **FINAL**	Covers emission of NOx to the atmosphere from the Plutonium Uranium Extraction Plant and the Uranium-Trioxide Plant. No expiration date.

Table D-3. Permits, Licenses, and Other Statutory/Regulatory Program Decisions Affecting Hanford Site Cleanup Mission. (3 pages)

Document	Summary
Hanford Site Air Operating Permit 00-05-006, Renewal 1 **FINAL**	Covers operations on the Hanford Site having a potential to emit airborne emissions. The permit provides a compilation of applicable *Clean Air Act of 1977* requirements both for radioactive and non-radioactive emissions at the Hanford Site. It will be implemented through federal and state programs. Attachment 1 contains the State of Washington Department of Ecology (Ecology) permit terms and conditions. Attachment 2 contains the State of Washington Department of Health (Health) Radioactive Air Emissions License (FF-01) as permit terms and conditions. Attachment 3 contains the Benton Clean Air Agency (BCAA) permit terms and conditions applicable to the regulations of open burning and asbestos.
Permit WA-002591-7 , Clean Water Act of 1977 – National Pollutant Discharge Elimination System Permit **FINAL**	Governing effluent discharges to the Columbia River; includes the outfall for the 300 Area Treated Effluent Disposal Facility and two outfalls in the 100-K Area.
Permit WAR05A57F , Clean Water Act of 1977 – National Pollutant Discharge Elimination System Permit **FINAL**	Governs storm water discharges. This permit expired October 30, 2005, and a new permit has not yet been issued. However, facilities covered by this permit are automatically granted an administrative continuance of permit coverage until a new permit is issued.
Permit CR-IU005, Clean Water Act of 1977 – National Pollutant Discharge Elimination System Permit **FINAL**	Allows wastewater from the Environmental Molecular Sciences Laboratory to be discharged to the city of Richland's wastewater treatment facility.
Permit ST 4500, Washington State Department of Ecology – State Wastewater Permit **FINAL**	Allows treated wastewater from the Effluent Treatment Facility to be discharged to the State-Approved Land Disposal Site. This permit expired August 1, 2005, and has not been reissued. The old permit will remain in effect until the new permit is issued.
Permit ST 4501, Washington State Department of Ecology – State Wastewater Permit **FINAL**	Allows for the discharge of cooling water and other primarily uncontaminated wastewater from 400 Area facilities to two ponds located north-northeast of the 400 Area perimeter fence. This permit was effective October 1, 2003, and expired on October 1, 2008. It will remain in effect until a new permit is issued.
Permit ST 4502, Washington State Department of Ecology – State Wastewater Permit **FINAL**	Allows treated effluent from the 200-East and 200-West Areas to be discharged to the 200 Area Treated Effluent Disposal Facility. This permit expired in May 2005 and has not been reissued. The old permit will remain in effect until the new permit is issued.
Permit ST 4507, Washington State Department of Ecology – State Wastewater Permit **FINAL**	Allows domestic wastewater to be discharged to the 100-N Area sewage lagoon. This permit expired in May 2002. A renewal application has been submitted. The old permit will remain in effect until a new permit is issued.

Table D-3. Permits, Licenses, and Other Statutory/Regulatory Program Decisions Affecting Hanford Site Cleanup Mission. (3 pages)

Document	Summary
Permit ST 4511 , Washington State Department of Ecology – State Wastewater Permit **FINAL**	Consolidation of permits: ST 4508, ST 4509, and ST 4510. This Categorical State Waste Discharge Permit authorizes the discharge of wastewater from maintenance, construction, and hydrotesting activities and allows for cooling water, condensate, and industrial storm water discharges at the Hanford Site. This permit was issued February 16, 2005, and expired February 16, 2010.
Permit WAG-50-5180, Washington State Department of Ecology – State Wastewater Permit **FINAL**	General sand and gravel for the Concrete Batch Plant in the 200-East Area. Reissued in May 2006.
Permit WAG-50-5181, Washington State Department of Ecology – State Wastewater Permit **FINAL**	For gravel pit 30 in the 200-East Area. Reissued in May 2006.
Large Onsite Sewage Systems (LOSS) "Permit to Operate" HAN099 **FINAL**	Lists systems in the various areas
Underground Injection Control (UIC) Wells	Hanford has a number of UIC wells – storm water, non-storm water and septic systems. The Mission Support Contractor maintains the inventory and locations of active and inactive wells.

Table D-4. Tri-Party Agreement Decisions Affecting Hanford Site Cleanup Mission.

TPA Documentation	Summary of Decision
• M-045-00 and • Appendix C Part 1: Required Retrieval Technologies • Appendix H	Closure will follow retrieval of as much tank waste as technically possible, with tank waste residues not to exceed 360 ft^3 in each of the 100-series tanks, 30 ft^3 in each of the 200-series tanks, or the limit of waste retrieval technology capability.
• Work to Be Performed • Section IV.A.3 • M-062-21	Under this decree, initial plant operations is defined as, over a rolling period of at least three months leading to the milestone date, operating the WTP to produce high-level waste glass at an average rate of at least 4.2 metric tons of glass/day, and low-activity waste glass at an average rate of at least 21 metric tons of glass/day.
WTP = Waste Treatment Plant.	

Table D-5. Other Federal and State Decisions Affecting Hanford Site Cleanup Mission. (4 pages)

Other Federal/State Decision	Summary of Decision
Executive Order 11514, *Protection and Enhancement of Environmental Quality*, as amended by Executive Order 11991	This Executive Order requires Federal agencies to continually monitor and control their activities to (1) protect and enhance the quality of the environment and (2) develop procedures to ensure the fullest practicable provision of timely public information and understanding of Federal plans and programs that may have potential environmental impact so that interested parties can submit their views. DOE has issued regulations (10 CFR 1021, "National Environmental Policy Act Implementing Procedures") and DOE O 451.1B, *National Environmental Policy Act Compliance Program*, for compliance with this Executive order.
Executive Order 12088, *Federal Compliance with Pollution Control Standards*	This Executive Order directs Federal agencies to comply with applicable administrative and procedural pollution control standards established by, but not limited to, the *Clean Air Act of 1977*, the *Noise Control Act of 1972*, the *Clean Water Act of 1977*, the *Safe Drinking Water Act of 1974*, the *Toxic Substances Control Act of 1976*, and RCRA.
Executive Order 12580, *Superfund Implementation*	This Executive Order delegates to a number of Federal departments and agencies the authority and responsibility to implement certain provisions of CERCLA. The policies and procedures for implementing these provisions (e.g., carrying out response actions and fulfilling natural resource trusteeship responsibilities) are spelled out in the National Contingency Plan.
Nuclear Waste Policy Act of 1982 **FINAL**	This Act directed DOE to characterize and evaluate the Yucca Mountain, Nevada, site for suitability as a potential repository for disposal of commercial spent nuclear fuel and HLW. The act also directed the President to evaluate the need for a separate repository for HLW resulting from atomic energy defense activities. On April 30, 1985, President Reagan completed this evaluation, the result of which was that high-level waste from atomic energy defense activities may be disposed of in the proposed repository along with spent nuclear fuel. After passage by the U.S. House of Representatives and U.S. Senate, on July 23, 2002, President Bush signed House Joint Resolution 87 approving the site at Yucca Mountain for the development of a repository for the disposal of HLW and spent nuclear fuel, pursuant to the *Nuclear Waste Policy Act of 1982*. As indicated in the Obama Administration's FY 2010 budget request, the Administration intends to terminate the Yucca Mountain program while developing nuclear waste disposal alternatives. Notwithstanding the decision to terminate the Yucca Mountain program, DOE remains committed to meeting its obligations to manage and ultimately dispose of HLW and spent nuclear fuel. The Administration directed the establishment of the Blue Ribbon Commission on America's Nuclear Future (Commission) to evaluate alternative approaches for meeting these obligations. The Commission is scheduled to submit a draft report to the Secretary of Energy by July 2011, and a final report by January 2012. The Commission will provide the opportunity for a meaningful dialogue on how best to address this challenging issue and will provide recommendations that will form the basis for working with Congress to revise the statutory framework for managing and disposing of HLW and spent nuclear fuel.

Table D-5. Other Federal and State Decisions Affecting Hanford Site Cleanup Mission. (4 pages)

Other Federal/State Decision	Summary of Decision
Federal Facilities Compliance Act of 1992 **FINAL**	This Act, enacted on October 6, 1992, amended RCRA, Section 6961 and other sections and requires DOE to prepare plans that develop treatment capacity for mixed waste stored or generated at each facility, except for those facilities subject to a permit that establishes a schedule for treatment of such waste or an existing agreement or order governing the treatment of such waste to which the state is a party. The host state and/or EPA must approve each plan. The state of Washington, EPA, and DOE had an existing plan (i.e., the TPA) addressing compliance with the storage prohibition for mixed waste at the time this law was enacted. Therefore, Hanford was not required to develop a new plan. A violation of the TPA may concurrently be a violation of the *Federal Facilities Compliance Act of 1992* (i.e., the State of Washington may seek judicial enforcement under RCRA (42 U.S.C. 6901)..
Waste Isolation Pilot Plant Land Withdrawal Act (Public Law 102-579). **FINAL**	The act withdrew land from the public domain for the purposes of creating and operating WIPP, the geologic repository in New Mexico designated as the national disposal site for defense transuranic waste. In addition to establishing the location for the facility, the *Waste Isolation Pilot Plant Land Withdrawal Act* also defines the characteristics and amount of waste that will be disposed of at the facility. The amendments to the Waste Isolation Pilot Plant Land Withdrawal Act exempt waste designated by the Secretary of Energy for disposal at WIPP from the RCRA land disposal restrictions. However, these amendments do not exempt mixed transuranic waste from other RCRA requirements. WIPP does have an RCRA permit and can accept mixed transuranic waste. On May 15, 2003, EPA Region 6 approved DOE's request to dispose of transuranic waste and mixed transuranic waste containing PCBs at WIPP subject to certain "conditions of approval."
Spent Fuel Settlement Agreement (No. CV-91-0035-S-EJL and No. CV-91-0054-S-EJL), October 17, 1995	This agreement allows INL to receive spent nuclear fuel and mixed waste from off site and establishes schedules for the treatment of existing high-level waste, transuranic waste, mixed waste, and removal of spent nuclear fuel from the state.
Consent Decree for Stabilization of SSTs at Hanford Site between U.S. Department of Energy and Washington State Department of Ecology (No. CT-99-5076-EFS) September 29, 1999 **FINAL**	This consent decree established a court-enforceable, technically sound schedule for pumping liquid nuclear waste from the remaining 29 unstabilized SSTs. The key elements of the consent decree included: • Pumping the tanks that pose the greatest environmental risk first, thus providing additional protection for the Columbia River and public health. • Accelerating the schedule for pumping so that 98 percent of approximately 23.5 million liters (6.2 million gallons) of remaining pumpable liquid is removed by September 30, 2003, with the final 2 percent scheduled to be removed by September 30, 2004 (this was completed). • Increasing DOE funding to a level that supports successful execution of the new schedule for tank stabilization.

Table D-5. Other Federal and State Decisions Affecting Hanford Site Cleanup Mission. (4 pages)

Other Federal/State Decision	Summary of Decision
Presidential Proclamation 7319, *Establishment of the Hanford Reach National Monument* (June 9, 2000) **FINAL**	This proclamation set apart and reserved the Hanford Reach National Monument to protect all lands and interests in lands owned or controlled by the United States within the boundaries of the monument area. The lands reserved consist of approximately 195,000 acres, and are appropriated and withdrawn from all forms of entry, location, selection, sale, or leasing or other disposition under the public land laws. The monument is to be managed by the U.S. Fish and Wildlife Service under existing agreements with DOE. DOE retains its responsibilities under applicable environmental laws, including the remediation of hazardous substances or the restoration of natural resources at the Hanford Site.
Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments* (November 6, 2000). **FINAL**	This Executive Order supplements "Government-to-Government Relations with Native American Tribal Governments" (59 FR 22951), and states that each executive department and agency shall consult, to the greatest extent practicable and to the extent permitted by law, with Tribal Nations prior to taking actions that affect federally recognized tribal governments. This order also states that each executive department and agency shall assess the impact of Federal government plans, projects, programs, and activities on tribal trust resources and ensure that tribal government rights and concerns are considered during the development of such plans, projects, programs, and activities.
U.S. Department of Interior Announcement, National Historic Landmark, August 19, 2008.	Hanford's B Reactor, has been designated a National Historic Landmark by the U.S. Department of Interior.
Consent Decree and Tri-Party Agreement Settlement Package, order signed October 25, 2010, settling *State of Washington v. Chu*, United States District Court, Eastern District of Washington, Case No. CV-08-5085-FVS	The Consent Decree and TPA Settlement Package imposes milestones for the construction, commissioning, and startup of the Waste Treatment and Immobilization Plant (WTP), as well as continued retrieval of waste from Hanford's SSTs. Significant milestones in the Consent Decree require DOE to meet deadlines for the WTP's facilities to keep construction on pace; start treating tank waste through the WTP by 2019; achieve initial plant operations by 2022; retrieve the waste from the remaining 10 tanks in the "C" tank farm by 2014; identify nine other SSTs to retrieve waste from by 2014; and finish retrieving the waste from those nine other tanks by 2022. The Consent Decree also covers reporting requirements for waste retrievals from SSTs, regulatory coordination, and a process to resolve disputes between the agencies.

Table D-5. Other Federal and State Decisions Affecting Hanford Site Cleanup Mission. (4 pages)

Other Federal/State Decision	Summary of Decision
Settlement Agreement between the State of Washington and the U.S. Department of Energy (No. 2:03CV-05018-AAM January 6, 2006 **FINAL**	Prior to the issuance of the *Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement, Richland, Washington* (HSW EIS) (DOE/EIS-0286F) and record of decision (69 FR 39449, "Record of Decision for the Solid Waste Program, Hanford Site, Richland, WA: Storage and Treatment of Low-Level Waste and Mixed Low-Level Waste; Disposal of Low-Level Waste and Mixed Low-Level Waste, and Storage, Processing, and Certification of Transuranic Waste for Shipment to the Waste Isolation Pilot Plant"), Ecology initiated litigation on issues related to the importation, treatment, and disposal of radioactive and hazardous waste generated off site as a result of nuclear defense and research activities. The court enjoined shipment of offsite transuranic waste to Hanford for processing and storage pending shipment to the Waste Isolation Pilot Plant near Carlsbad, New Mexico. Several amendments have been made, with the result that DOE, Ecology, and the Washington State Attorney General's Office signed a Settlement Agreement ending the litigation on January 6, 2006. The agreement is intended to resolve Ecology's concerns about HSW EIS (DOE/EIS-0286F) groundwater analyses and to address other concerns about the HSW EIS, including those identified in the quality review (DOE 2006). The agreement also stipulates that when the *Reader's Guide Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington* (DOE/EIS-0391) has been completed, it will supersede the HSW EIS. Until that time, DOE will not rely on HSW EIS groundwater analyses for decision-making, and DOE will not import offsite waste to Hanford, with certain limited exemptions as specified in the agreement.

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980.*
DOE = U.S. Department of Energy.
EPA = U.S. Environmental Protection Agency.
HLW = high-level waste.
HSW EIS = *Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement, Richland, Washington.*
INL = Idaho National Laboratory.
PCB = polychlorinated biphenyl.
RCRA = *Resource Conservation and Recovery Act of 1976.*
SST = single-shell tank.
TPA = Tri-Party Agreement.
WIPP = Waste Isolation Pilot Plant.
WTP = Waste Treatment Plant.

D.4. REFERENCES

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Presidential Proclamation 7319, 2000, *Establishment of the Hanford Reach National Monument*, William J. Clinton, June 9.*Resource Conservation and Recovery Act of 1976*, 42 USC 6901, et seq.

Safe Drinking Water Act of 1974, 42 USC 300, et seq.

Consent Decree between the State of Washington and the U.S. Department of Energy, order signed January 6, 2006, in *State of Washington v. Bodman*, Civil Action No. 2:03CV-05018-AAM.

Spent Fuel Settlement Agreement between the State of Idaho and U.S. Department of Energy, order signed October 16, 1995, in *Public Service Co. of Colorado v. Batt* (CV-91-0035-S-EJL) and *United States V. Batt*, (CV-91-0054-S-EJL).

Superfund Amendments and Reauthorization Act of 1986, 42 USC 103, et seq.

Toxic Substances Control Act of 1976, 15 USC 2601, et seq.

WA7890008967, 2007, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*, as amended, Washington State Department of Ecology, Richland, Washington.

Waste Isolation Pilot Plant Land Withdrawal Act, 1992, Public Law 102-579, October 30, 106 Stat.4777.

APPENDIX E

HANFORD ESTIMATED CLEANUP COST AND SCHEDULE STATUS

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TERMS

ALARA	as low as reasonably achievable
BOF	Balance of Facilities
CENRTC	capital equipment not related to construction
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CH	contact-handled
CSB	Canister Storage Building
CVDF	Cold Vacuum Drying Facility
CWC	Central Waste Complex
D&D	decontamination and decommissioning
D4	deactivation, decontamination, decommissioning, and demolition
DOE	U.S. Department of Energy
DOE-ORP	U.S. Department of Energy, Office of River Protection
DOE-RL	U.S. Department of Energy, Richland Operations Office
DQO	data quality objective
DST	double-shell tank
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESH&Q	environmental safety, health and quality
ETF	Effluent Treatment Facility
FFTF	Fast Flux Test Facility
FY	fiscal year
GM	groundwater monitoring
GRP	Groundwater Remediation Project
HAMMER	Hazardous Materials Management and Emergency Response (Facility)
HLW	high-level waste
HVAC	heating, ventilation and air conditioning
IDF	Integrated Disposal Facility
IDFE	Integrated Disposal Facility East
IFW	Integrated Field Work
IHLW	immobilized high-level waste
ILAW	immobilized low-activity waste
ISA	Interim Storage Area
ISS	interim safe storage
KE	K East Basin
KW	K West Basin
KOP	knock-out pot
LAW	low-activity waste
LERF	Liquid Effluent Retention Facility
LLBG	low-level burial ground
LOE	level of effort

LTS	Long-Term Stewardship
MLLW	mixed low-level waste
NEPA	*National Environmental Policy Act*
NM	nuclear material
NRDWL	non-radioactive dangerous waste landfill
OSHA	Occupational Safety and Health Administration
OU	operable unit
PA	performance assessment
PBS	project baseline summary
PFP	Plutonium Finishing Plant
PPSL	Plutonium Process Support Laboratories
PT	pretreatment
PUREX	Plutonium Uranium Extraction (Plant)
RH	remote-handled
RCRA	*Resource Conservation and Recovery Act of 1976*
REDOX	Reduction-Oxidation Facility (S Plant)
RMA	remote mechanical operations “A” line
RMC	remote mechanical operations “C” line
ROD	record of decision
RTD	remove, treat, and dispose
S&M	surveillance and maintenance
SAP	sampling and analysis plan
SNF	spent nuclear fuel
SST	single-shell tank
STP	Sludge Treatment Project
SWOC	Solid Waste Operations Complex
TEDF	Treated Effluent Disposal Facility
TOC	total organic compound
TPA	Tri-Party Agreement
TRU	transuranic
TSD	treatment, storage, and disposal
WAC	*Washington Administrative Code*
WIPP	Waste Isolation Pilot Plant
WESF	Waste Encapsulation and Storage Facility
WM	Waste Management
WRAP	Waste Receiving and Processing (Facility)
WTP	Waste Treatment and Immobilization Plant

APPENDIX E

HANFORD CLEANUP LIFECYCLE SCHEDULE AND COST DETAILS

As directed in the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al 1989), also referred to as the Tri-Party Agreement (TPA), Milestone M-036-01, additional schedule and cost details are provided in appendices to the *Hanford Lifecycle Scope, Schedule and Cost Report* (Lifecycle Report).[1] The schedules and costs are provided by project baseline summary (PBS) and reflect the scope discussed in Chapters 4.0 through 7.0 of the Lifecycle Report. Where not adequately addressed in these chapters, additional scope information is provided in this appendix in summary form.

The schedules and costs provided in this appendix are reported to Level 2 for the entire lifecycle and to Level 3 for the execution year (Fiscal Year [FY] 2011) and the following 5 years. Due to the complexity of the Level 3 schedules, the information is reported in table format with costs by year. The start and finish of each Level 3 work element is reflected by the initial and final years that include costs.

Information for each of the PBSs is provided in the following subsections as a series of tables:

- A scope table that summarizes the Level 3 work elements. In some instances, the scope descriptions have been developed only to Level 2. In these cases, the information has been presented in the main chapters of the report and is not repeated here. These PBSs are identified in the appropriate subsections.
- A cost and schedule table for the remaining lifecycle is presented at Level 2 by fiscal year. The costs are escalated and include site-wide service allocations and cost and/or schedule uncertainty (also referred to as contingency in the Waste Treatment and Immobilization Plant [WTP] PBS). Costs generally are presented from FY 2011 through 2060 for all PBSs or for 2 years following the final year of the lifecycle if it extends beyond 2060. PBS RL-LTS extends from FY 2061 through FY 2090.
- A near-term cost and schedule table that extends from FY 2011 through 2016.

E.1 RICHLAND OPERATIONS OFFICE PROJECT BASELINE SUMMARY INFORMATION

The U.S. Department of Energy (DOE), Richland Operations Office (RL) manages their assigned cleanup mission through the following PBSs (at Level 1):

- Nuclear Materials Stabilization and Disposition–PFP, PBS RL-0011
- SNF Stabilization and Disposition, PBS RL-0012
- Solid Waste Stabilization and Disposition–200 Area, PBS RL-0013C
- Safeguards and Security, PBS RL-0020
- Soil and Water Remediation–Groundwater/Vadose Zone, PBS RL-0030
- Nuclear Facility D&D–Remainder of Hanford, PBS RL-0040

[1] Ecology, EPA, and DOE, 1989, *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, as amended.

- Infrastructure and Services, PBS RL-0040
- Nuclear Facility D&D–River Corridor Cleanup Project, PBS RL-0041
- Nuclear Facility D&D–Fast Flux Test Facility Project, PBS RL-0042
- Richland Community and Regulatory Support, PBS RL-0100
- Long-Term Stewardship, PBS RL-LTS.

E.1.1 NM STABILIZATION AND DISPOSITION–PFP (PBS RL-0011) SCHEDULE AND COST DETAILS

Table E-1. NM Stabilization and Disposition–PFP (PBS RL-0011) Level 3 Scope Summary. (2 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
Maintain Safe and Compliant	Maintain Worker/Public Health and Environmental Safety	Provides safety, emergency management, OSHA, and fire protection programs for the PFP.
	Maintain Compliant Facility	Provides for environmental management and administration, permitting, and NEPA support for the PFP.
	Facility System and Components	Ensures the facility configuration minimizes risks, protects the environment, and remains in a safe and compliant condition.
	Maintain Maintenance Program	Provides resources to manage and implement the PFP maintenance program.
	Maintain Special Projects	Provides for special projects to safely sustain required facility capabilities.
Disposition PFP Facility	Transition 234-5Z Balance of Plant	Addresses progressive deactivation and dismantling of systems, components, and structures in compliance with CERCLA process and resulting in established criteria (i.e., clean-slab-on-grade). Activities include necessary maintenance during D&D and activities to maintain temporary safe configurations.
	Transition 236-Z	
	Transition 242-Z	
	Transition 243-Z	
	Transition 291-Z	
	Transition 2736-Z/ZB Complex	
	Transition Support Buildings and Yard	
	Lab Support for Transition	
	Maintain Transition Program	
	Transition Operations Support	
	Modifications To Support Transition	
	Manage/Dispose of PFP Solid Waste	
	Staff Transition	
	Transition 234-5Z Active RMA/RMC Lines	
	Transition 234-5Z Labs	
	Transition 234-5Z Inactive RMA/RMC Lines	

Table E-1. NM Stabilization and Disposition–PFP (PBS RL-0011) Level 3 Scope Summary. (2 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
Project Management and Support	PFP Project Management and Support	Provides for management functions, including management and technical/engineering support to the project mission.
	PFP Technical Support	
Site-wide Services – RL-0011	Site-wide Services	Includes proportional share of costs for site services and infrastructure, adders, and other indirect costs.

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act.*
D&D = decontamination and decommissioning.
NEPA = *National Environmental Policy Act.*
OSHA = Occupational Safety and Health Administration.
PFP = Plutonium Finishing Plant.
PRF = Plutonium Reclamation Facility.
RMA = remote mechanical operations “A” line.
RMC = remote mechanical operations “C” line.

Table E-2. NM Stabilization and Disposition–PFP (PBS RL-0011) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated).

Fiscal Year	2011	2012	2013	2014	2015	2016	Total
Maintain Safe and Compliant PFP	23,010	24,116	24,629	4,869	506	574	**77,702**
Disposition PFP Facility	148,922	0	111,976	91,566	57,400	10,013	**419,877**
Project Management and Support	12,499	1,604	28,712	24,927	48,879	38,750	**155,370**
Site-wide Services – RL-0011	31,089	22,651	46,491	43,986	17,969	2,924	**165,110**
Total	**215,520**	**48,371**	**211,807**	**165,347**	**124,754**	**52,260**	**818,059**

NM = nuclear materials.
PBS = project baseline summary.
PFP = Plutonium Finishing Plant.

Table E-3. NM Stabilization and Disposition–PFP (PBS RL-0011) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (2 pages)

Schedule Level	Scope	Fiscal Year 2011	2012	2013	2014	2015	2016	Total
1	**NM Stabilization and Disposition – PFP (PBS RL-0011)**							
2	**Maintain Safe and Compliant PFP**	**23,010**	**24,116**	**24,629**	**4,869**	**506**	**574**	**77,702**
3	Maintain Worker/Public Health and Environmental Safety	4,997	5,511	5,483	433	0	0	**16,424**
3	Maintain Compliant Facility	393	427	425	435	0	0	**1,680**
3	Facility System and Components	9,588	10,406	9,442	906	0	0	**30,342**
3	Maintain Maintenance Program	7,547	7,772	8,491	2,310	0	0	**26,120**
3	Maintain Special Projects	484	0	0	0	0	0	**484**
3	Cost and/or Schedule Uncertainty – Maintain Safe and Compliant PFP	0	0	788	784	506	574	**2,653**
2	**Disposition PFP Facility**	**148,922**	**0**	**111,976**	**91,566**	**57,400**	**10,013**	**419,877**
3	Transition 234-5Z Balance of Plant	29,271	0	17,727	11,163	3,902	0	**62,063**
3	Transition 236-Z	15,561	0	15,238	7,051	0	0	**37,849**
3	Transition 242-Z	2,203	0	872	73	0	0	**3,148**
3	Transition 243-Z	759	0	1,115	0	0	0	**1,874**
3	Transition 291-Z	1,985	0	5,912	748	0	0	**8,646**

Table E-3. NM Stabilization and Disposition–PFP (PBS RL-0011) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (2 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
3	Transition 2736-Z/ZB Complex	3,713	0	437	1,204	0	0	**5,354**
3	Transition Support Buildings and Yard	4,643	0	497	1,758	984	0	**7,881**
3	Lab Support for Transition	7,888	0	5,726	6,055	3,144	0	**22,812**
3	Maintain Transition Program	5,484	0	5,889	5,808	5,286	0	**22,467**
3	Transition Operations Support	24,850	0	34,947	37,029	23,781	0	**120,607**
3	Modifications to Support Transition	5,977	0	2,437	1,059	491	0	**9,964**
3	Manage/Dispose of PFP Solid Waste	13,087	0	15,637	15,767	7,198	3,399	**55,088**
3	Staff Transition	3,940	0	0	0	0	0	**3,940**
3	Transition 234-5Z Active RMA/RMC Lines	15,775	0	0	0	0	0	**15,775**
3	Transition 234-5Z Labs – PPSL / Standards / A	8,230	0	0	0	0	0	**8,230**
3	Transition 234-5Z Inactive RMA/RMC Lines	5,557	0	0	0	0	0	**5,557**
3	Cost and/or Schedule Uncertainty – Disposition PFP Facility	0	0	5,543	3,851	12,613	6,614	**28,620**
2	**Project Management and Support**	**12,499**	**1,604**	**28,712**	**24,927**	**48,879**	**38,750**	**155,370**
3	PFP Project Management and Support	9,242	1,604	17,019	18,881	21,776	10,709	**79,231**
3	PFP Technical Support	3,257	0	3,502	1,630	3,336	0	**11,725**
3	Cost and/or Schedule Uncertainty – Project Management and Support	0	0	487	680	23,431	25,748	**50,346**
3	Management Reserve – Project Management and Support	0	0	7,704	3,735	336	2,292	**14,068**
2	**Site-wide Services – RL-0011**	**31,089**	**22,651**	**46,491**	**43,986**	**17,969**	**2,924**	**165,110**
3	Site-wide Services – RL-0011	31,089	22,651	46,491	43,986	17,969	2,924	**165,110**
Total		**215,520**	**48,371**	**211,807**	**165,347**	**124,754**	**52,260**	**818,059**

NM = nuclear materials.
PFP = Plutonium Finishing Plant.
PPSL = Plutonium Process Support Laboratories.
RMA = remote mechanical operations "A" line.
RMC = remote mechanical operations "C" line.

E.1.2 SNF STABILIZATION AND DISPOSITION (PBS RL-0012) SCHEDULE AND COST DETAILS

Table E-4. SNF Stabilization and Disposition (PBS RL-0012) Level 3 Scope Summary. (3 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
100-K Safe and Compliant	General Support	Provides for general support functions that include administrative support; establishment and management of the project's training program; management of the project's overall scope, schedule, and budget; management of the change control process; and performance of project status monitoring and reporting.
	Regulatory Compliance	Provides for regulatory compliance activities that include environmental support, nuclear safety support, quality assurance support, procedure support, and management assessment and corrective action management support.
	Safety and Health	Provides functional support at the managerial level for radiological controls, compliance with site-wide regulations, maintenance of technical basis documents, radiological risk screening, and ALARA worksheets and reports.
K Basins Operations and Maintenance	KW Basin	Provides for operations support to keep the KW Basin in a safe and compliant mode until finish of dewatering and turn over to D&D; includes support to preventative maintenance, operation of equipment, system walk downs, daily routines, management oversight, review and approve work package, and safety inspections.
Facility Operations	100-K Facility Support	Provides infrastructure maintenance support for non-reactor buildings (e.g., janitorial services, project support, direct supervision, sampling support, corrective maintenance, modifications).
	100-K Auxiliary Support	Includes activities to operate all support facilities required to maintain the KW Basin safe and compliant, including operation of the water plant and all potable water services for the project; routine surveillance, sampling, maintenance support in compliance with state and Federal drinking water requirements; operation of facilities, including auxiliary systems (boilers, compressor, HVAC units, fire systems, etc.) at KE, KW, and CVDF; and management of the National Pollution Discharge Environmental System at 100-K Area.
	100-K Waste Handling	Provides for field operations for waste handling support for waste flows not specific to sludge treatment and D&D, including waste characterization and designation, planning, preparation of waste management plans, waste area operations, and shipment documentation and coordination.

Table E-4. SNF Stabilization and Disposition (PBS RL-0012) Level 3 Scope Summary. (3 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
100-K Facilities Deactivation	CVDF Deactivation	Provides for activities to deactivate the CVDF, including actions such as repairing roof leaks and dispositioning office furniture, supplies, and unnecessary spare parts/tools/portable equipment; identifying, inventorying, labeling, and recording attached hazardous materials; stabilizing loose and/or damaged asbestos; draining and removing heels from all tanks, vessels, drums, etc., or characterizing them for radionuclides and hazardous materials; reducing electrical systems to those needed for surveillance and maintenance and subsequent D&D; isolating water supplies from buildings and draining them or providing freeze protection to eliminate the potential for leaks and/or freezing; shutting down all HVAC supply air and exhaust air systems; and decontaminating and releasing radiological contaminated zones.
	Ancillary Facilities Deactivation	Provides for activities to deactivate the CVDF, including actions such as repairing roof leaks, office furniture and supplies and unnecessary spare parts/tools/portable equipment; identifying, inventorying, labeling, and recording attached hazardous materials; stabilizing loose and/or damaged asbestos; draining and removing heels from all tanks, vessels, drums, etc., or characterizing them for radionuclides and hazardous materials; reducing electrical systems to those needed for surveillance and maintenance and subsequent D&D; isolating water supplies from buildings and draining them or providing freeze protection to eliminate the potential for leaks and/or freezing; shutting down all HVAC supply air and exhaust air systems; and decontaminating and releasing radiological contaminated zones.
KW Basin Deactivation and Demolition	Management and Support	Provides for project management; engineering; training; safety and health support activities; dose data gathering and analysis, sampling, and characterization of both radioactive and hazardous waste; baseline management; and updating the waste volume projections.
	KW Deactivation and Dewater	Includes dose data gathering and analysis, sampling, and characterization of both radioactive and hazardous waste for the 100-K Area facilities and decontamination of the KW Basin walls and floor.
	KW Demolition Preparation	Includes pouring of grout to partially fill the KW Basin North and South Load-Out Pits, Dummy Elevator Pit, Sand Filter Vault, and ion exchange column formed monolith within the facility. This will be accomplished utilizing a specialized contractor for grout placement.
	KW Garnet Filter Disposition	Provides for the removal and disposition of the garnet filter media following shutdown of the Integrated Water Treatment System. The garnet media will be grouted and packaged prior to disposal at the ERDF.
	KW Superstructure Demolition	Provides for the planning, management, and execution of the demolition of the KW superstructure.
	KW Substructure Demolition	Provides for the planning, management, and execution of demolition of the KW substructure.

Table E-4. SNF Stabilization and Disposition (PBS RL-0012) Level 3 Scope Summary. (3 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
Sludge Treatment Project	STP Management and Support	Provides for project management; engineering; training; safety and health support activities; dose data gathering and analysis, sampling, and characterization of both radioactive and hazardous waste; baseline management; and updating the waste volume projections.
	Knock-Out Pots Disposition	Provides for disposition of the KOPs following removal of the sludge.
	STP – Phase 1 Retrieval and Interim Storage	The scope includes removal of consolidated containerized sludge, KOP sludge, and Settler Tank sludge from the KW Basin and interim storage.
Site-wide Services – RL-0012	Site-wide Services	Includes proportional share of indirect costs for site services and infrastructure, adders, and other indirect costs.

ALARA = as low as reasonably achievable.
CVDF = Cold Vacuum Drying Facility.
D&D = decontamination and decommissioning.
ERDF = Environmental Restoration Disposal Facility.
HVAC = heating, ventilation, and air conditioning.
KE = K East.
KOP = knock-out pot.
KW = K West.
PBS = project baseline summary.
SNF = spent nuclear fuel.
STP = Sludge Treatment Project.

Table E-5. SNF Stabilization and Disposition (PBS RL-0012) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated).

Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	Total
100-K Safe and Compliant	4,932	5,340	5,321	5,449	5,588	357	0	0	**26,987**
K Basins Operations and Maintenance	4,854	5,255	7,468	7,645	7,851	2,765	2,435	2,511	**40,784**
Facility Operations	3,756	4,067	4,052	4,150	4,256	272	0	0	**20,553**
100-K Facilities Deactivation	1,653	6,125	927	0	0	389	0	584	**9,677**
KW Basin Deactivation and Demolition	0	0	0	0	11,268	41,760	31,632	122	**84,783**
Sludge Treatment Project	60,972	58,331	60,064	23,440	30,459	30,192	21,528	7,784	**292,771**
Site-wide Services - RL-0012	18,465	33,688	10,595	9,270	11,504	7,099	5,285	142	**96,048**
Total	**94,632**	**112,806**	**88,427**	**49,953**	**70,928**	**82,833**	**60,881**	**11,143**	**571,603**

KW = K West.
PBS = project baseline summary.
SNF = spent nuclear fuel.

Table E-6. SNF Stabilization and Disposition (PBS RL-0012) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (2 pages)

Schedule Level	Scope	Fiscal Year								Total
		2011	2012	2013	2014	2015	2016	2017	2018	
1	**SNF Stabilization and Disposition (PBS RL-0012)**									
2	**100-K Safe and Compliant**	**4,932**	**5,340**	**5,321**	**5,449**	**5,588**	**357**	**0**	**0**	**26,987**
3	General Support	2,068	2,239	2,231	2,284	2,343	150	0	0	**11,315**
3	Regulatory Compliance	2,128	2,304	2,296	2,351	2,411	154	0	0	**11,643**
3	Safety and Health	736	797	794	813	834	53	0	0	**4,029**
2	**K Basins Operations and Maintenance**	**4,854**	**5,255**	**7,468**	**7,645**	**7,851**	**2,765**	**2,435**	**2,511**	**40,784**
3	KW Basin	4,854	5,255	5,236	5,362	5,499	351			**26,556**
3	Cost and/or Schedule Uncertainty – Basins Operations and Maintenance	0	0	2,232	2,283	2,352	2,414	2,435	2,511	**14,228**
3	Management Reserve – Basins Operations and Maintenance	12,750	28,370	33,910	2,810	6,090	23,590	0	0	**107,520**
2	**Facility Operations**	**3,756**	**4,067**	**4,052**	**4,150**	**4,256**	**272**	**0**	**0**	**20,553**
3	100-K Facility Support	1,986	2,150	2,142	2,194	2,250	144	0	0	**10,865**
3	100-K Auxiliary Support	1,030	1,115	1,111	1,137	1,166	74	0	0	**5,633**
3	100-K Waste Handling	741	802	799	819	840	54	0	0	**4,055**
2	**100-K Facilities Deactivation**	**1,653**	**6,125**	**927**	**0**	**0**	**389**	**0**	**584**	**9,677**
3	Cold Vacuum Drying Facility Deactivation		3,207		0	0	0	0	0	**3,207**
3	Ancillary Facilities Deactivation	1,653	2,918	927	0	0	389	0	584	**6,470**
2	**KW Basin Deactivation and Demolition**	**0**	**0**	**0**	**0**	**11,268**	**41,760**	**31,632**	**122**	**84,783**
3	Management and Support	0	0	0	0	2,116	8,034	7,571	0	**17,722**
3	KW Deactivation and Dewater	0	0	0	0	4,574	2,015	0	0	**6,589**

Table E-6. SNF Stabilization and Disposition (PBS RL-0012) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (2 pages)

Schedule Level	Scope	Fiscal Year								Total
		2011	2012	2013	2014	2015	2016	2017	2018	
3	KW Demolition Preparation	0	0	0	0	1,674	4,638	0	0	**6,312**
3	KW Garnet Filter Disposition	0	0	0	0	1,063	3,984	108	0	**5,155**
3	KW Superstructure Demolition	0	0	0	0	0	8,173	0	0	**8,173**
3	KW Substructure Demolition	0	0	0	0	0	6,045	17,230	0	**23,275**
3	Cost and/or Schedule Uncertainty – KW Basin Deactivation and Demolition	0	0	0	0	1,841	8,871	6,722	122	**17,556**
2	**Sludge Treatment Project**	**60,972**	**58,331**	**60,064**	**23,440**	**30,459**	**30,192**	**21,528**	**7,784**	**292,771**
3	Sludge Treatment Project Management and Support	8,368	9,061	9,028	9,245	9,482	(0)	0	0	**45,184**
3	Knock-Out Pots Disposition	3,558	3,725		0	0	0	0	0	**7,284**
3	Sludge Treatment Project – Phase 1: Retrieval and Interim Storage	36,584	33,532	12,242	6,780	10,498	0	0	0	**99,636**
3	Cost and/or Schedule Uncertainty – Sludge Treatment Project	0	0	5,644	4,664	4,529	7,135	11,166	3,873	**37,011**
2	**Site-wide Services – RL-0012**	**18,465**	**33,688**	**10,595**	**9,270**	**11,504**	**7,099**	**5,285**	**142**	**96,048**
3	Site-wide Services – RL-0012	18,465	33,688	10,595	9,270	11,504	7,099	5,285	142	**96,048**
Total		**94,632**	**112,806**	**88,427**	**49,953**	**70,928**	**82,833**	**60,881**	**11,143**	**571,603**

KW = K West.
PBS = project baseline summary.
SNF = spent nuclear fuel.

E.1.3 SOLID WASTE STABILIZATION AND DISPOSITION–200 AREA (PBS RL-0013C) SCHEDULE AND COST DETAILS

Table E-7. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Level 3 Scope Summary. (5 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
Project Management	Project Management	Provides for overall management function in support of the waste management mission.
Capsule Storage and Disposition	WESF Base Operations	Includes activities to safely store the cesium and strontium capsules in the WESF pool cells, operate and maintain the WESF facilities and associated waste sites, structures, operating systems and equipment, and monitoring systems within the authorization envelope, prepare and package waste streams for disposition as required and dispose as appropriate, and maintain systems necessary for environmental compliance, radiological control, personnel safety and capsule integrity.
	WESF Upgrades	Provides for the upgrade of WESF as necessary to maintain safe, compliant, and cost-effective operations until the capsules can be transferred to interim dry storage.
	Transition WESF	Provides for the WESF operating crews to transition the facility to a condition ready for D&D after transfer of the capsules and facility shutdown.
	Cesium/strontium Capsule Disposition	Includes retrieval of cesium/strontium capsules from the WESF pool cells and packaging, transportation, and placement of the capsules into dry storage. Provides for the construction of, including contracting and construction management oversight during construction, and operations and maintenance of the interim dry storage area.
Canister Storage Building (CSB)	Canister Storage Building	Includes activities to safely store SNF (primarily from K Basins) and IHLW from the WTP, while awaiting final disposition at a national repository. Includes operation and maintenance of the CSB facilities and associated structures, operating systems and equipment, and monitoring systems.
	200 Area ISA	Provides for the safe storage of SNF in dry cask storage systems while awaiting final disposition at a national repository, including surveillance and maintenance activities of stored spent nuclear fuel within the fenced area.
	Fuel Prep Facility	Supports the design and construction of the Fuel Preparation Facility, which will receive SNF and cesium/strontium capsules for repackaging for subsequent shipments to a national repository.

Table E-7. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Level 3 Scope Summary. (5 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
	Offsite SNF Disposition	Provides for interface management with the National SNF program and repository for final disposition and acceptance of Hanford Site SNF and WESF capsules and includes compliance documentation, data packages for SNF and WESF Capsules, licensing and transportation activities, and input to resolution of Hanford fuel performance issues affecting final disposition; includes activities such as performance assessment, NEPA coverage, safety analyses, and interface control documentation.
Mixed Low-Level Waste Treatment	Non-Thermal Treatment	Provides for non-thermal treatment of MLLW in above ground storage at SWOC facilities, retrievably stored in the LLBG, or newly generated SWOC non-thermal treatment waste, as required to meet regulatory requirements; and categorization and treatment of non-thermal treatment waste from retrieval activities.
TRU Retrieval of Stored Waste	CH Waste Retrieval Operations	Provides for retrieval, designation, and transfer to a TSD facility of CH suspect TRU waste from LLBGs 218-W-4C, 218-W-4B, 218-E-12B, and 218-W-3B.
	RH Waste Retrieval Operations	Provides for retrieval, designation, and transfer to a TSD facility of RH suspect TRU waste from LLBGs 218-W-4C, 218-W-4B, 218-E-12B, and 218-W-3B.
Waste Receiving and Processing Facility (WRAP)	WRAP Base Operations	Provides for operations and maintenance of the WRAP facility to support shipping and receiving activities associated with WIPP shipments.
	WRAP Transition	Following operations, WRAP facility will be transitioned to a condition ready for D&D.
	Min Safe Operation	Provides for surveillance and maintenance of structures, systems, components, and processes to ensure operation within the approved safety and compliance requirements envelope, including preventive maintenance, repair of failed and malfunctioning equipment, walkdown of safety systems, equipment, and facility grounds (operational surveillance); and routine radiological surveys during non-operational period and during transuranic package transporter only operational period.
T-Plant	T Plant Base Operations	Provides for the services necessary to maintain the T Plant Complex in a ready-to-serve status (base operations) for waste processing operations.
	T Plant Upgrades	Provides for upgrades to waste processing equipment, systems components, and computer interface equipment at the T Plant facilities, and includes physical upgrades to the T Plant Facility.
	T Plant Transition	Following operations, T Plant will be transitioned to a condition ready for D&D.
	T Plant M-91 Upgrades	Provides for upgrades to the T Plant Complex to allow processing of RH and large-package MLLW and TRU waste to meet waste acceptance criteria for disposal.

Table E-7. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Level 3 Scope Summary. (5 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
	T Plant SNF Support	Provides for upgrades to the T Plant Complex as necessary to store treated K Basin sludge (balance of sludge), including receiving treated K Basin sludge and placing the sludge into storage.
	RH Waste Shipments from M-91	Provides for loading RH-TRU waste into shipping containers for shipment to the WIPP and includes building payloads and preparations for shipping of the RH-TRU waste.
Central Waste Complex (CWC)	CWC Base Operations	Provides for the services necessary to maintain the CWC in a ready-to-serve status (base operations) for waste processing operations.
	CWC CENRTC	Provides for CENRTC that may be required to maintain the CWC facility in a ready-to-operate condition and includes the procurement of forklifts and other equipment necessary to maintain compliant facility operations for CWC, the LLBG, and the Mixed Waste Trenches.
	Alternate CH-TRU Shipping Facility	Provides for the capability, including design and construction of a new facility or upgrades to existing facilities, to load CH-TRU waste into shipping containers for shipment to WIPP following closure of WRAP.
	CWC Transition	Following operations, CWC will be transitioned to a condition ready for D&D.
	Low-Level Waste Burial Grounds Base Operations	Provides for the operation of the LLBGs in a safe, compliant, and cost-effective manner, including activities such as emergency preparedness, assessments and surveillances, environmental monitoring and sampling, fire protection, engineering, and training.
Environmental Restoration Disposal Facility (ERDF)	ERDF Cell Expansion	Provides for the expansion of ERDF as needed to support site cleanup efforts.
	ERDF Interim Cover	Provides for interim covers to be placed over ERDF cells as they are filled.
	ERDF Operations	Includes ERDF operations-related activities, such as leachate pump preventive maintenance, pump replacement, and air monitoring. Disposal and transportation costs are not included here, but are included for individual PBSs generating waste.
Liquid Effluent Facilities	200 Area Liquid Effluent Facilities Base Operations	Provides for safe, cost-effective, and environmentally compliant operation and maintenance of the LERF, ETF, and TEDF, and includes receiving, storing, treating, and disposing of liquid effluents from Hanford Site cleanup activities.
	200 Area Liquid Effluent Facilities Upgrades	Provides for modifications to the ETF, TEDF, and LERF to improve operations, extend the useful life, ensure regulatory compliance, and/or correct identified deficiencies.
	200 Area Liquid Effluent Facilities CENRTC	Provides for CENRTC that may be required to maintain the 200 Area Liquid Effluents facilities in a ready-to-operate condition.

Table E-7. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Level 3 Scope Summary. (5 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
Integrated Disposal Facility (IDF)	IDF Construction	Provides for the startup and testing of the IDF, including preparation of operating and maintenance procedures, training and critical spare parts.
	IDF Operations	Provides for the operation of the IDF in a safe, compliant, and cost-effective manner, including activities such as emergency preparedness; assessments and surveillances; environmental monitoring and sampling; fire protection; engineering; and training.
	IDF Regulatory and Safety	Includes safety oversight and Industrial Safety, such as assisting in the review of documents for safety impacts, performing safety surveillances, inspections and support, assisting in the maintenance of the Health and Safety Plan, and updating the baseline hazards assessments; includes regulatory support, such as performance assessment, associated permit modifications, and other requirements (e.g., operational readiness reviews) needed for the existing IDF to be in “ready-to-serve” status.
	IDFE Construction	Provides for additional onsite, expandable, integrated, disposal capacity for compliant ILAW waste stream packages produced at the WTP and for MLLW and LLW; includes project management, permitting and safety, project support, and engineering, procurement, and construction.
Low-Level and Mixed Low-Level Waste Disposal	Cost and/or Schedule Uncertainty – Low-Level and Mixed Low-Level Waste Disposal	
Mixed Waste Disposal Trenches	Mixed Waste Disposal Trenches Base Operations	Provides for the operation of the Mixed Waste Disposal Trenches in a safe, compliant, and cost-effective manner, including activities such as emergency preparedness; assessments and surveillances; environmental monitoring and sampling; fire protection; engineering; and training.
	Mixed Waste Disposal Trenches Upgrades	Provides for the design, construction, and other activities necessary to add operational layers in the Mixed Waste Disposal Trenches to maintain their ready-to-serve status and for placing temporary caps on the trenches prior to turnover to PBS RL-0040 for final cleanup and closure.
Sludge Disposition	STP – Phase 2 Treatment and Packaging	Provides for treatment and packaging of sludge.
	Shutdown and Deactivation	Provides for safe and compliant shutdown and deactivation of the STP.
	STP Management	Project management and support for the Sludge Disposition work element.

Table E-7. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Level 3 Scope Summary. (5 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
Site-wide Services – RL-0013C	Site-wide Services	Includes proportional share of indirect costs for site services and infrastructure, adders, and other indirect costs.

CENRTC = capital equipment not related to construction.
CH = contact-handled.
CSB = Canister Storage Building.
CWC = Central Waste Complex.
D&D = decontamination and decommissioning.
ERDF = Environmental Restoration Disposal Facility.
ETF = Effluent Treatment Facility.
IDF = Integrated Disposal Facility.
IDFE = Integrated Disposal Facility – East.
IHLW = immobilized high-level waste.
ILAW = immobilized low-activity waste.
ISA = Interim Storage Area.
LERF = Liquid Effluent Retention Facility.
LLBG = Low-Level Burial Grounds.
MLLW = mixed low-level waste.
NEPA = *National Environmental Policy Act.*
PBS = project baseline summary.
RH = remote-handled.
SNF = spent nuclear fuel
STP = Sludge Treatment Project
SWOC = Solid Waste Operations Complex.
TEDF = Treated Effluent Disposal Facility.
TRU = transuranic.
TSD = treatment, storage, and disposal.
WESF = Waste Encapsulation Storage Facility.
WRAP = Waste Receiving and Processing (Facility).
WTP = Waste Treatment and Immobilization Plant.

Table E-8. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (6 pages)

Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Project Management	19,896	23,074	22,761	25,158	26,879	30,551	45,113	42,356	49,790	52,002
Capsule Storage and Disposal	7,809	5,288	14,064	23,085	32,000	70,929	9,986	18,492	18,480	9,115
Canister Storage Building (CSB)	4,415	4,786	4,959	5,072	7,639	7,216	8,025	18,906	27,053	37,536
Mixed Low Level Waste Treatment	0	356	433	447	458	464	468	500	502	512
TRU Retrieval of Stored Waste	49,389	0	24,310	10,391	12,801	2,622	2,214	2,356	71	0
Waste Receiving and Processing Facility (WRAP)	16,112	9,803	18,153	18,589	19,062	15,365	26	0	0	0
T-Plant	13,251	14,372	17,603	18,094	18,572	45,499	82,622	110,140	113,751	118,371
Central Waste Complex (CWC)	14,312	15,320	13,743	11,197	11,459	12,043	11,613	9,909	9,891	10,105
Environmental Restoration Disposal Facility (ERDF)	38	87	362	238	243	5,846	8,006	8,080	8,096	103
Liquid Effluent Facilities	18,232	19,763	30,006	33,605	32,754	5,202	0	0	0	0
Integrated Disposal Facility (IDF)	453	491	501	515	528	833	1,667	1,753	1,298	1,332
Low-Level and Mixed Low-Level Waste Disposal	0	0	278	292	300	362	463	234	251	207
Mixed Waste Disposal Trenches	1,206	690	1,305	705	723	730	2,049	0	0	0
Sludge Disposition	0	0	4,653	6,425	13,585	38,096	136,517	81,432	35,318	38,317
Site-wide Services - RL-0013	36,501	48,970	39,248	40,179	39,266	41,375	54,891	58,594	47,096	40,544
Total	**181,614**	**143,000**	**192,379**	**193,990**	**216,271**	**277,134**	**363,660**	**352,752**	**311,597**	**308,144**

Table E-8. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (6 pages)

Fiscal Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Project Management	61,414	52,286	46,425	47,488	51,029	37,007	24,712	25,529	24,747	26,661
Capsule Storage and Disposal	4,526	194	20,330	20,931	140	143	148	157	439	151
Canister Storage Building (CSB)	37,535	10,198	10,068	10,503	11,089	11,010	11,378	11,972	23,203	23,869
Mixed Low Level Waste Treatment	524	538	551	574	599	609	630	661	679	698
TRU Retrieval of Stored Waste	0	0	0	0	0	0	0	0	0	0
Waste Receiving and Processing Facility (WRAP)	0	0	0	0	0	0	0	0	0	0
T-Plant	119,341	92,677	65,605	115,506	143,085	124,043	128,107	135,914	138,510	142,884
Central Waste Complex (CWC)	10,662	10,641	10,892	11,350	5,937	6,473	6,284	6,620	6,794	6,989
Environmental Restoration Disposal Facility (ERDF)	5,506	117	110	143	144	146	150	158	166	167
Liquid Effluent Facilities	0	0	0	0	0	0	0	0	0	0
Integrated Disposal Facility (IDF)	1,356	1,403	1,449	4,491	15,908	29,183	5,188	5,002	5,150	5,297
Low-Level and Mixed Low-Level Waste Disposal	69	0	0	0	0	0	0	0	0	0
Mixed Waste Disposal Trenches	0	0	0	0	0	0	0	0	0	0
Sludge Disposition	35,383	36,075	35,885	3,477	1,673	461	154	0	0	0
Site-wide Services - RL-0013	41,362	33,945	36,600	53,155	66,766	65,960	60,792	84,468	90,003	90,527
Total	**317,675**	**238,074**	**227,915**	**267,618**	**296,370**	**275,035**	**237,543**	**270,481**	**289,691**	**297,243**

Table E-8. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (6 pages)

Fiscal Year	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Project Management	26,829	29,124	28,298	30,454	30,514	27,980	59,887	38,131	31,982	27,994
Capsule Storage and Disposal	0	0	0	0	0	0	0	30	0	25
Canister Storage Building (CSB)	24,618	25,356	25,828	26,334	26,995	29,451	36,990	24,286	25,597	23,070
Mixed Low Level Waste Treatment	718	737	750	763	781	824	916	964	1,006	926
TRU Retrieval of Stored Waste	0	0	0	0	0	0	0	0	0	0
Waste Receiving and Processing Facility (WRAP)	0	0	0	0	0	0	0	0	0	0
T-Plant	146,756	152,406	155,320	156,924	161,719	130,879	38,861	45,051	1,388	1,109
Central Waste Complex (CWC)	4,518	4,158	4,236	4,319	4,934	16,521	0	0	0	0
Environmental Restoration Disposal Facility (ERDF)	173	173	178	186	180	199	219	239	252	226
Liquid Effluent Facilities	0	0	0	0	0	0	0	0	0	0
Integrated Disposal Facility (IDF)	5,463	5,636	5,707	5,877	5,957	6,339	7,115	7,537	7,943	7,166
Low-Level and Mixed Low-Level Waste Disposal	0	0	0	0	0	0	0	0	0	0
Mixed Waste Disposal Trenches	0	0	0	0	0	0	0	0	0	0
Sludge Disposition	0	0	0	0	0	0	0	0	0	0
Site-wide Services - RL-0013	91,616	90,156	87,970	85,466	84,881	80,711	51,262	40,333	25,031	14,958
Total	**300,691**	**307,746**	**308,287**	**310,323**	**315,961**	**292,904**	**195,250**	**156,571**	**93,199**	**75,474**

Table E-8. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (6 pages)

Fiscal Year	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Project Management	24,663	24,397	25,628	24,741	24,821	27,365	21,430	21,368	17,310	18,477
Capsule Storage and Disposal	0	0	3	0	13	0	0	0	0	0
Canister Storage Building (CSB)	22,790	23,621	614	1	0	0	0	0	0	0
Mixed Low Level Waste Treatment	921	936	1,007	1,104	3	0	0	0	0	0
TRU Retrieval of Stored Waste	0	0	0	0	0	0	0	0	0	0
Waste Receiving and Processing Facility (WRAP)	0	0	0	0	0	0	0	0	0	0
T-Plant	2,358	5,934	5,820	7,553	13,889	21,205	19,489	17,104	10,909	4,946
Central Waste Complex (CWC)	0	0	0	0	0	0	0	0	0	0
Environmental Restoration Disposal Facility (ERDF)	220	220	240	265	281	302	321	320	335	339
Liquid Effluent Facilities	0	0	0	0	0	0	0	0	0	15,891
Integrated Disposal Facility (IDF)	7,120	7,180	7,768	8,657	9,258	10,234	10,544	10,389	28	0
Low-Level and Mixed Low-Level Waste Disposal	0	0	0	0	0	0	0	0	0	0
Mixed Waste Disposal Trenches	0	0	0	0	0	0	0	0	0	0
Sludge Disposition	0	0	0	0	0	0	0	0	0	0
Site-wide Services - RL-0013	11,710	10,831	5,868	7,588	7,977	10,056	10,761	11,731	5,739	11,530
Total	**69,782**	**73,119**	**46,948**	**49,909**	**56,242**	**69,162**	**62,545**	**60,912**	**34,321**	**51,183**

Table E-8. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (6 pages)

Fiscal Year	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060
Project Management	15,518	15,564	16,542	16,500	13,226	15,149	15,463	14,771	6,173	7,548
Capsule Storage and Disposal	0	0	0	0	0	0	0	0	0	0
Canister Storage Building (CSB)	0	0	0	0	0	0	0	0	0	0
Mixed Low-Level Waste Treatment	0	0	0	0	0	0	0	0	0	0
TRU Retrieval of Stored Waste	0	0	0	0	0	0	0	0	0	0
Waste Receiving and Processing Facility (WRAP)	0	0	0	0	0	0	0	0	0	0
T-Plant	169	133	0	0	0	0	0	0	0	0
Central Waste Complex (CWC)	0	0	0	0	0	0	0	0	0	0
Environmental Restoration Disposal Facility (ERDF)	12,096	323	345	315	129	0	0	0	0	0
Liquid Effluent Facilities	71,745	70,789	75,979	69,173	70,728	81,973	83,658	79,444	32,511	35,792
Integrated Disposal Facility (IDF)	0	0	0	0	0	0	0	0	0	0
Low-Level and Mixed Low-Level Waste Disposal	0	0	0	0	0	0	0	0	0	0
Mixed Waste Disposal Trenches	0	0	0	0	0	0	0	0	0	0
Sludge Disposition	0	0	0	0	0	0	0	0	0	0
Site-wide Services - RL-0013	31,635	26,067	27,736	15,947	13,889	22,464	22,806	17,981	6,997	12,429
Total	**131,162**	**112,876**	**120,602**	**101,935**	**97,972**	**119,586**	**121,927**	**112,196**	**45,680**	**55,770**

Table E-8. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (6 pages)

Fiscal Year	Total
Project Management	**1,432,723**
Capsule Storage and Disposal	**256,477**
Canister Storage Building (CSB)	**601,985**
Mixed Low-Level Waste Treatment	**22,554**
TRU Retrieval of Stored Waste	**104,154**
Waste Receiving and Processing Facility (WRAP)	**97,110**
T-Plant	**2,857,865**
Central Waste Complex (CWC)	**240,918**
Environmental Restoration Disposal Facility (ERDF)	**55,980**
Liquid Effluent Facilities	**827,245**
Integrated Disposal Facility (IDF)	**219,713**
Low-Level and Mixed Low-Level Waste Disposal	**2,457**
Mixed Waste Disposal Trenches	**7,408**
Sludge Disposition	**467,452**
Site-wide Services - RL-0013	**2,014,368**
Total	**9,208,409**

PBS = project baseline summary.
TRU = transuranic.

Table E-9. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (3 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
1	**Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C)**							
2	**Project Management**	**19,896**	**23,074**	**22,761**	**25,158**	**26,879**	**30,551**	**148,319**
3	Project Management	19,896	16,068	16,029	16,414	16,833	17,003	**102,243**
3	Cost and/or Schedule Uncertainty - Project Management	0	0	374	397	434	423	**1,628**
3	Management Reserve - Project Management	0	7,006	6,359	8,347	9,613	13,125	**44,450**
2	**Capsule Storage and Disposal**	**7,809**	**5,288**	**14,064**	**23,085**	**32,000**	**70,929**	**153,175**
3	WESF Base Operations	4,878	5,288	5,275	5,402	5,539	5,595	**31,977**
3	WESF Upgrades	2,932	0	6,258	718	3	0	**9,911**
3	Transition WESF	0	0	0	0	0	0	**0**
3	Cesium/Strontium Capsule Disposition	0	0	1,661	14,604	21,410	57,060	**94,735**
3	Cost and/or Schedule Uncertainty - Capsule Storage and Disposal	0	0	870	2,361	5,048	8,273	**16,552**
2	**Canister Storage Building (CSB)**	**4,415**	**4,786**	**4,959**	**5,072**	**7,639**	**7,216**	**34,087**
3	CSB Legacy	4,206	4,559	4,548	4,657	4,776	4,825	**27,571**
3	100% 200 Area Interim Storage Area	210	227	227	232	238	240	**1,374**
3	Fuel Preparation Facility	0	0	0	0	2,369	1,891	**4,260**
3	Off Site SNF Disposition	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - CSB	0	0	185	182	256	260	**883**
2	**Mixed Low-Level Waste Treatment**	**0**	**356**	**433**	**447**	**458**	**464**	**2,158**
3	Non-Thermal Treatment	0	356	355	363	373	376	**1,823**
3	Cost and/or Schedule Uncertainty - Mixed Low-Level Waste Treatment	0	0	78	83	86	87	**334**
2	**TRU Retrieval of Stored Waste**	**49,389**	**0**	**24,310**	**10,391**	**12,801**	**2,622**	**99,513**
3	Contact-Handled Waste Retrieval Operations	40,245	0	22,686	9,883	10,176	0	**82,990**
3	Remote-Handled Waste Retrieval Operations	9,144	0	0	0	1,633	1,650	**12,427**
3	Cost and/or Schedule Uncertainty - TRU Retrieval of Stored Waste	0	0	1,624	508	992	972	**4,096**
2	**Waste Receiving and Processing Facility (WRAP)**	**16,112**	**9,803**	**18,153**	**18,589**	**19,062**	**15,365**	**97,084**
3	WRAP Transition	0	0	0	0	0	14,187	**14,187**
3	Min-Safe Operation	1,387	1,503	1,500	1,536	1,575	0	**7,501**
3	WRAP Base Operations	14,725	8,300	15,923	16,306	16,722	0	**71,976**
3	Cost and/or Schedule Uncertainty - WRAP	0	0	730	747	764	1,178	**3,419**

Table E-9. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (3 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
2	**T-Plant**	**13,251**	**14,372**	**17,603**	**18,094**	**18,572**	**45,499**	**127,391**
3	T-Plant Base Operations	13,251	14,372	14,337	14,681	15,056	15,208	**86,905**
3	T-Plant Upgrades	0	0	0	0	0	1,366	**1,366**
3	T-Plant Transition	0	0	0	0	0	0	**0**
3	T-Plant M-91 Upgrades	0	0	0	0	0	18,861	**18,861**
3	T-Plant Spent Nuclear Fuel Support	0	0	0	0	0	0	**0**
3	Remote-Handled Waste Shipments from M-91	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - T-Plant	0	0	3,266	3,413	3,516	10,064	**20,259**
2	**Central Waste Complex (CWC)**	**14,312**	**15,320**	**13,743**	**11,197**	**11,459**	**12,043**	**78,074**
3	CWC Base Operations	7,832	8,490	8,469	8,673	8,894	8,984	**51,342**
3	CWC CENRTC	261	0	0	0	0	298	**559**
3	Alternate Contact-Handled TRU Shipping Facility	3,689	4,560	2,772	22	0	0	**11,043**
3	CWC Transition	0	0	0	0	0	0	**0**
3	Low-Level Waste Burial Grounds Base Operations	2,531	2,270	2,264	2,319	2,378	2,563	**14,325**
3	Cost and/or Schedule Uncertainty - CWC	0	0	237	183	187	198	**805**
2	**Environmental Restoration Disposal Facility (ERDF)**	**38**	**87**	**362**	**238**	**243**	**5,846**	**6,814**
3	ERDF Cell Expansion	0	0	0	0	0	4,612	**4,612**
3	ERDF Interim Cover	0	0	0	0	0	0	**0**
3	ERDF Operations	38	87	87	89	91	92	**484**
3	Cost and/or Schedule Uncertainty - ERDF	0	0	275	149	152	1,142	**1,718**
2	**Liquid Effluent Facilities**	**18,232**	**19,763**	**30,006**	**33,605**	**32,754**	**5,202**	**139,562**
3	200 Area Liquid Effluent Facilities Base Operations	18,145	19,669	19,621	20,093	20,605	5,202	**103,335**
3	200 Area Liquid Effluent Facilities Upgrades	0	0	7,787	10,583	9,151	0	**27,521**
3	200 Area Liquid Effluent Facilities CENRTC	87	94	94	96	99	0	**470**
3	Cost and/or Schedule Uncertainty - Liquid Effluent Facilities	0	0	2,504	2,833	2,899	0	**8,236**
2	**Integrated Disposal Facility (IDF)**	**453**	**491**	**501**	**515**	**528**	**833**	**3,321**
3	IDF Construction	0	0	0	0	0	0	**0**
3	IDF Operations	363	394	393	402	413	421	**2,386**
3	IDF Regulatory and Safety	90	97	97	100	102	394	**880**

Table E-9. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (3 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
3	Integrated Disposal Facility - East (IDFE)	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - IDF	0	0	10	13	14	17	**54**
2	**Low-Level and Mixed Low-Level Waste Disposal**	**0**	**0**	**278**	**292**	**300**	**362**	**1,232**
3	Cost and/or Schedule Uncertainty - Low-Level and Mixed Low-Level Waste Disposal	0	0	278	292	300	362	**1,232**
2	**Mixed Waste Disposal Trenches**	**1,206**	**690**	**1,305**	**705**	**723**	**730**	**5,359**
3	Mixed Waste Disposal Trenches Base Operations	636	690	688	705	723	730	**4,172**
3	Mixed Waste Disposal Trenches Upgrades	570	0	616	0	0	0	**1,186**
2	**Sludge Disposition**	**0**	**0**	**4,653**	**6,425**	**13,585**	**38,096**	**62,759**
3	Cost and/or Schedule Uncertainty – Sludge Disposition	0	0	0	0	0	0	**0**
3	Sludge Treatment Project – Phase 2 Treatment and Package	0	0	4,653	6,425	13,585	28,099	**52,762**
3	Shutdown and Deactivation	0	0	0	0	0	0	**0**
3	STP Management and Support	0	0	0	0	0	9,997	**9,997**
2	**Site-wide Services - RL-0013**	**36,501**	**48,970**	**39,248**	**40,179**	**39,266**	**41,375**	**245,539**
3	Site-wide Services - RL-0013	36,501	48,970	39,248	40,179	39,266	41,375	**245,539**
Total		**181,614**	**143,000**	**192,379**	**193,990**	**216,271**	**277,134**	**1,204,388**

CENRTC = capital equipment not related to construction.
CSB = Canister Storage Building.
CWC = Central Waste Complex.
ERDF = Environmental Restoration Disposal Facility.
IDF = Integrated Disposal Facility.
IDFE = Integrated Disposal Facility – East.
PBS = project baseline summary.
SNF = spent nuclear fuel.
TRU = transuranic.
WESF = Waste Encapsulation Storage Facility.
WRAP = Waste Receiving and Processing (Facility).

E.1.4 SAFEGUARDS AND SECURITY (PBS RL-0020) SCHEDULE AND COST DETAILS

Scope information for Safeguards and Security, PBS RL-0020, is presented in Table E-10. This PBS is not broken down to Level 3 details, so no additional scope is presented; however, both near-term and remaining estimated cleanup cost information is provided.

Table E-10. Safeguards and Securities (PBS RL-0020) Level 2 Scope Summary.

Work Element	Scope Description
Safeguards and Security	This work element includes management, training, and equipment for staff; physical protective systems, such as intrusion protection, Hanford Site access, and badging; information and cyber security; personnel security; material control and accountability; and security program management.
PBS = project baseline summary.	

Table E-11. Safeguards and Security (PBS RL-0020) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated).

Fiscal Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Safeguards and Security	69,234	69,234	64,826	66,917	68,179	70,109	71,884	73,691	69,121	71,327
Fiscal Year	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Safeguards and Security	73,063	74,947	76,744	45,771	46,817	48,481	49,943	51,748	53,065	54,806
Fiscal Year	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Safeguards and Security	56,398	58,300	59,814	61,440	63,334	65,777	67,550	69,032	42,920	44,384
Fiscal Year	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**
Safeguards and Security	44,451	46,360	47,490	49,951	50,604	54,048	58,400	61,793	65,227	69,427
Fiscal Year	**2051**	**2052**	**2053**	**2054**	**2055**	**2056**	**2057**	**2058**	**2059**	**2060**
Safeguards and Security	72,559	77,690	80,432	86,549	88,073	90,099	92,171	94,291	95,850	95,657
	Total									
	3,279,975									

E.1.5 SOIL AND WATER REMEDIATION–GROUNDWATER / VADOSE ZONE (PBS RL-0030) SCHEDULE AND COST DETAILS

Table E-12. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Level 3 Scope Summary. (5 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
Integration and Assessments	Strategic Integration	Coordinates and focuses on site characterization and assessment efforts to ensure consistency and technical defensibility in the application of CERCLA processes, eliminate information gaps and overlaps, apply science and technology new to Hanford, foster technical peer review, integrate remediation decisions, and develop necessary and sufficient strategies.
	Technical Integration	
	Remediation Decision Support	
	Remediation Science and Technology	
	Sample and Data Management	
	Environmental Databases	
	Value Engineering Studies	
Recharge Control	Recharge Commons	Annually prepare a prioritized list of recommended service water line upgrades or storm water runoff control projects to eliminate artificial recharge.
Drilling	100-KR-4 Drilling	Planning, coordinating, and implementing well drilling and well decommissioning for Hanford Site wells according to project-specific requirements.
	100-HR-3 Drilling	
	200-BP-5 Drilling	
	200-PO-1 Drilling	
	200-UP-1 Drilling	
	200-ZP-1 Drilling	
	200-ZP-2 Drilling	
	TPA M-24-00 Well Drilling	
	Miscellaneous Well Drilling	
	Decommission Non-Tank Farm Wells	
	300-FF-5 Well Drilling	
	100-NR-2 Drilling	
	100-BC-5 Well Drilling	
	100-FR-3 Well Drilling	
Project Management	Project Management and Support	Planning, management direction, evaluation, and management system outputs for this PBS.
	Project Management and Support – Training	
Integrated Field Work (IFW)	IFW – Operations and Maintenance	Includes general and common activities, services, infrastructure, material, equipment, labor, and contracts used to plan, support, and perform non-OU specific field work, including non-OU-related well maintenance, monitoring, and reporting.
	IFW – Training	
	IFW – GRP Field Work Projects	
	IFW – Field Equipment Purchases (CENRTC)	
	Non-OU-Related Well Maintenance and Monitoring and Reporting	
Groundwater Monitoring and Performance	Modutanks	The scope of these activities cross-cut and support multiple projects in PBS RL-0030.
	RCRA Monitoring and Reporting	
	RCRA Field Support	

Table E-12. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Level 3 Scope Summary. (5 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
Assessments	Hanford Geotechnical	
	Groundwater Monitoring/Performance Assessment Project Management	
100-BC-5 Operable Unit	100-BC-5 Operable Unit Project Management	Scope includes project management, decision documents for final remedy, remedial actions, well support, monitoring and reporting, modifications and expansions, and field studies and deployment.
	100-BC-5 Decision Documentation	
	100-BC-5 Remedial Actions (Interim and Final)	
	100-BC-5 Well Support	
	100-BC-5 Monitoring and Reporting	
	100-BC-5 Modifications and Expansions	
	100-BC-5 Field Studies and Deployment	
100-KR-4 Operable Unit	100-KR-4 Operable Unit Project Management	Scope includes project management, decision documents for final remedy, remedial actions, well support, monitoring and reporting, modifications and expansions, field studies and deployment, and final deactivation and decommissioning of remedy components.
	100-KR-4 Decision Documentation	
	100-KR-4 Remedial Actions (Interim and Final)	
	100-KR-4 Well Support	
	100-KR-4 Monitoring and Reporting	
	100-KR-4 Modifications and Expansions	
	100-KR-4 Field Studies and Deployment	
	100-KR-4 D&D	
100-NR-2 Operable Unit	100-NR-2 Project Management	Scope includes project management, decision documents for final remedy, remedial actions, well support, monitoring and reporting, modifications and expansions, field studies and deployment, and final deactivation and decommissioning of remedy components.
	100-NR-2 Decision Documentation	
	100-NR-2 Remedial Actions (Interim and Final)	
	100-NR-2 Well Support	
	100-NR-2 Monitoring and Reporting	
	100-NR-2 Modifications and Expansions	
	100-NR-2 Field Studies and Deployment	
	100-NR-2 D&D	
100-HR-3 Operable Unit	100-HR-3 Project Management	Scope includes project management, decision documents for final remedy, remedial actions, well support, monitoring and reporting, modifications and expansions, field studies and deployment, and final deactivation and decommissioning of remedy components.
	100-HR-3 Decision Documentation	
	100-HR-3 Remedial Actions (Interim and Final)	
	100-HR-3 Well Support	

Table E-12. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Level 3 Scope Summary. (5 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
	100-HR-3 Monitoring and Reporting	
	100-HR-3 Modifications and Expansions	
	100-HR-3 Field Studies and Deployment	
	100-HR-3 D&D	
100-FR-3 Operable Unit	100-FR-3 OU Project Management	Scope includes project management, decision documents for final remedy, remedial actions, well support, monitoring and reporting, and modifications and expansions.
	100-FR-3 Decision Documentation	
	100-FR-3 Remedial Actions (Interim and Final)	
	100-FR-3 Well Support	
	100-FR-3 Monitoring and Reporting	
	100-FR-3 Modifications and Expansions	
200-BP-5 Operable Unit	200-BP-5 Project Management	Scope includes project management, decision documents for final remedy, remedial actions, well support, and field studies and deployment.
	200-BP-5 Decision Documentation	
	200-BP-5 Remedial Actions (Interim and Final)	
	200-BP-5 Well Support	
	200-BP-5 Field Studies and Deployment	
200-PO-1 Operable Unit	200-PO-1 Project Management	Scope includes project management, decision documents for final remedy, and well support.
	200-PO-1 Decision Documentation	
	200-PO-1 Well Support	
200-UP-1 Operable Unit	200-UP-1 Project Management	Scope includes project management, decision documents for final remedy, remedial actions, well support, monitoring and reporting, modifications and expansions, and final deactivation and decommissioning of remedy components.
	200-UP-1 Decision Documentation	
	200-UP-1 Remedial Actions (Interim and Final)	
	200-UP-1 Well Support	
	200-UP-1 Monitoring and Reporting	
	200-UP-1 D&D	
	200-UP-1 Modifications and Expansions	
200-ZP-1 Operable Unit	200-ZP-1 Project Management	Scope includes project management, decision documents for final remedy, remedial actions, monitoring and reporting, modifications and expansions, and final deactivation and decommissioning of remedy components.
	200-ZP-1 Decision Documentation	
	200-ZP-1 Remedial Actions (Interim and Final)	
	200-ZP-1 Monitoring and Reporting	
	200-ZP-1 D&D	
	200-ZP-1 Modifications and Expansions	

Table E-12. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Level 3 Scope Summary. (5 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
200-ZP-2 Operable Unit (now 200-PW-1 Operable Unit)	200-ZP-2 Project Management	Scope includes project management, remedial actions, well support, and final deactivation and decommissioning of remedy components.
	200-ZP-2 Remedial Actions (Interim and Final)	
	200-ZP-2 Well Support	
	200-ZP-2 D&D	
300-FF-5 Operable Unit	300-FF-5 Project Management	Scope includes project management, decision documents for final remedy, well support, remedial actions, monitoring and reporting, and field studies and deployment.
	300-FF-5 Decision Documentation	
	300-FF-5 Well Support	
	300-FF-5 Remedial Actions (Interim and Final)	
	300-FF-5 Monitoring and Reporting	
	300-FF-5 Field Studies and Deployment	
Regulatory Decisions [1]	B/C Cribs and Trenches Area Remediation	Scope includes CERCLA and RCRA assessment activities for the Central Plateau source operable units, including project management, planning, documentation, and field and other activities necessary to complete the final remedy decision process.
	200-CW-1/3 Gable Mountain	
	200-CW-2/4/5	
	200-TW-1/2 Scavenged Waste	
	200-PW-2/4 Uranium-Rich Process	
	200-PW-1 Plutonium-Rich Waste Group	
	200-LW-1/2 200A Chem Lab Waste Group	
	200-UR-1 Unplanned Releases Waste Group	
	200-SW-1/2 Solid Waste Disposal Areas	
	200-IS-1 Tanks, Lines, Pits and Boxes	
	200-BP1-1 Hanford Prototype Barrier	
	Burial Ground Sampling and Analysis	
	Model Group DQO/SAPs	
	200-MW-1 Misc. Waste Group Closure	
	200-CS-1 Chemical Sewer	
Deep Vadose Zone Treatability Tests	Deep Vadose Zone Treatability Tests	Scope includes planning for and conducting both laboratory and field treatability tests to investigate options for remediating the deep vadose zone in the Central Plateau.
Deep Vadose Zone Operable Unit	Deep Vadose Zone Decision Documentation	The Deep Vadose Zone Operable Unit will address mitigation of the contamination present at the Hanford Site in the deep vadose zone. The initial action planned for this OU (project management, remedial actions, well support, etc.) will be addressed in the future.

Table E-12. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Level 3 Scope Summary. (5 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
Site-wide Services – RL-0030	Site-wide Services	Includes proportional share of indirect costs for site services and infrastructure, adders, and other indirect costs.

[1] Transition of scope, schedule, and cost information into the new Central Plateau operable units is not yet complete, so this information is presented by old operable units in the report.

CENRTC = capital equipment not related to construction.
CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act.*
D&D = deactivation and decommissioning.
DQO = data quality objective.
GRP = Groundwater Remediation Project.
IFW = Integrated Field Work.
OU = operable unit.
PBS = project baseline summary.
RCRA = *Resource Conservation and Recovery Act.*
SAP = Sampling and Analysis Plan.
TPA = Tri-Party Agreement.

Table E-13. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (6 pages)

Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Integration and Assessments	12,705	15,495	14,636	15,244	15,514	14,451	14,414	15,287	15,518	15,582
Recharge Control	21	23	23	23	24	24	24	26	26	27
Drilling	22,842	2,674	6,242	2,491	7,128	26,012	14,184	9,900	6,072	4,563
Project Management	22,891	21,677	21,413	23,255	21,932	21,441	19,974	16,005	20,146	24,429
Integrated Field Work	7,169	7,952	10,188	10,531	10,724	10,854	10,877	11,743	11,716	11,969
Groundwater Monitoring and Performance Assessments	11,933	13,280	13,373	22,436	14,503	14,249	14,264	15,387	15,335	15,658
100-BC-5 Operable Unit	1,127	1,331	465	2,465	2,505	5,785	3,400	2,659	2,542	2,601
100-KR-4 Operable Unit	8,324	8,718	12,997	11,795	13,735	24,638	22,613	10,180	9,180	8,433
100-NR-2 Operable Unit	2,734	774	14,763	20,232	12,585	4,819	4,154	12,788	13,566	13,239
100-HR-3 Operable Unit	27,008	11,452	17,575	14,499	37,807	26,861	12,016	23,313	15,767	3,014
100-FR-3 Operable Unit	389	7,053	10,632	6,580	4,807	3,324	3,013	2,938	2,650	2,631
200-BP-5 Operable Unit	326	361	6,069	24,249	11,214	10,406	11,133	12,674	7,598	7,370
200-PO-1 Operable Unit	527	4,064	5,858	5,020	11,148	3,426	1,988	15,403	17,000	1,376
200-UP-1 Operable Unit	22,281	8,289	5,522	3,284	3,138	2,958	4,172	4,238	3,176	3,330
200-ZP-1 Operable Unit	63,558	42,462	57,178	50,039	32,649	30,239	30,203	32,721	29,215	30,954
200-ZP-2 Operable Unit	1,208	1,340	1,322	5,034	1,412	1,576	1,581	1,638	1,526	1,559
300-FF-5 Operable Unit	1,415	4,947	3,944	6,663	3,396	2,663	1,992	1,563	1,250	1,256
Regulatory Decisions	2,612	961	6,160	3,134	1,724	558	4	0	0	35,519
Deep Vadose Zone Treatability Tests	9,508	9,537	10,268	2,243	7,349	0	0	0	0	0
Deep Vadose Zone Operable Unit	0	0	0	0	0	0	0	0	33,801	50,647
Site-wide Services - RL-0030	12,992	58,545	41,556	48,952	31,523	31,907	29,554	36,240	30,343	34,061
Total	**231,568**	**220,934**	**260,186**	**278,170**	**244,819**	**236,194**	**199,559**	**224,703**	**236,426**	**268,218**

Table E-13. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (6 pages)

Fiscal Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Integration and Assessments	15,933	14,383	14,436	15,041	15,459	15,747	16,678	17,196	17,663	18,208
Recharge Control	27	28	29	30	32	32	34	35	36	37
Drilling	3,909	9,049	8,599	8,408	7,983	12,485	6,493	6,992	7,086	7,228
Project Management	22,104	17,085	20,400	16,329	13,152	12,524	13,461	9,541	10,170	10,089
Integrated Field Work	12,453	12,854	13,152	13,721	14,340	12,219	12,393	11,085	11,414	11,789
Groundwater Monitoring and Performance Assessments	16,054	16,564	16,908	17,647	18,536	18,966	19,687	20,768	21,377	21,909
100-BC-5 Operable Unit	2,585	16,017	16,508	17,099	3,020	3,088	1,391	272	275	281
100-KR-4 Operable Unit	7,729	6,544	26,874	4,621	3,466	3,447	2,916	2,004	1,583	1,615
100-NR-2 Operable Unit	10,855	6,150	469	473	310	245	253	267	274	163
100-HR-3 Operable Unit	2,403	1,590	1,223	691	235	239	247	263	270	279
100-FR-3 Operable Unit	2,562	2,665	897	248	260	266	277	300	308	317
200-BP-5 Operable Unit	19,782	6,215	4,287	3,873	3,627	3,521	2,963	2,319	2,513	2,684
200-PO-1 Operable Unit	787	601	523	430	875	482	471	492	510	918
200-UP-1 Operable Unit	819	843	6,476	597	482	431	391	406	426	429
200-ZP-1 Operable Unit	31,666	32,394	33,139	33,901	34,681	35,479	36,295	37,130	37,983	38,857
200-ZP-2 Operable Unit	2,050	1,970	3,013	2,050	123	126	130	137	141	145
300-FF-5 Operable Unit	20,306	27,250	24,674	24,174	19,038	16,031	11,635	12,393	11,686	10,230
Regulatory Decisions	22,722	9,043	12,033	5,566	3,317	994	1,094	209	339	63
Deep Vadose Zone Treatability Tests	0	0	0	0	0	0	0	0	0	0
Deep Vadose Zone Operable Unit	51,725	53,359	26,084	25,968	11,685	1,018	1,232	67	26	0
Site-wide Services - RL-0030	33,064	35,179	33,649	26,626	24,677	25,177	25,805	29,880	30,974	31,025
Total	**279,535**	**269,784**	**263,373**	**217,495**	**175,296**	**162,516**	**153,848**	**151,756**	**155,054**	**156,267**

Table E-13. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (6 pages)

Fiscal Year	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Integration and Assessments	18,755	19,744	19,656	20,025	20,523	21,499	24,424	25,637	27,075	24,394
Recharge Control	39	40	40	41	42	44	50	53	22	0
Drilling	7,505	6,471	6,751	6,698	6,968	349	0	0	0	0
Project Management	5,594	5,576	5,739	5,866	4,889	7,592	6,901	8,647	6,878	6,238
Integrated Field Work	6,254	6,442	6,562	6,691	6,938	7,177	8,153	8,585	9,031	8,141
Groundwater Monitoring and Performance Assessments	22,652	23,277	23,816	24,271	24,748	25,906	29,448	31,056	32,715	29,630
100-BC-5 Operable Unit	291	299	299	318	320	333	378	403	426	383
100-KR-4 Operable Unit	225	166	166	167	171	180	203	213	224	202
100-NR-2 Operable Unit	118	121	112	114	117	123	140	147	155	139
100-HR-3 Operable Unit	291	304	306	308	313	330	375	398	419	376
100-FR-3 Operable Unit	329	341	347	355	315	327	372	377	397	357
200-BP-5 Operable Unit	1,556	1,164	474	377	385	404	458	489	513	465
200-PO-1 Operable Unit	532	548	559	570	1,044	616	724	759	782	1,238
200-UP-1 Operable Unit	454	419	419	437	443	464	409	414	435	265
200-ZP-1 Operable Unit	39,751	40,665	41,600	42,557	43,536	44,537	8,695	29	0	0
200-ZP-2 Operable Unit	149	178	111	113	115	121	138	145	153	138
300-FF-5 Operable Unit	7,984	6,904	3,597	261	182	189	212	228	246	221
Regulatory Decisions	11	11	12	12	12	12,059	5,547	1,614	7,697	10,303
Deep Vadose Zone Treatability Tests	0	0	0	0	0	0	0	0	0	0
Deep Vadose Zone Operable Unit	0	0	0	0	0	0	0	0	0	0
Site-wide Services - RL-0030	27,217	27,019	26,059	25,540	24,733	29,289	42,307	40,689	44,812	26,845
Total	**139,704**	**139,692**	**136,625**	**134,722**	**135,794**	**151,540**	**128,933**	**119,884**	**131,981**	**109,333**

Table E-13. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (6 pages)

Fiscal Year	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Integration and Assessments	24,081	24,362	25,127	27,586	29,296	29,618	29,400	28,982	29,189	29,440
Recharge Control	0	0	0	0	0	0	0	0	0	0
Drilling	0	0	0	0	0	0	0	0	0	0
Project Management	6,237	6,030	6,771	7,259	7,983	8,563	8,907	8,868	8,791	8,943
Integrated Field Work	8,035	8,169	8,876	9,852	10,499	11,708	12,109	11,949	12,026	12,130
Groundwater Monitoring and Performance Assessments	29,120	29,739	32,248	35,692	38,037	42,483	43,790	43,172	43,749	43,992
100-BC-5 Operable Unit	379	385	421	465	498	549	564	553	559	565
100-KR-4 Operable Unit	200	205	224	247	263	296	303	133	134	135
100-NR-2 Operable Unit	138	140	153	181	193	214	221	219	220	222
100-HR-3 Operable Unit	373	380	412	449	485	537	257	245	233	0
100-FR-3 Operable Unit	352	367	400	441	470	526	544	535	543	546
200-BP-5 Operable Unit	455	469	509	562	591	653	677	673	678	684
200-PO-1 Operable Unit	685	696	757	858	1,634	1,002	1,046	1,034	1,045	1,053
200-UP-1 Operable Unit	262	256	283	318	334	372	389	385	383	388
200-ZP-1 Operable Unit	0	0	0	0	0	0	0	0	0	0
200-ZP-2 Operable Unit	136	138	1	0	0	0	0	0	0	0
300-FF-5 Operable Unit	216	217	236	260	281	307	320	316	318	321
Regulatory Decisions	7,536	3,189	582	1	0	0	0	0	0	0
Deep Vadose Zone Treatability Tests	0	0	0	0	0	0	0	0	0	0
Deep Vadose Zone Operable Unit	0	0	0	0	0	0	0	0	0	0
Site-wide Services - RL-0030	20,833	19,237	24,738	32,077	35,773	43,389	45,698	49,700	45,075	40,356
Total	**99,038**	**93,979**	**101,738**	**116,249**	**126,336**	**140,216**	**144,225**	**146,766**	**142,942**	**138,775**

Table E-13. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (6 pages)

Fiscal Year	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060
Integration and Assessments	28,513	30,038	32,309	29,037	29,837	34,168	34,862	32,835	32,702	40,113
Recharge Control	0	0	0	0	0	0	0	0	0	0
Drilling	0	0	0	0	0	0	0	0	0	0
Project Management	8,876	9,522	9,579	8,679	8,786	9,821	9,133	8,602	8,567	10,508
Integrated Field Work	11,813	12,434	13,292	11,986	12,290	14,178	14,466	13,625	13,569	16,645
Groundwater Monitoring and Performance Assessments	42,655	44,678	48,015	43,362	44,556	50,624	51,652	48,649	48,451	59,432
100-BC-5 Operable Unit	548	574	619	563	571	658	672	633	630	773
100-KR-4 Operable Unit	133	138	148	134	136	152	155	146	146	179
100-NR-2 Operable Unit	216	227	236	211	217	247	252	238	237	290
100-HR-3 Operable Unit	0	0	0	0	0	0	0	0	0	0
100-FR-3 Operable Unit	529	558	597	538	555	633	646	608	606	743
200-BP-5 Operable Unit	664	679	723	668	692	782	798	752	749	918
200-PO-1 Operable Unit	1,023	1,078	1,150	1,046	1,065	1,231	1,256	1,183	1,178	1,445
200-UP-1 Operable Unit	374	390	425	379	393	475	463	436	434	533
200-ZP-1 Operable Unit	0	0	0	0	0	0	0	0	0	0
200-ZP-2 Operable Unit	0	0	0	0	0	0	0	0	0	0
300-FF-5 Operable Unit	315	324	352	320	329	369	376	354	353	433
Regulatory Decisions	0	0	0	0	0	0	0	0	0	0
Deep Vadose Zone Treatability Tests	0	0	0	0	0	0	0	0	0	0
Deep Vadose Zone Operable Unit	0	0	0	0	0	0	0	0	0	0
Site-wide Services - RL-0030	32,928	33,044	35,190	20,187	17,620	28,613	29,048	22,870	21,246	37,859
Total	**128,587**	**133,682**	**142,635**	**117,111**	**117,048**	**141,953**	**143,779**	**130,931**	**128,867**	**169,873**

Table E-13. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (6 pages)

Fiscal Year	Total
Integration and Assessments	**1,132,820**
Recharge Control	**936**
Drilling	**215,083**
Project Management	**592,365**
Integrated Field Work	**542,769**
Groundwater Monitoring and Performance Assessments	**1,470,448**
100-BC-5 Operable Unit	**100,045**
100-KR-4 Operable Unit	**196,935**
100-NR-2 Operable Unit	**124,672**
100-HR-3 Operable Unit	**203,543**
100-FR-3 Operable Unit	**66,369**
200-BP-5 Operable Unit	**162,844**
200-PO-1 Operable Unit	**100,736**
200-UP-1 Operable Unit	**83,518**
200-ZP-1 Operable Unit	**1,012,114**
200-ZP-2 Operable Unit	**29,714**
300-FF-5 Operable Unit	**232,849**
Regulatory Decisions	**154,638**
Deep Vadose Zone Treatability Tests	**38,904**
Deep Vadose Zone Operable Unit	**255,612**
Site-wide Services - RL-0030	**1,601,720**
Total	**8,318,635**

Table E-14. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (7 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
1	**Soil and Water Remediation-Groundwater/Vadose Zone, PBS RL-0030**							
2	**Integration and Assessments**	**12,705**	**15,495**	**14,636**	**15,244**	**15,514**	**14,451**	**88,045**
3	Strategic Integration	979	1,294	1,059	1,324	1,126	1,137	**6,919**
3	Technical Integration	2,364	2,567	2,186	2,247	2,325	2,347	**14,036**
3	Remediation Decision Support	1,912	2,076	1,684	1,731	1,790	639	**9,832**
3	Remediation Science and Technology	3,569	3,877	3,862	3,970	4,106	4,146	**23,530**
3	Sample and Data Management	948	1,297	1,292	1,328	1,374	1,387	**7,626**
3	Environmental Databases	2,664	3,582	3,569	3,668	3,795	3,831	**21,109**
3	Value Engineering Studies	271	294	293	301	311	314	**1,784**
3	Cost and/or Schedule Uncertainty – Integration and Assessments	0	508	692	675	687	649	**3,211**
2	**Recharge Control**	**21**	**23**	**23**	**23**	**24**	**24**	**138**
3	Recharge Commons	21	23	23	23	24	24	**138**
2	**Drilling**	**22,842**	**2,674**	**6,242**	**2,491**	**7,128**	**26,012**	**67,389**
3	100-KR-4 Drilling	2,116	0	0	351	0	0	**2,467**
3	100-HR-3 Drilling	2,430	0	0	0	0	1,704	**4,134**
3	200-BP-5 Drilling	17	0	0	0	0	3,155	**3,172**
3	200-PO-1 Drilling	1,200	0	0	0	0	2,228	**3,428**
3	200-UP-1 Drilling	0	0	0	0	0	10,782	**10,782**
3	200-ZP-1 Drilling	8,071	322	3,755	1	0	0	**12,149**
3	200-ZP-2 Drilling	0	0	0	0	0	0	**0**
3	TPA M-24-00 Well Drilling	2,461	2,065	2,117	2,072	2,408	2,542	**13,665**
3	Miscellaneous Well Drilling	0	0	0	0	0	122	**122**
3	Decommission Non-Tank Farm Wells	5,158	0	0	0	0	0	**5,158**
3	300-FF-5 Well Drilling	74	0	0	0	4,637	4,841	**9,552**
3	100-NR-2 Drilling	430	0	0	0	0	0	**430**
3	100-BC-5 Well Drilling	95	0	0	0	0	0	**95**
3	100-FR-3 Well Drilling	790	0	0	0	0	0	**790**
3	Cost and/or Schedule Uncertainty - Drilling	0	287	370	67	83	639	**1,446**

Table E-14. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (7 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
2	**Project Management**	**22,891**	**21,677**	**21,413**	**23,255**	**21,932**	**21,441**	**132,609**
3	Project Management and Support	7,169	7,786	10,248	10,534	10,896	11,002	**57,635**
3	Project Management and Support - Training	164	178	854	878	908	917	**3,899**
3	Cost and/or Schedule Uncertainty - Project Management	0	0	258	334	388	440	**1,420**
3	Management Reserve - Project Management	15,558	13,713	10,053	11,510	9,740	9,083	**69,657**
2	**Integrated Field Work**	**7,169**	**7,952**	**10,188**	**10,531**	**10,724**	**10,854**	**57,418**
3	IFW - Operations and Maintenance	4,328	4,700	6,287	6,462	6,684	6,749	**35,210**
3	Integrated Field Work - Training	1,755	1,906	2,509	2,579	2,668	2,694	**14,111**
3	IFW - GRP Field Work Projects	782	850	847	870	900	909	**5,158**
3	IFW - Field Equipment Purchases (CENRTC)	178	194	193	198	0	0	**763**
3	Non OU Related Well Maintenance and Monitoring and Reporting	127	138	135	139	144	145	**828**
3	Cost and/or Schedule Uncertainty - Integrated Field Work	0	165	218	283	327	357	**1,350**
2	**Groundwater Monitoring and Performance Assessments**	**11,933**	**13,280**	**13,373**	**22,436**	**14,503**	**14,249**	**89,774**
3	Modutanks	0	0	73	5,829	0	0	**5902**
3	RCRA Monitoring and Reporting	9,065	9,849	9,808	10,082	10,428	10,525	**59,757**
3	RCRA Field Support	2,586	2,808	2,798	2,876	2,975	3,004	**17,047**
3	Hanford Geotechnical	71	77	76	79	81	82	**466**
3	GM/PA Project Management	211	230	229	235	243	246	**1,394**
3	Cost and/or Schedule Uncertainty - Groundwater Monitoring and Performance Assessments	0	317	389	3,336	775	393	**5,210**
2	**100-BC-5 Operable Unit**	**1,127**	**1,331**	**465**	**2,465**	**2,505**	**5,785**	**13,678**
3	100-BC-5 OU Project Management	52	56	56	58	60	60	**342**
3	100-BC-5 Decision Documentation	971	248	100	756	0	0	**2075**
3	100-BC-5 Remedial Actions (Interim and Final)	0	0	0	0	0	0	**0**
3	100-BC-5 Well Support	50	54	54	55	57	57	**327**

Table E-14. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (7 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
3	100-BC-5 Monitoring and Reporting	54	59	58	60	62	63	**356**
3	100-BC-5 Modifications and Expansions	0	0	0	0	0	3,704	**3,704**
3	100-BC-5 Field Studies and Deployment	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - 100-BC-5 Operable Unit	0	914	198	1,537	2,327	1,902	**6,878**
2	**100-KR-4 Operable Unit**	**8,324**	**8,718**	**12,997**	**11,795**	**13,735**	**24,638**	**80,207**
3	100-KR-4 Project Management	336	365	364	374	387	391	**2,217**
3	100-KR-4 Decision Documentation	0	529	527	356	782	0	**2,194**
3	100-KR-4 Remedial Actions (Interim and Final)	5,501	5,392	5,371	4,863	5,016	5,065	**31,208**
3	100-KR-4 Well Support	79	88	88	90	93	94	**532**
3	100-KR-4 Monitoring and Reporting	183	174	255	262	271	274	**1,419**
3	100-KR-4 Modifications and Expansions	403	440	165	0	175	5,770	**6,953**
3	100-KR-4 Field Studies and Deployment	1,823	1,730	0	0	0	0	**3,553**
3	100-KR-4 D&D	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - 100-KR-4 Operable Unit	0	0	6,227	5,851	7,011	13,044	**32,133**
2	**100-NR-2 Operable Unit**	**2,734**	**774**	**14,763**	**20,232**	**12,585**	**4,819**	**55,907**
3	100-NR-2 Project Management	168	182	182	187	193	195	**1107**
3	100-NR-2 Decision Documentation	227	101	584	0	0	0	**912**
3	100-NR-2 Remedial Actions (Interim and Final)	2,221	308	307	315	326	329	**3,806**
3	100-NR-2 Well Support	58	63	63	65	67	68	**384**
3	100-NR-2 Monitoring and Reporting	59	64	64	66	68	69	**390**
3	100-NR-2 Modifications and Expansions	0	0	0	0	0	0	**0**
3	100-NR-2 Field Studies and Deployment	0	56	633	3,448	1,704	180	**6021**
3	100-NR-2 D&D	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - 100-NR-2 Operable Unit	0	0	12,931	16,152	10,226	3,978	**43,287**
2	**100-HR-3 Operable Unit**	**27,008**	**11,452**	**17,575**	**14,499**	**37,807**	**26,861**	**135,202**
3	100-HR-3 Project Management	328	356	355	365	377	381	**2162**
3	100-HR-3 Decision Documentation	648	476	306	756	0	0	**2186**

Table E-14. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (7 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
3	100-HR-3 Remedial Actions (Interim and Final)	7,892	8,984	8,856	6,697	6,919	6,078	**45,426**
3	100-HR-3 Well Support	132	164	164	168	174	176	**978**
3	100-HR-3 Monitoring and Reporting	277	301	575	591	612	616	**2,972**
3	100-HR-3 Modifications and Expansions	17,732	121	436	1,843	1,790	851	**22,773**
3	100-HR-3 Field Studies and Deployment	0	436	346	22	23	23	**850**
3	100-HR-3 D&D	0	0	1,324	0	0	0	**1,324**
3	Cost and/or Schedule Uncertainty - 100-HR-3 Operable Unit	0	614	5,214	4,056	27,912	18,737	**56,533**
2	**100-FR-3 Operable Unit**	**389**	**7,053**	**10,632**	**6,580**	**4,807**	**3,324**	**32,785**
3	100-FR-3 OU Project Management	87	94	94	97	100	83	**555**
3	100-FR-3 Decision Documentation	181	727	480	596	166	0	**2,150**
3	100-FR-3 Remedial Actions (interim and final)	0	0	1,443	1,988	2,057	2,077	**7,565**
3	100-FR-3 Well Support	61	66	66	68	70	71	**402**
3	100-FR-3 Monitoring and Reporting	60	65	65	66	69	69	**394**
3	100-FR-3 Modifications and Expansions	0	4,375	1,107	0	0	0	**5,482**
3	Cost and/or Schedule Uncertainty - 100-FR-3 Operable Unit	0	1,725	7,378	3,765	2,346	1,025	**16,239**
2	**200-BP-5 Operable Unit**	**326**	**361**	**6,069**	**24,249**	**11,214**	**10,406**	**52,625**
3	200-BP-5 Project Management	141	154	201	207	214	215	**1,132**
3	200-BP-5 Decision Documentation	0	0	635	7,915	1,125	394	**10,069**
3	200-BP-5 Remedial Actions (Interim and Final)	0	0	3,602	7,097	5,855	5,912	**22,466**
3	200-BP-5 Well Support	185	200	200	205	212	214	**1,216**
3	200-BP-5 Field Studies and Deployment	0	0	0	4,872	0	0	**4,872**
3	Cost and/or Schedule Uncertainty - 200-BP-5 Operable Unit	0	8	1,431	3,952	3,808	3,670	**12,869**
2	**200-PO-1 Operable Unit**	**527**	**4,064**	**5,858**	**5,020**	**11,148**	**3,426**	**30,043**
3	200-PO-1 Project Management	256	278	277	285	294	297	**1,687**
3	200-PO-1 Decision Documentation	0	0	0	1,488	1,441	571	**3,500**
3	200-PO-1 Well Support	271	315	314	323	334	337	**1,894**

Table E-14. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (7 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
3	Cost and/or Schedule Uncertainty - 200-PO-1 Operable Unit	0	3,471	5,267	2,925	9,079	2,221	**22,963**
2	**200-UP-1 Operable Unit**	**22,281**	**8,289**	**5,522**	**3,284**	**3,138**	**2,958**	**45,472**
3	200-UP-1 Project Management	187	203	202	208	215	217	**1232**
3	200-UP-1 Decision Documentation	0	2,145	1,026	273	216	0	**3660**
3	200-UP-1 Remedial Actions (Interim and Final)	626	5,203	3,538	2,281	2,396	2,419	**16463**
3	200-UP-1 Well Support	100	116	116	119	123	124	**698**
3	200-UP-1 Monitoring and Reporting	338	475	357	269	112	113	**1,664**
3	200-UP-1 D&D	0	0	0	0	0	0	**0**
3	200-UP-1 Modifications and Expansions	21,029	0	0	0	0	0	**21,029**
3	Cost and/or Schedule Uncertainty - 200-UP-1 Operable Unit	0	147	283	135	75	84	**724**
2	**200-ZP-1 Operable Unit**	**63,558**	**42,462**	**57,178**	**50,039**	**32,649**	**30,239**	**276,125**
3	200-ZP-1 Project Management	279	362	359	369	382	384	**2135**
3	200-ZP-1 Decision Documentation	2,809	2,581	2,281	3,043	2,614	2,639	**15,967**
3	200-ZP-1 Remedial Actions (Interim and Final)	4,673	26,331	27,793	24,891	24,690	24,580	**132,958**
3	200-ZP-1 Monitoring and Reporting	310	394	427	439	454	458	**2482**
3	200-ZP-1 D&D	0	0	0	0	0	0	**0**
3	200-ZP-1 Modifications and Expansions	55,488	12,794	22,270	18,525	0	0	**109,077**
3	Cost and/or Schedule Uncertainty - 200-ZP-1 Operable Unit	0	0	4,048	2,772	4,510	2,178	**13,508**
2	**200-ZP-2 Operable Unit**	**1,208**	**1,340**	**1,322**	**5,034**	**1,412**	**1,576**	**11,892**
3	200-ZP-2 Project Management	215	234	233	239	248	250	**1,419**
3	200-ZP-2 Remedial Actions (Interim and Final)	977	1,062	1,057	4,158	1,124	1,292	**9,670**
3	200-ZP-2 Well Support	15	16	0	0	0	0	**31**
3	200-ZP-2 D&D	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - 200-ZP-2 Operable Unit	0	28	32	637	40	34	**771**
2	**300-FF-5 Operable Unit**	**1,415**	**4,947**	**3,944**	**6,663**	**3,396**	**2,663**	**23,028**
3	300-FF-5 Project Management	252	274	273	280	290	293	**1,662**

Table E-14. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (7 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
3	300-FF-5 Decision Documentation	685	707	0	0	0	0	**1,392**
3	300-FF-5 Remedial Actions (Interim and Final)	0	0	0	0	0	0	**0**
3	300-FF-5 Wells Support	87	94	94	97	100	101	**573**
3	300-FF-5 Monitoring and Reporting	391	700	698	717	742	749	**3,997**
3	300-FF-5 Field Studies and Deployment	0	0	0	3,341	0	0	**3,341**
3	Cost and/or Schedule Uncertainty - 300-FF-5 Operable Unit	0	3,171	2,880	2,227	2,264	1,520	**12,062**
2	**Regulatory Decisions**	**2,612**	**961**	**6,160**	**3,134**	**1,724**	**558**	**15,149**
3	B/C Cribs and Trenches Area Remediation	34	0	0	0	0	0	**34**
3	200-CW-1/3 Gable Mountain	199	57	0	0	0	0	**256**
3	200-CW-2/4/5	5	0	0	0	0	0	**5**
3	200-TW-1/2 Scavenged Waste	0	0	0	0	0	0	**0**
3	200-PW-2/4 Uranium-Rich Process	0	0	0	0	0	0	**0**
3	200-PW-1 Pu-Rich Waste Group	60	0	0	0	0	0	**60**
3	200-LW-1/2 200A Chem Lab Waste Group	59	0	0	0	0	0	**59**
3	200-UR-1 Unplanned Releases Waste Group	95	0	0	0	0	0	**95**
3	200-SW-1/2 Solid Waste Disposal Areas	244	0	0	0	0	0	**244**
3	200-IS-1 Tanks, Lines, Pits and Boxes	144	0	0	0	0	0	**144**
3	200-BP1-1 Hanford Prototype Barrier	148	157	0	0	0	0	**305**
3	Burial Ground Sampling and Analysis	19	748	24	0	0	0	**791**
3	Model Group DQO/SAPs	1,442	0	0	0	0	0	**1,442**
3	200-MW-1 Misc. Waste Group Closure	139	0	0	0	0	0	**139**
3	200-CS-1 Chemical Sewer	25	0	0	0	0	0	**25**
3	Cost and/or Schedule Uncertainty - Regulatory Decisions	0	0	6,136	3,134	1,724	558	**11,552**
2	**Deep Vadose Zone Treatability Tests**	**9,508**	**9,537**	**10,268**	**2,243**	**7,349**	**0**	**38,905**
3	Deep Vadose Zone Treatability Tests	9,096	9,119	9,840	0	0	0	**28,055**
3	Cost and/or Schedule Uncertainty - Deep Vadose Zone Treatability Tests	412	418	428	2,243	7,349	0	**10,850**

Table E-14. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (7 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
2	**Deep Vadose Zone Operable Unit**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
3	Deep Vadose Zone Decision Documentation	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - Deep Vadose Zone Operable Unit	0	0	0	0	0	0	**0**
2	**Site-wide Services - RL-0030**	**12,992**	**58,545**	**41,556**	**48,952**	**31,523**	**31,907**	**225,475**
3	Site-wide Services - RL-0030	12,992	58,545	41,556	48,952	31,523	31,907	**225,475**
Total		**231,568**	**220,934**	**260,186**	**278,170**	**244,819**	**236,194**	**1,471,871**

CENRTC = capital equipment not related to construction.
D&D = decontamination and decommissioning.
DQO = data quality objective.
GM = groundwater monitoring.
GRP = Groundwater Remediation Project.
IFW = Integrated Field Work.
OU = operable unit.
PA = performance assessment.
PBS = performance baseline summary.
RCRA = *Resource Conservation and Recovery Act*.
SAP = Sampling and Analysis Plan.
TPA = Tri-Party Agreement.

E.1.6 NUCLEAR FACILITY D&D–REMAINDER OF HANFORD (PBS RL-0040) SCHEDULE AND COST DETAILS

Table E-15. Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) Level 3 Scope Summary. (3 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
Regulatory Decisions	Central Plateau Project Management	Provides for overall management function in support of the nuclear facility D&D mission on the Central Plateau.
	Central Plateau Engineering Studies	Provides for cross-cutting engineering and technical studies and trade-off evaluations necessary to optimize design and execution for Central Plateau facility and waste site remediation/restoration with consideration of groundwater and vadose zone remediation and ongoing operations.
	Emergency Response for Facility/Waste Site ESH&Q or Remediation – FY 2014 to FY 2048	Includes the tasks necessary to address aging facility or waste site conditions that are above and beyond anticipated operational and maintenance plans. Activities may include hazard removal, RTD, stabilization, or increased S&M of waste sites; or D&D or increased S&M of buildings. Activities are focused on unplanned or unforeseen facility or waste site conditions impacting safety, human health, or environment (e.g., major equipment failure, spread of contamination, structural failure).
	Canyon ROD	Planning activity that supports workscope in four Central Plateau zones (PUREX, B Plant, REDOX, T Plant) and a ROD for below-grade remediation of PFP; includes characterization, alternatives analysis, feasibility study/proposed plan development, document review cycles with Regulators, public comment, comment resolution, and disposition determination (primarily by CERCLA ROD) for the canyons.
Zone Environmental Remediation	For each closure zone, provides for remediation definition, remediation of pipelines, installation of barriers, utility relocations, post-ROD confirmatory sampling, S&M/O&M of installed barriers, and zone closure activities. Potential waste site remediation range includes no action, in situ treatment (e.g., grouting), monitored natural attenuation, capping, RTD, or combinations of these techniques. Buildings and structures are assumed to undergo D4 activities, including demolition to slab-on-grade. Below-grade portions will be addressed through the waste site cleanup. Actual remedial actions will be determined through the appropriate decision process and applied through a geographical implementation strategy. The information in this table is a summary of the planning assumptions.	
	Zone 1, 200-E Admin Zone	This zone contains waste sites, buildings and structures, and pipelines that will be addressed through zone closure.
	Zone 2, 200-E Ponds Zone	This zone contains waste sites, buildings and structures, and pipelines that will be addressed through zone closure. This is the largest remediation zone on the Central Plateau. This zone also constitutes a considerable portion of the newly-defined Outer Zone under DOE/RL-2009-81.
	Zone 3, 200-W Ponds Zone	This zone contains waste sites, buildings and structures, and pipelines that will be addressed through zone closure.

Table E-15. Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) Level 3 Scope Summary. (3 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
	Zone 4, B Farm Zone	This zone contains waste sites, buildings and structures, and pipelines that will be addressed through zone closure. This zone also contains a tank farm and will require remedial coordination with the tank farm cleanup efforts.
	Zone 5, B Plant Zone	This zone contains a canyon (B Plant), waste sites, buildings and structures, and pipelines that will be addressed through zone closure.
	Zone 6, C Farm Zone	This zone contains waste sites, buildings and structures, pipelines, and utility relocations that will be addressed through zone closure. This zone also contains a tank farm (C Farm) and will require remedial coordination with the tank farm cleanup efforts.
	Zone 7, CSB Zone	This zone contains waste sites and buildings and structures that will be addressed through zone closure.
	Zone 8, ERDF Zone	This zone contains waste sites and buildings and structures that will be addressed through zone closure.
	Zone 9, ETF Zone	This zone contains waste sites and buildings and structures that will be addressed through zone closure.
	Zone 10, PFP Zone	This zone contains waste sites, buildings and structures, pipelines, and utility relocations that will be addressed through zone closure.
	Zone 11, PUREX Zone	This zone contains a canyon (PUREX), waste sites, buildings and structures, pipelines, and utility relocations that will be addressed through zone closure.
	Zone 12, REDOX Zone	This zone contains a canyon (REDOX), waste sites, buildings and structures, pipelines, and utility relocations that will be addressed through zone closure.
	Zone 13, S/U Farm Zone	This zone contains waste sites, buildings and structures, and utility relocations that will be addressed through zone closure. This zone also contains tank farms and will require remedial coordination with the tank farm cleanup efforts.
	Zone 14, Semi-Works Zone	This zone contains waste sites, buildings and structures, pipelines, and utility relocations that will be addressed through zone closure.
	Zone 15, Solid Waste Zone	This zone contains waste sites and buildings and structures that will be addressed through zone closure.
	Zone 16, T Farm Zone	This zone contains waste sites and buildings and structures that will be addressed through zone closure. This zone also contains tank farms and will require remedial coordination with the tank farm cleanup efforts.
	Zone 17, T Plant Zone	This zone contains a canyon (T Plant), waste sites, buildings and structures, pipelines, and utility relocations that will be addressed through zone closure.
	Zone 18, U Plant Zone	This zone contains a canyon (U Plant), waste sites, buildings and structures, pipelines, and utility relocations that will be addressed through zone closure.

Table E-15. Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) Level 3 Scope Summary. (3 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
	Zone 19, WM Zone	This zone contains waste sites, buildings and structures, pipelines, and utility relocations that will be addressed through zone closure.
	Zone 20, WTP/A Farm Zone	This zone contains waste sites, buildings and structures, pipelines, and utility relocations that will be addressed through zone closure. This zone also contains tank farms and will require remedial coordination with the tank farm cleanup efforts.
	Zone 21, IDF Zone	This zone contains waste sites that will be addressed through zone closure.
	Zone 22, NRDWL/BC Control Zone	This zone contains waste sites and pipelines that will be addressed through zone closure.
	Zone 23, 100 Area	This zone contains buildings and structures that will be addressed through zone closure.
	Zone 24, 600 Area	This zone contains buildings and structures that will be addressed through zone closure.
	Zone 25, 300 Area	This zone does not currently have any identified scope in the lifecycle plan. Cleanup is assumed to be accomplished through RL-0041.
	Zone 26, 400 Area	This zone contains buildings and structures that will be addressed through zone closure.
Surveillance and Maintenance and Min-Safe for Facilities and Waste Sites	100 Area S&M	Scope includes CERCLA 5-year reviews, visual surveillance, surface maintenance, maintain facilities and waste sites in minimum safe condition to protect personnel and the environment, documentation, environmental protection, ISMS, nuclear safety, occupational safety and health, QA, emergency preparedness, radiation protection, safeguards and security, baseline controls, and training.
	200 Area S&M	
	400 Area S&M	
	600 Area S&M	
	300 Area S&M	
Site-wide Services – RL-0040	Site-wide Services	Includes proportional share of indirect costs for site services and infrastructure, adders, and other indirect costs.

DOE/RL-2009-81, 2009, *Central Plateau Cleanup Completion Strategy*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

CERCLA	=	*Comprehensive Environmental Response, Compensation, and Liability Act.*
CSB	=	Canister Storage Building.
D&D	=	decontamination and decommissioning.
D4	=	deactivation, decommissioning, decontamination, and demolition.
ERDF	=	Environmental Restoration Disposal Facility.
ESH&Q	=	Environment, Safety, Health, and Quality.
ETF	=	Effluent Treatment Facility.
FY	=	fiscal year.
IDF	=	Integrated Disposal Facility.
ISMS	=	Integrated Safety Management System.
NRDWL	=	non-radioactive dangerous waste landfill.
O&M	=	operation and maintenance.
PBS	=	project baseline summary.
PFP	=	Plutonium Finishing Plant.
PUREX	=	Plutonium Uranium Extraction (Plant).
QA	=	quality assurance.
REDOX	=	Reduction-Oxidation (Plant).
ROD	=	record of decision.
RTD	=	remove, treat, dispose.
S&M	=	surveillance and maintenance.
WM	=	Waste Management
WTP	=	Waste Treatment and Immobilization Plant.

Table E-16. Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (2 pages)

Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Regulatory Decisions	12,824	18,004	11,529	20,650	30,234	68,594	91,718	47,876	71,411	73,830
Zone Environmental Remediation	275,538	0	0	1,049	252,622	408,614	553,862	383,376	409,718	652,136
S&M and Min-Safe for Facilities and Waste Sites	12,322	13,143	13,122	13,436	14,193	14,349	13,748	13,616	13,431	13,694
Site-wide Services - RL-0040	15,499	0	5,282	5,799	55,375	83,163	81,565	78,787	89,317	92,860
Total	**316,182**	**31,147**	**29,932**	**40,935**	**352,424**	**574,720**	**740,892**	**523,655**	**583,877**	**832,521**
Fiscal Year	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Regulatory Decisions	65,562	67,841	42,434	38,190	41,001	36,509	32,665	36,629	35,314	29,139
Zone Environmental Remediation	676,814	466,635	424,239	379,215	377,872	336,447	273,611	143,995	71,348	63,253
S&M and Min-Safe for Facilities and Waste Sites	14,773	15,548	16,656	15,539	15,906	16,141	16,715	17,620	18,067	18,590
Site-wide Services - RL-0040	89,202	82,685	73,995	65,193	52,333	57,183	60,937	35,687	26,274	24,444
Total	**846,351**	**632,710**	**557,324**	**498,138**	**487,112**	**446,279**	**383,928**	**233,930**	**151,003**	**135,426**
Fiscal Year	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Regulatory Decisions	30,168	30,901	32,278	33,964	32,374	35,760	38,776	41,006	47,551	44,467
Zone Environmental Remediation	41,253	34,464	47,258	39,463	52,399	176,219	224,643	202,549	197,881	334,089
S&M and Min-Safe for Facilities and Waste Sites	19,163	20,787	20,128	20,508	20,924	21,998	24,974	25,368	26,649	24,101
Site-wide Services - RL-0040	25,139	25,980	29,391	29,151	28,023	26,174	41,742	45,100	59,385	89,241
Total	**115,723**	**112,131**	**129,055**	**123,086**	**133,720**	**260,151**	**330,136**	**314,023**	**331,467**	**491,898**
Fiscal Year	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**
Regulatory Decisions	63,415	69,260	53,633	53,394	49,326	59,307	59,877	55,798	61,939	59,860
Zone Environmental Remediation	368,482	422,706	292,125	224,800	157,658	57,716	42,294	118,380	133,581	123,757
S&M and Min-Safe for Facilities and Waste Sites	23,816	25,577	26,250	29,118	30,943	34,437	35,697	35,272	35,483	35,753
Site-wide Services - RL-0040	96,579	95,385	88,193	71,887	61,770	49,827	52,583	72,729	77,318	69,485
Total	**552,293**	**612,929**	**460,201**	**379,199**	**299,696**	**201,286**	**190,452**	**282,179**	**308,321**	**288,855**
Fiscal Year	**2051**	**2052**	**2053**	**2054**	**2055**	**2056**	**2057**	**2058**	**2059**	**2060**
Regulatory Decisions	60,078	64,198	72,805	60,119	62,643	81,336	68,834	71,209	82,912	54,086
Zone Environmental Remediation	107,404	93,620	56,976	233,792	201,510	61,661	57,824	164,157	217,103	119,127
S&M and Min-Safe for Facilities and Waste Sites	13,600	14,199	11,779	10,614	10,891	12,599	12,804	12,118	12,167	9,030
Site-wide Services - RL-0040	52,805	49,295	35,638	51,955	44,460	26,419	27,428	40,390	54,915	34,476
Total	**233,886**	**221,311**	**177,198**	**356,480**	**319,504**	**182,015**	**166,891**	**287,874**	**367,097**	**216,720**

Table E-16. Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (2 pages)

Fiscal Year	2061	2062	2063	2064	2065	2066	Total
Regulatory Decisions	24,699	25,350	31,618	34,117	23,260	4,600	**2,646,872**
Zone Environmental Remediation	99,296	128,067	130,267	119,230	68,827	20,125	**11,321,049**
S&M and Min-Safe for Facilities and Waste Sites	2,513	2,826	3,400	3,183	3,252	791	**973,319**
Site-wide Services - RL-0040	0	0	0	0	0	0	**2,628,445**
Total	**126,508**	**156,243**	**165,285**	**156,531**	**95,339**	**25,515**	**17,569,685**

D&D = decontamination and decommissioning.
PBS = project baseline summary.
S&M = surveillance and maintenance.

Table E-17. Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (4 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
1	**Nuclear Facility D&D-Remainder of Hanford, PBS RL-0040**							
2	**Regulatory Decisions**	**12,824**	**18,004**	**11,529**	**20,650**	**30,234**	**68,594**	**161,835**
3	Central Plateau Project Management	6,601	5,586	5,572	5,706	10,495	10,608	**44,568**
3	Central Plateau Engineering Studies	0	0	0	0	1,248	1,740	**2,988**
3	Emergency Response for Facility/Waste Site ESH&Q or Remediation - FY 2014 - FY 2048	0	0	0	0	6,861	6,958	**13,819**
3	Canyon ROD	1,415	0	0	0	4,501	4,546	**10,462**
3	Cost and/or Schedule Uncertainty - Decisions and Closure Integration	367	157	206	182	582	822	**2,316**
3	Management Reserve - Decisions and Closure Integration	4,442	12,262	5,750	14,762	6,547	43,921	**87,684**
2	**Zone Environmental Remediation**	**275,538**	**0**	**0**	**1,049**	**252,622**	**408,614**	**937,823**
3	Zone 1 (200-E Admin Zone)	2,491	0	0	595	613	985	**4,684**
3	Cost and/or Schedule Uncertainty - Zone 1 (200-E Admin Zone)	369	0	0	226	111	187	**893**
3	Zone 2 (200-E Ponds Zone)	16,383	0	0	0	0	800	**17,183**
3	Cost and/or Schedule Uncertainty - Zone 2 (200-E Ponds Zone)	3,099	0	0	0	0	47	**3,146**
3	Zone 3 (200-W Ponds Zone)	5,878	0	0	0	2,115	16,183	**24,176**
3	Cost and/or Schedule Uncertainty - Zone 3 (200-W Ponds Zone)	839	0	0	29	508	2,865	**4,241**
3	Zone 4 (B Farm Zone)	0	0	0	0	8,526	35,482	**44,008**
3	Cost and/or Schedule Uncertainty - Zone 4 (B Farm Zone)	0	0	0	0	1,111	11,383	**12,494**
3	Zone 5 (B Plant Zone)	1,135	0	0	0	0	2,627	**3,762**
3	Cost and/or Schedule Uncertainty - Zone 5 (B Plant Zone)	145	0	0	0	0	315	**460**
3	Zone 6 (C Farm Zone)	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - Zone 6 (C Farm Zone)	0	0	0	0	0	0	**0**
3	Zone 7 (CSB Zone)	0	0	0	0	0	0	**0**

Table E-17. Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (4 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
3	Cost and/or Schedule Uncertainty - Zone 7 (CSB Zone)	0	0	0	0	0	0	**0**
3	Zone 8 (ERDF Zone)	0	0	0	0	990	3,504	**4,494**
3	Cost and/or Schedule Uncertainty - Zone 8 (ERDF Zone)	78	0	0	0	0	93	**171**
3	Zone 9 (ETF Zone)	0	0	0	0	6,373	4,237	**10,610**
3	Cost and/or Schedule Uncertainty - Zone 9 (ETF Zone)	0	0	0	0	2,813	1,351	**4,164**
3	Zone 10 (PFP Zone)	0	0	0	0	175	628	**803**
3	Cost and/or Schedule Uncertainty - Zone 10 (PFP Zone)	0	0	0	0	38	324	**362**
3	Zone 11 (PUREX Zone)	0	0	0	0	36,741	155,899	**192,640**
3	Cost and/or Schedule Uncertainty - Zone 11 (PUREX Zone)	0	0	0	0	27,667	12,204	**39,871**
3	Zone 12 (REDOX Zone)	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - Zone 12 (REDOX Zone)	0	0	0	0	0	117	**117**
3	Zone 13 (S/U Farm Zone)	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - Zone 13 (S/U Farm Zone)	0	0	0	0	0	0	**0**
3	Zone 14 (Semi-Works Zone)	369	0	0	0	311	0	**680**
3	Cost and/or Schedule Uncertainty - Zone 14 (Semi-Works Zone)	483	0	0	0	62	0	**545**
3	Zone 15 (Solid Waste Zone)	149	0	0	0	0	0	**149**
3	Cost and/or Schedule Uncertainty - Zone 15 (Solid Waste Zone)	0	0	0	0	0	0	**0**
3	Zone 16 (T Farm Zone)	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - Zone 16 (T Farm Zone)	0	0	0	0	0	0	**0**
3	Zone 17 (T Plant Zone)	6,839	0	0	0	51,497	100,717	**159,053**
3	Cost and/or Schedule Uncertainty - Zone 17 (T Plant Zone)	1,003	0	0	199	12,067	11,219	**24,488**

Table E-17. Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (4 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
3	Zone 18 (U Plant Zone)	42,965	0	0	0	71,138	31,340	**145,443**
3	Cost and/or Schedule Uncertainty - Zone 18 (U Plant Zone)	3,805	0	0	0	29,766	4,521	**38,092**
3	Zone 19 (WM Zone)	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - Zone 19 (WM Zone)	0	0	0	0	0	0	**0**
3	Zone 20 (WTP/A Farm Zone)	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - Zone 20 (WTP/A Farm Zone)	0	0	0	0	0	0	**0**
3	Zone 21 (IDF Zone)	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - Zone 21 (IDF Zone)	0	0	0	0	0	0	**0**
3	Zone 22 (NRDWL/BC Control Zone)	139,950	0	0	0	0	11,088	**151,038**
3	Cost and/or Schedule Uncertainty - Zone 22 (NRDWL/BC Control Zone)	1,590	0	0	0	0	498	**2,088**
3	Zone 23 (100 Area)	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - Zone 23 (100 Area)	0	0	0	0	0	0	**0**
3	Zone 24 (600 Area)	47,966	0	0	0	0	0	**47,966**
3	Cost and/or Schedule Uncertainty - Zone 24 (600 Area)	0	0	0	0	0	0	**0**
3	Zone 26 (400 Area)	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - Zone 26 (400 Area)	0	0	0	0	0	0	**0**
2	**S&M and Min-Safe for Facilities and Waste Sites**	**12,322**	**13,143**	**13,122**	**13,436**	**14,193**	**14,349**	**80,565**
3	100 Area S&M	0	0	0	0	407	411	**818**
3	200 Area S&M	10,643	11,345	11,318	11,590	11,885	12,005	**68,786**
3	400 Area S&M	416	451	450	460	472	477	**2,726**
3	600 Area S&M	416	451	450	460	472	477	**2,726**
3	300 Area S&M	517	560	559	572	587	593	**3,388**

Table E-17. Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (4 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
3	Cost and/or Schedule Uncertainty - S&M and Min-Safe for Facilities and Waste Sites	330	336	345	353	369	386	**2,119**
2	**Site-wide Services - RL-0040**	**15,499**	**0**	**5,282**	**5,799**	**55,375**	**83,163**	**165,118**
3	Site-wide Services - RL-0040	15,499	0	5,282	5,799	55,375	83,163	**165,118**
Total		**316,182**	**31,147**	**29,932**	**40,935**	**352,424**	**574,720**	**1,345,340**

CSB = Canister Storage Building.
D&D = decontamination and decommissioning.
ERDF = Environmental Restoration Disposal Facility.
ESH&Q = environment, safety, health, and quality.
ETF = Effluent Treatment Facility.
FY = fiscal year.
IDF = Integrated Disposal Facility.
NRDWL = non-radioactive dangerous waste landfill.
PBS = project baseline summary.
PFP = Plutonium Finishing Plant.
PUREX = Plutonium Uranium Extraction (Plant).
REDOX = Reduction-Oxidation (Plant).
ROD = record of decision.
S&M = surveillance and maintenance.
WM = Waste Management.
WTP = Waste Treatment and Immobilization Plant.

E.1.7 INFRASTRUCTURE AND SERVICES (PBS RL-0040) SCHEDULE AND COST DETAILS

Scope information for Infrastructure and Services, PBS RL-0040, is presented in Table E-18. No additional scope detail is presented here; however, both near-term and remaining estimated cleanup cost information is provided.

Table E-18. Infrastructure and Services (PBS RL-0040) Level 3 Scope Summary.

Level 2 Work Element	Level 3 Work Element	Scope Summary
Infrastructure and Services	Occupational Medicine	This work element includes occupational medicine; steam systems; legal support; land transfers; cleanup baseline, integration, and development; radiochemical processing laboratory and 300 Area transition; and real property asset management.
	Steam Systems	
	Legal Support	
	Land Transfers	
	Cleanup Baseline, Integration, and Development	
HAMMER	HAMMER	This work element includes operations and maintenance activities at the HAMMER facility in support of Hanford Site and other training.
Infrastructure Reliability Projects	Infrastructure Reliability Projects	This work element includes repair and replacement of infrastructure systems and provides capital upgrades to the infrastructure, including larger scale expense projects. Also included are capital equipment expenditures associated with replacements for crane and rigging, electrical utilities, biological control, transportation, materials management, Hanford Fire Department, and water and sewer utilities.
Real Estate and Site Planning	Real Estate and Site Planning	This work element includes development and implementation of an integrated, lifecycle approach to furnish, operate, coordinate, maintain, and right-size land-use planning and management services; operation and maintenance of Hanford Site services; and providing real property asset management services to include land-use planning, management, and disposal of real property interests, such as easements, licenses, permits, and leases; performing management of real property at the Hanford Site and coordinating the use of real property among Hanford Site contractors.

HAMMER = Hazardous Materials Management and Emergency Response (Facility). The Volpentest HAMMER Training and Education Center.

PBS = project baseline summary.

Table E-19. Infrastructure and Services (PBS RL-0040) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (2 pages)

Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Infrastructure and Services	14,852	15,111	15,511	11,354	12,299	6,692	6,763	6,966	7,117	20,734
HAMMER	8,640	7,252	7,259	7,419	7,557	7,771	7,968	8,168	7,997	7,935
Real Estate and Site Planning	3,622	0	0	0	0	0	0	0	0	0
Infrastructure Reliability Projects	18,484	21,647	21,103	22,279	23,060	24,001	24,030	24,570	39,710	39,243
Site-wide Services - RL-0040	15,499	0	8,165	8,885	7,871	6,584	6,789	7,960	11,217	9,498
Total	**61,096**	**44,010**	**52,038**	**49,937**	**50,787**	**45,049**	**45,551**	**47,663**	**66,040**	**77,410**
Fiscal Year	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Infrastructure and Services	7,497	7,658	7,596	9,393	8,025	8,169	8,348	8,587	8,714	8,980
HAMMER	7,866	7,767	7,674	7,756	7,703	7,725	7,725	7,702	7,678	7,642
Real Estate and Site Planning	0	0	0	0	0	0	0	0	0	0
Infrastructure Reliability Projects	36,394	40,638	40,055	32,395	42,275	28,237	24,801	13,996	13,770	14,229
Site-wide Services - RL-0040	8,990	10,941	11,150	11,456	17,165	12,288	12,103	9,957	9,941	9,832
Total	**60,747**	**67,003**	**66,474**	**61,000**	**75,169**	**56,419**	**52,976**	**40,243**	**40,103**	**40,683**
Fiscal Year	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Infrastructure and Services	9,122	9,417	9,530	9,708	12,161	10,287	10,453	10,767	10,962	9,502
HAMMER	7,598	7,551	7,494	7,436	7,366	7,283	7,188	7,016	6,974	6,857
Real Estate and Site Planning	0	0	0	0	0	0	0	0	0	0
Infrastructure Reliability Projects	15,133	15,150	16,115	15,972	16,472	17,121	19,010	32,151	21,522	22,168
Site-wide Services - RL-0040	10,277	10,013	9,932	9,470	9,078	9,839	14,929	21,525	16,706	11,278
Total	**42,130**	**42,131**	**43,071**	**42,587**	**45,077**	**44,530**	**51,580**	**71,460**	**56,165**	**49,804**
Fiscal Year	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**
Infrastructure and Services	9,716	9,882	10,237	10,473	10,542	10,840	11,043	14,282	11,573	11,862
HAMMER	6,723	6,579	6,422	6,247	6,065	5,924	5,846	5,609	5,355	5,073
Real Estate and Site Planning	0	0	0	0	0	0	0	0	0	0
Infrastructure Reliability Projects	23,014	23,823	24,679	25,677	26,461	18,412	9,278	9,491	9,710	9,933
Site-wide Services - RL-0040	9,163	8,523	10,514	12,647	13,364	11,306	2,810	2,978	2,563	2,161
Total	**48,616**	**48,807**	**51,851**	**55,044**	**56,432**	**46,481**	**28,977**	**32,361**	**29,201**	**29,029**

Table E-19. Infrastructure and Services (PBS RL-0040) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (2 pages)

Fiscal Year	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060
Infrastructure and Services	12,028	12,543	12,739	13,019	13,318	13,652	13,905	14,219	14,492	5,304
HAMMER	4,747	4,381	3,983	3,542	3,051	3,121	3,193	3,266	3,341	3,418
Real Estate and Site Planning	0	0	0	0	0	0	0	0	0	0
Infrastructure Reliability Projects	10,162	10,395	10,634	10,879	11,129	11,385	5,824	5,957	6,094	0
Site-wide Services - RL-0040	1,702	1,500	1,350	766	561	794	808	691	660	980
Total	**28,639**	**28,820**	**28,707**	**28,206**	**28,059**	**28,952**	**23,729**	**24,134**	**24,587**	**9,703**

Fiscal Year	2061	2062	2063	2064	2065	2066	Total
Infrastructure and Services	9,949	8,513	9,454	10,695	10,091	3,937	**590,584**
HAMMER	0	0	0	0	0	0	**323,856**
Real Estate and Site Planning	0	0	0	0	0	0	**3,622**
Infrastructure Reliability Projects	0	0	0	0	0	0	**998,671**
Site-wide Services - RL-0040	0	0	0	0	0	0	**405,177**
Total	**9,949**	**8,513**	**9,454**	**10,695**	**10,091**	**3,937**	**2,321,910**

HAMMER = Hazardous Materials Management and Emergency Response (Facility); also known as the Volpentest HAMMER Training and Education Center.
PBS = project baseline summary.

Table E-20. Infrastructure and Services (PBS RL-0040) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated).

Schedule Level	Scope	Fiscal Year 2011	2012	2013	2014	2015	2016	Total
1	**Infrastructure and Services, PBS RL-0040**							
2	**Infrastructure and Services**	**14,852**	**15,111**	**15,511**	**11,354**	**12,299**	**6,692**	**75,819**
3	Occupational Medicine	2,618	2,667	2,739	2,802	2,867	2,944	**16,637**
3	Steam Systems	5,511	5,615	5,767	5,900	6,036	1,183	**30,012**
3	Legal Support	2,043	2,082	2,138	2,187	2,238	2,298	**12,986**
3	Land Transfers	0	0	0	0	639	0	**639**
3	Cleanup Baseline, Integration, and Development	4,078	4,155	4,267	0	0	0	**12,500**
3	Cost and/or Schedule Uncertainty - RL-0040	603	592	599	464	520	266	**3,044**
2	**HAMMER**	**8,640**	**7,252**	**7,259**	**7,419**	**7,557**	**7,771**	**45,898**
3	HAMMER	8,640	7,252	7,259	7,419	7,557	7,771	**45,898**
2	**Real Estate and Site Planning**	**3,622**	**0**	**0**	**0**	**0**	**0**	**3,622**
3	Real Estate and Site Planning	3,622	0	0	0	0	0	**3,622**
2	**Infrastructure Reliability Projects**	**18,484**	**21,647**	**21,103**	**22,279**	**23,060**	**24,001**	**130,574**
3	Infrastructure Reliability Projects	18,484	21,647	21,103	22,279	23,060	24,001	**130,574**
2	**Site-wide Services - RL-0040**	**15,499**	**0**	**8,165**	**8,885**	**7,871**	**6,584**	**47,004**
3	Site-wide Services - RL-0040	15,499	0	8,165	8,885	7,871	6,584	**47,004**
	Total	**61,097**	**44,010**	**52,038**	**49,937**	**50,787**	**45,048**	**302,917**

HAMMER = The Volpentest HAMMER Training and Education Center. Also known as Hazardous Materials Management and Emergency Response (Facility).
PBS = project baseline summary.

E.1.8 NUCLEAR FACILITY D&D-RIVER CORRIDOR CLOSURE PROJECT (PBS RL-0041) SCHEDULE AND COST DETAILS

Table E-21. Nuclear Facility D&D-River Corridor Closure Project (PBS RL-0041) Level 3 Scope Summary. (3 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
D4 Closure	100 Area 324/327 Area 300 Area Sites 400 Area	This work element includes D4 of approximately 500 facilities, provision of utility and surveillance and maintenance services during D4, and closure of utilities located in the River Corridor. The D4 closure buildings are located throughout the River Corridor in the 100, 300, 400, and 600 Areas of the Hanford Site. Typical hazards associated with the buildings include radiological contamination (e.g., uranium, mixed fission products, activation products, plutonium), chemical hazards (e.g., beryllium, asbestos, laboratory chemicals), and industrial hazards (e.g., elevated working locations, degraded roofs, biological hazards, electrical hazards, excavations). The D4 process includes obtaining regulatory approvals; characterizing the hazards and waste; deactivating the facility by removing loose hazardous materials and equipment; decontaminating the facility to allow open-air demolition; and decommissioning the facility by disconnecting utilities and services. The structure is then demolished using techniques such as heavy equipment (e.g., track hoe, processor, loader, cranes), explosives, cutting equipment, or other methods and the demolition debris is disposed, generally to ERDF. Following demolition, samples are collected to verify that cleanup criteria are met, and the sites are backfilled and revegetated.
	Surveillance and Maintenance	Scope addresses activities associated with maintaining buildings in a safe and compliant manner, including performing required surveillances on a periodic basis.
	Operate and Close Utilities	Scope addresses operating utilities during and to support cleanup activities, then closing the utilities once they are no longer needed.
	Management and Support	Scope provides for management function in support of the D4 mission.
Reactor ISS Closure	100 B/C Area 100 K Area 100-N Area Management and Support	This work element includes removal of reactor area buildings and components, leaving the reactor blocks intact in interim safe storage. The reactors will then undergo surveillance, monitoring, and maintenance for a period of time up to 75 years, to allow radionuclides to decay. Following this period, the reactor blocks will be removed from their current locations and transported to the 200 Area for disposal.
Field Remediation Closure	100-B/C Area 100-D Area 100-H Area 100-K Area	This work element includes performing CERCLA field remediation and closure of contaminated waste sites and burial grounds within the River Corridor. This includes design and closure; confirmatory sampling; remediation of waste sites, liquid waste sites, and burial

Table E-21. Nuclear Facility D&D-River Corridor Closure Project (PBS RL-0041) Level 3 Scope Summary. (3 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
	100-N Area	grounds; miscellaneous restoration; and support activities. The records of decision for the Field Remediation Closure work scope generally identify RTD as the preferred alternative. (Records of decision are identified in Appendix A of the Lifecycle Report.) In addition to RTD, confirmatory sites were identified that require sampling to determine the need for RTD. Following sampling, these sites either become RTD sites or are closed as no-action sites. Contamination in the waste sites and burial grounds of the River Corridor include chemical and radioactive constituents, such as asbestos, lead, chromium, carbon tetrachloride, strontium, uranium, cesium, and tritium. The cleanup process involves sampling and analyzing the site to determine the extent and type of contamination, excavating contaminated waste materials, and restoring the landscape through site backfill, grading, and revegetation.
	100 Area Remaining Sites	
	300 Area Sites	
	400 Area	
	600 Area	
	Miscellaneous Restoration	This scope addresses cleanup activities associated with general materials, such as debris piles, and other items that do not require CERCLA or RCRA cleanup, but that could present a physical hazard or unpleasant aesthetic if not addressed.
	Management and Support	Scope provides for management function in support of the field remediation mission.
Waste Operations	200 Area Waste Operations	This work element includes the transportation, disposal, and treatment (if required) of waste from the River Corridor cleanup activities, as well as from other Hanford Site cleanup operators. Waste operations will expand and operate the ERDF, and transition the ERDF to a successor operator at the end of the Nuclear Facility D&D–River Corridor Closure Project.
	Management and Support	Scope provides for management function in support of the waste operations mission.
Final Closure	Final Closure	This work element includes developing a final strategy; preparing an integrated River Corridor work plan for a CERCLA baseline risk assessment; preparing a baseline risk assessment for the 100 and 300 Areas; conducting a risk evaluation for River Corridor areas outside of the 100 and 300 Areas; conducting orphan site evaluations; conducting surface soil surveys; preparing remedial action reports; preparing an remedial investigation report and a proposed plan for River Corridor source areas; and conducting independent closure reviews. The scope supports obtaining a proposed "Finding of Suitability to Transfer" the Hanford Site's River Corridor to long-term stewardship in accordance with CERCLA Section 120(h).
	Management and Support	Scope provides for management function in support of the final closure mission.

Table E-21. Nuclear Facility D&D-River Corridor Closure Project (PBS RL-0041) Level 3 Scope Summary. (3 pages)

Level 2 Work Element	Level 3 Work Element	Scope Summary
Mission Support/ General Support	Project Integration	This work element consists of functional support and business operations necessary to achieve River Corridor Closure and field project objectives. This includes providing trained and qualified staff, performance standards, facilities services, and office supplies. General support functions include safety health and quality, regulatory and environmental management, project integration, project services, engineering services, and Office of the Project General Manager.
	Project Services	
	Safety, Health, and Quality	
	Engineering	
	Regulatory and Environmental Management	
	Office of the Project General Manager	
B Reactor	B Reactor	The scope includes management and oversight for B Reactor facility activities, including planning, directing, and providing technical support to maintain, upgrade, and preserve the B Reactor Facility in a safe condition.
Nuclear Facility D&D – 100-K Remediation	100-K Group 2 Remediation	Final remediation of waste sites and D4 buildings and structures in the 100-K Area will be completed when all spent nuclear fuel is removed from the K Basins. The scope includes the ISS of the KE and KW reactors consistent with the other 100 Area reactors.
	100-K Group 1 Remediation	
	100-K Area Regulatory Closure Documents	
	100-K Group 3 Remediation	
	KW Deactivation	
	100-K Area Utilities	
	100-K Project Management	
	KE and KW Reactor ISS	
	100-K Bioremediation	
Site-wide Services	Site-wide Services	Includes proportional share of indirect costs for site services and infrastructure, adders, and other indirect costs.

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act.*
D&D = decontamination and decommissioning.
D4 = deactivation, decontamination, decommissioning, and demolition.
ERDF = Environmental Restoration Disposal Facility.
ISS = interim safe storage.
KE = K East.
KW = K West.
PBS = project baseline summary.
RCRA = *Resource Conservation and Recovery Act.*
RTD = remove, treat, and dispose.

Table E-22. Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041), Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated).

Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
D4 Closure	106,492	112,837	36,082	2	0	0	0	0	0	0
Reactor Interim Safe Storage (ISS) Closure	19,155	9,228	1,272	0	0	0	0	0	0	0
Field Remediation Closure	124,027	52,191	18,642	0	0	0	0	0	0	0
Waste Operations	74,416	66,932	44,470	323	0	0	0	0	0	0
Final Closure	2,317	2,088	5,108	41	0	0	0	0	0	0
Mission/General Support	34,553	34,823	31,256	2,117	0	0	0	0	0	0
Indirect Costs	16,024	16,225	13,372	68,578	0	0	0	0	0	0
Management Reserve - River Corridor Closure Contract	36,080	29,977	66,260	8,159	871	894	452	408	109	84
Cost and/or Schedule Uncertainty - River Corridor Closure Contract	0	0	66,122	173,684	158,088	117,820	96,370	44,063	8,903	0
B Reactor	2,360	2,454	2,511	2,592	2,641	2,716	2,785	2,855	2,926	0
Nuclear Facility D&D - River Corridor Closure (100-K Area Remediation)	108,427	6,771	25,594	18,113	20,763	18,536	15,367	16,841	13,367	8,973
Site-wide Services - RL-0041	32,736	8,000	7,368	5,419	5,338	3,841	3,260	4,095	3,143	1,806
Total	**556,588**	**341,526**	**318,056**	**279,028**	**187,701**	**143,807**	**118,235**	**68,262**	**28,447**	**10,864**

Fiscal Year	2021	2022	2023	2024	Total
D4 Closure	0	0	0	0	**255,413**
Reactor Interim Safe Storage (ISS) Closure	0	0	0	0	**29,655**
Field Remediation Closure	0	0	0	0	**194,860**
Waste Operations	0	0	0	0	**186,142**
Final Closure	0	0	0	0	**9,555**
Mission/General Support	0	0	0	0	**102,749**
Indirect Costs	0	0	0	0	**114,198**
Management Reserve - River Corridor Closure Contract	923	14	0	0	**144,231**
Cost and/or Schedule Uncertainty - River Corridor Closure Contract	0	479	1,130	1,308	**667,968**
B Reactor	0	0	0	0	**23,841**
Nuclear Facility D&D - River Corridor Closure (100-K Area Remediation)	19,445	44,340	44,609	28,609	**389,754**
Site-wide Services - RL-0041	3,950	10,022	10,421	8,163	**107,560**
Total	**24,318**	**54,855**	**56,160**	**38,080**	**2,225,925**

D&D = decontamination and decommissioning.
D4 = deactivation, decontamination, decommissioning, and demolition.
ISS = interim safe storage.
PBS = project baseline summary.

Table E-23. Nuclear Facility D&D-River Corridor Closure Project (PBS RL-0041), Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (3 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
1	**Nuclear Facility D&D-River Corridor Closure Project, PBS RL-0041**							
2	**D4 Closure**	**106,492**	**112,837**	**36,082**	**2**	**0**	**0**	**255,413**
3	D4-100 Area	23,962	24,509	7,344	0	0	0	**55,815**
3	D4-324/327 Area	38	0	0	0	0	0	**38**
3	D4-300 Area Sites	44,268	49,104	13,313	0	0	0	**106,685**
3	D4-400 Area	0	5,128	1,486	0	0	0	**6,614**
3	D4-Surveillance and Maintenance	4,893	4,789	396	2	0	0	**10,080**
3	D4-Operate and Close Utilities	6,993	6,696	492	0	0	0	**14,181**
3	D4-Management and Support	26,338	22,611	13,051	0	0	0	**62,000**
2	**Reactor Interim Safe Storage (ISS) Closure**	**19,155**	**9,228**	**1,272**	**0**	**0**	**0**	**29,655**
3	ISS -100 B/C Area	3,482	4,284	613	0	0	0	**8,379**
3	ISS -100 K Area	6,591	1,190	0	0	0	0	**7,781**
3	ISS -100 N Area	7,248	904	0	0	0	0	**8,152**
3	ISS -Management and Support	1,834	2,850	659	0	0	0	**5,343**
2	**Field Remediation Closure**	**124,027**	**52,191**	**18,642**	**0**	**0**	**0**	**194,860**
3	Field Remediation - 100 B/C Area	3,107	6,752	5,009	0	0	0	**14,868**
3	Field Remediation - 100 D Area	22,304	1,100	0	0	0	0	**23,404**
3	Field Remediation - 100 H Area	2,791	1,749	781	0	0	0	**5,321**
3	Field Remediation - 100 K Area	19,009	7,915	3,189	0	0	0	**30,113**
3	Field Remediation - 100 N Area	6,998	7,335	560	0	0	0	**14,893**
3	Field Remediation - 100 Area Remaining Sites	5,224	628	0	0	0	0	**5,852**
3	Field Remediation - 300 Area Sites	7,849	11,975	4,442	0	0	0	**24,266**
3	Field Remediation - 400 Area	0	149	1	0	0	0	**150**
3	Field Remediation - 600 Area	53,991	11,835	732	0	0	0	**66,558**
3	Field Remediation - Misc Restoration	136	135	2	0	0	0	**273**
3	Field Remediation - Management and Support	2,617	2,617	3,925	0	0	0	**9,159**
2	**Waste Operations**	**74,416**	**66,932**	**44,470**	**323**	**0**	**0**	**186,141**
3	200 Area Waste Operations	72,374	64,123	40,995	196	0	0	**177,688**
3	Waste Operations Management and Support	2,042	2,809	3,475	128	0	0	**8,454**

Table E-23. Nuclear Facility D&D-River Corridor Closure Project (PBS RL-0041), Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (3 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
2	**Final Closure**	**2,317**	**2,088**	**5,108**	**41**	**0**	**0**	**9,554**
3	Final Closure	1,897	1,668	4,450	11	0	0	**8,026**
3	Final Closure Management and Support	420	420	658	29	0	0	**1,527**
2	**Mission/General Support**	**34,553**	**34,823**	**31,256**	**2,117**	**0**	**0**	**102,749**
3	Mission/General Support Project Integration	4,833	4,833	4,547	249	0	0	**14,462**
3	Mission/General Support Project Services	14,126	14,145	12,905	949	0	0	**42,125**
3	Mission/General Support Safety, Health and Quality	6,091	6,091	7,115	419	0	0	**19,716**
3	Mission/General Support Engineering	1,219	1,219	1,029	55	0	0	**3,522**
3	Mission/General Support Regulatory and Environmental Management	1,632	1,632	2,531	83	0	0	**5,878**
3	Mission/General Support Office of the Project General Manager	6,653	6,903	3,128	363	0	0	**17,047**
2	**Indirect Costs**	**16,024**	**16,225**	**13,372**	**68,578**	**0**	**0**	**114,199**
2	**Management Reserve - River Corridor Closure Contract**	**36,080**	**29,977**	**66,260**	**8,159**	**871**	**894**	**142,241**
2	**Cost and/or Schedule Uncertainty - River Corridor Closure Contract**	**0**	**0**	**66,122**	**173,684**	**158,088**	**117,820**	**515,714**
2	**B Reactor**	**2,360**	**2,454**	**2,511**	**2,592**	**2,641**	**2,716**	**15,274**
2	**Nuclear Facility D&D - River Corridor Closure (100-K Area Remediation)**	**108,427**	**6,771**	**25,594**	**18,113**	**20,763**	**18,536**	**198,204**
3	100-K Group 2 Remediation	2,437	0	8,550	59	0	0	**11,046**
3	100-K Group 1 Remediation	40,501	249	0	0	0	0	**40,750**
3	100-K Area Regulatory Closure Documents	0	0	166	953	4,821	1,694	**7634**
3	100-K Group 3 Remediation	34,111	1,631	96	106	0	0	**35,944**
3	KW Deactivation	2,742	0	0	0	0	0	**2,742**
3	100-K Area Utilities	2,744	1,259	1,256	1,067	0	0	**6,326**
3	100-K Project Management	8,520	3,632	8,210	8,407	8,621	8,535	**45,925**
3	KE and KW Reactor ISS	11,078	0	7,315	7,521	7,320	8,307	**41,541**
3	100-K Bioremediation	6,295	0	0	0	0	0	**6,295**

Table E-23. Nuclear Facility D&D-River Corridor Closure Project (PBS RL-0041), Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (3 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
3	Nuclear Facility D&D – River Corridor Closure (100-K Area Remediation)	0	0	0	0	0	0	**0**
2	**Site-wide Services - RL-0041**	**32,736**	**8,000**	**7,368**	**5,419**	**5,338**	**3,841**	**62,702**
3	Site-wide Services - RL-0041	32,736	8,000	7,368	5,419	5,338	3,841	**62,702**
Total		**556,588**	**341,526**	**318,056**	**279,028**	**187,701**	**143,807**	**1,826,706**

D&D = decontamination and decommissioning.
ISS = interim safe storage.
D4 = deactivation, decontamination, decommissioning, and demolition.
KE = K East.
KW = K West.
PBS = project baseline summary.

E.1.9 NUCLEAR FACILITY D&D–FAST FLUX TEST FACILITY PROJECT (PBS RL-0042) SCHEDULE AND COST DETAILS

Table E-24. Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042) Level 3 Scope Summary.

Level 2 Work Element	Level 3 Work Element	Scope Summary
FFTF Cleanup	Maintain Safe and Compliant FFTF Complex	Provides for monitoring, surveillance, and maintenance of the FFTF while the facility is in a cold and dark state pending future D&D activities.
	Transition FFTF Complex	Provides for the progressive shutdown of facility support systems, including sodium, electrical substations, and cooling systems.
	Disposition FFTF Sodium	Includes removal of sodium residuals throughout the life of the project, sodium shipment and conversion, and the operation of the Sodium Storage Facility.
	Decommission FFTF Complex	While the final closure of the FFTF has not yet been determined, the planning assumptions include: • Demolition of all structures within the 400 Area Protected Area, except for reactor containment, to at least three feet below grade followed by backfill and revegetation; decommissioning waste would be disposed to appropriate disposal facilities. • Removal and disposition of the above-grade containment dome. • Grouting of the below grade portion of the reactor containment building and the reactor vessel. • Installation of an engineered barrier over the grouted area. • Installation of monitoring wells for long term monitoring.
	FFTF Project Management	Provides for management function in support of the project mission.
	Sodium Reaction Facility	Provides for the design, construction, and turnover to operations of a new facility in the Hanford 400 Area to convert FFTF sodium for use as caustic feed to the Waste Treatment Plant.
Infrastructure and Services	Infrastructure and Services	This work scope includes activity related to a DOE-RL direct contract.
Site-wide Services	Site-wide Services	Includes proportional share of indirect costs for site services and infrastructure, adders, and other indirect costs.

D&D = decontamination and decommissioning.
DOE-RL = U.S. Department of Energy, Richland Operations Office.
FFTF = Fast Flux Test Facility.
PBS = project baseline summary.

Table E-25. Nuclear Facility D&D-Fast Flux Test Facility Project (PBS RL-0042), Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated).

Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
FFTF Cleanup	1,394	1,669	1,659	1,699	1,741	1,752	1,771	1,909	1,896	2,823
Infrastructure and Services	38	41	41	42	43	43	44	47	47	48
Site-wide Services - RL-0042	1,028	796	489	521	459	372	384	475	456	815
Total	**2,460**	**2,507**	**2,189**	**2,262**	**2,243**	**2,167**	**2,199**	**2,431**	**2,399**	**3,686**
Fiscal Year	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
FFTF Cleanup	7,377	13,536	36,024	47,434	49,931	60,332	59,288	61,571	66,088	78,542
Infrastructure and Services	49	50	52	54	0	0	0	0	0	0
Site-wide Services - RL-0042	832	1,687	5,844	8,653	10,492	11,582	12,060	10,632	12,293	12,220
Total	**8,258**	**15,274**	**41,920**	**56,141**	**60,423**	**71,914**	**71,348**	**72,202**	**78,381**	**90,761**
Fiscal Year	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**Total**		
FFTF Cleanup	62,634	79,749	78,454	89,620	95,348	53,220	4,691	**962,151**		
Infrastructure and Services	0	0	0	0	0	0	0	**639**		
Site-wide Services - RL-0042	12,156	11,505	9,331	11,022	11,568	9,586	2,360	**159,620**		
Total	**74,790**	**91,254**	**87,784**	**100,643**	**106,916**	**62,806**	**7,051**	**1,122,410**		

FFTF = Fast Flux Test Facility.
PBS = project baseline summary.

Table E-26. Nuclear Facility D&D-Fast Flux Test Facility Project (PBS RL-0042), Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated).

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
1	**Nuclear Facility D&D-Fast Flux Test Facility Project, PBS RL-0042**							
2	**FFTF Cleanup**	**1,394**	**1,669**	**1,659**	**1,699**	**1,741**	**1,752**	**9,914**
3	Maintain Safe and Compliant FFTF Complex	1,133	1,233	1,225	1,255	1,287	1,294	**7,427**
3	Transition FFTF Complex	16	17	17	18	18	18	**104**
3	Disposition FFTF Sodium	103	112	111	114	117	118	**675**
3	Decommission FFTF Complex	0	0	0	0	0	0	**0**
3	FFTF Project Management	142	307	305	313	320	322	**1,709**
3	Sodium Reaction Facility	0	0	0	0	0	0	**0**
3	Cost and/or Schedule Uncertainty - FFTF	0	0	0	0	0	0	**0**
2	**Infrastructure and Services**	**38**	**41**	**41**	**42**	**43**	**43**	**248**
3	Infrastructure and Services	38	41	41	42	43	43	**248**
2	**Site-wide Services - RL-0042**	**1,028**	**796**	**489**	**521**	**459**	**372**	**3,665**
3	Site-wide Services - RL-0042	1,028	796	489	521	459	372	**3,665**
Total		**2,460**	**2,506**	**2,189**	**2,262**	**2,243**	**2,167**	**13,827**

D&D = decontamination and decommissioning.
FFTF = Fast Flux Test Facility.
PBS = project baseline summary.

E.1.10 RICHLAND COMMUNITY AND REGULATORY SUPPORT (PBS RL-0100) SCHEDULE AND COST DETAILS

Scope information for Community and Regulatory Support, PBS RL-0100, is presented in Table E-27. This PBS is not broken down to Level 3 details, so no additional scope is presented; however, both near-term and remaining estimated cleanup cost information is provided.

Table E-27. Richland Community and Regulatory Support (PBS RL-0100) Level 2 Scope Summary.

Work Element	Scope Description
Richland Community and Regulatory Support	This work element includes DOE-RL support to community activities and regulatory agencies, such as the Hanford Advisory Board, the Oregon Department of Energy, the Natural Resource Trustee Council, the Washington State Department of Ecology, and other entities through grants, permits, and payment of fees.

DOE-RL = U.S. Department of Energy, Richland Operations Office.
PBS = project baseline summary.

Table E-28. Richland Community and Regulatory Support (PBS RL-0100), Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated).

Fiscal Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Richland Community and Regulatory Support	19,387	20,337	25,898	26,573	25,488	25,548	26,124	26,385	26,649	26,915
Fiscal Year	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Richland Community and Regulatory Support	27,095	27,366	27,639	20,811	20,204	20,406	20,610	20,816	21,024	21,234
Fiscal Year	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Richland Community and Regulatory Support	21,447	21,575	21,791	22,009	22,229	22,347	22,570	21,207	20,877	20,689
Fiscal Year	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**
Richland Community and Regulatory Support	20,392	20,051	19,855	19,954	20,054	19,671	15,384	15,460	15,538	15,615
Fiscal Year	**2051**	**2052**	**2053**	**2054**	**2055**	**2056**	**2057**	**2058**	**2059**	**2060**
Richland Community and Regulatory Support	15,694	15,772	15,851	15,930	16,010	16,090	16,170	16,251	16,332	16,126
Fiscal Year	**Total**									
	1,035,451									

PBS = project baseline summary.

E.1.11 LONG-TERM STEWARDSHIP (PBS RL-LTS) SCHEDULE AND COST DETAILS

Scope information for Long-Term Stewardship, PBS RL-LTS, is presented in Table E-29. This PBS is not broken down to Level 3 scope, and there are no near-term cost details for this PBS due to when the work is planned to begin.

Table E-29. Long-Term Stewardship (PBS RL-LTS) Level 2 Scope Summary.

Work Element	Scope Description
Infrastructure	The scope includes operation and maintenance of site infrastructure following cleanup activities. Specific scope will include supplying electrical and water utilities, operating and maintaining emergency services (Hanford Fire Department), and maintaining roads as needed to support site long-term stewardship activities.
Waste Management	Scope includes operation and maintenance of 200 Area liquid effluent facilities in support of groundwater treatment and monitoring activities.
Site and Environmental Monitoring	Scope includes ongoing site and environmental monitoring of groundwater, soil, and the vadose zone, and monitoring for public safety and resource protection.
Post-Closure Surveillance and Maintenance	Scope includes real estate and site planning, land management, and surveillance and maintenance activities for the 100 and 200 Areas.
Environmental Compliance	Scope includes activities to ensure environmental compliance and protection.
Stakeholder Participation	Scope includes continued support of stakeholder participation through grants, and payment of fees in lieu of taxes.
Management and Administration	Scope provides for management and administration of these long-term stewardship activities.

LTS = Long-Term Stewardship.
PBS = project baseline summary.

Table E-30. Long-Term Stewardship (PBS RL-LTS) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (2 pages)

Fiscal Year	**2061**	**2062**	**2063**	**2064**	**2065**	**2066**	**2067**	**2068**	**2069**	**2070**
Infrastructure	28,025	27,262	26,521	25,800	25,098	24,415	23,751	23,104	22,477	21,864
Waste Management	93,717	91,168	88,688	86,276	83,929	81,646	79,425	77,265	75,163	73,119
Site and Environmental Monitoring	56,286	54,755	53,266	51,817	50,408	49,036	47,702	46,405	45,143	43,915
Post-Closure S&M	52,383	50,958	49,572	48,224	46,911	45,636	44,395	43,187	42,013	40,869
Environmental Compliance	4,675	4,548	4,424	4,303	4,186	4,073	3,962	3,854	3,749	3,647
Stakeholder Participation	21,280	20,701	20,138	19,590	19,057	18,539	18,035	17,544	17,067	16,603
Management and Administration	21,609	20,985	20,379	19,792	19,223	18,670	18,134	17,614	17,109	16,620
Total	**277,975**	**270,377**	**262,988**	**255,802**	**248,812**	**242,015**	**235,404**	**228,973**	**222,721**	**216,637**
Fiscal Year	**2071**	**2072**	**2073**	**2074**	**2075**	**2076**	**2077**	**2078**	**2079**	**2080**
Infrastructure	21,046	20,259	19,500	18,770	19,221	17,713	16,325	15,045	15,407	15,775
Waste Management	70,381	67,746	65,210	62,768	64,275	59,236	54,592	50,312	51,519	52,756
Site and Environmental Monitoring	42,271	40,688	39,165	37,699	38,603	35,577	32,788	30,217	30,942	31,685
Post-Closure S&M	39,699	38,562	37,458	36,386	35,651	34,421	33,245	32,120	31,450	30,803
Environmental Compliance	3,511	3,379	3,253	3,131	3,206	2,955	2,723	2,510	2,570	2,631
Stakeholder Participation	15,981	15,383	14,807	14,252	14,594	13,450	12,396	11,424	11,698	11,979
Management and Administration	16,021	15,444	14,888	14,353	14,476	13,519	12,633	11,811	11,900	11,999
Total	**208,910**	**201,461**	**194,281**	**187,359**	**190,026**	**176,871**	**164,702**	**153,439**	**155,486**	**157,628**
Fiscal Year	**2081**	**2082**	**2083**	**2084**	**2085**	**2086**	**2087**	**2088**	**2089**	**2090**
Infrastructure	16,154	16,542	16,092	16,639	17,372	18,310	19,481	20,923	22,680	24,812
Waste Management	0	0	0	0	0	0	0	0	0	0
Site and Environmental Monitoring	32,445	33,224	32,320	33,419	34,889	36,774	39,127	42,023	45,553	49,835
Post-Closure S&M	30,179	29,577	28,772	28,482	28,479	28,758	29,325	30,197	31,397	32,958
Environmental Compliance	2,695	2,759	2,684	2,776	2,898	3,054	3,250	3,490	3,783	4,139
Stakeholder Participation	12,266	12,561	12,219	12,635	13,190	13,903	14,793	15,887	17,222	18,841
Management and Administration	6,703	6,689	6,495	6,545	6,661	6,847	7,107	7,451	7,889	8,437
Total	**100,442**	**101,352**	**98,582**	**100,496**	**103,489**	**107,646**	**113,083**	**119,971**	**128,524**	**139,022**

Table E-30. Long-Term Stewardship (PBS RL-LTS) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (2 pages)

Fiscal Year	Total
Infrastructure	**616,383**
Waste Management	**1,426,191**
Site and Environmental Monitoring	**1,237,977**
Post-Closure S&M	**1,112,067**
Environmental Compliance	**102,818**
Stakeholder Participation	**468,035**
Management and Administration	**398,003**
Total	**5,361,474**

PBS = project baseline summary.
S&M = surveillance and maintenance.

E.2 OFFICE OF RIVER PROTECTION PROJECT BASELINE SUMMARY INFORMATION

The DOE, Office of River Protection (DOE-ORP) manages their assigned cleanup mission through the following PBSs (at Level 1):

- Radioactive Liquid Tank Waste Stabilization and Disposition, PBS ORP-0014
- Major Construction – Waste Treatment Plant, PBS ORP-0060.

Scope information for PBS ORP-0014 and PBS ORP-0060 is presented in Chapter 6.0 of the Lifecycle Report. No additional scope is presented here. Near-term and estimated cleanup costs are presented below.

Table E-31. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (2 pages)

Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Base Operations	326,090	254,861	263,931	356,555	366,504	367,605	393,976	380,201	491,668	472,975
Retrieve and Close SSTs	81,167	87,367	88,074	62,587	124,749	238,683	225,082	268,002	218,964	126,326
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	99,834	93,886	115,732	149,250	189,060	188,453	226,248	197,347	189,059	187,686
Supplemental Treatment	4,239	8,379	8,546	44,243	97,424	213,596	304,519	314,010	328,815	30,074
Treat Waste	0	6,620	6,832	19,834	20,310	33,995	105,413	195,452	411,621	410,079
Facility Closures	0	0	0	8	3,484	1,923	912	0	4,604	6,400
Tank Operations Contract - ORP Project Support	31,127	33,808	33,290	34,101	39,498	43,420	59,917	62,353	48,354	45,702
Total	**542,456**	**484,920**	**516,405**	**666,578**	**841,029**	**1,087,674**	**1,316,067**	**1,417,366**	**1,693,084**	**1,279,242**
Fiscal Year	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Base Operations	445,198	466,041	455,013	470,788	496,480	485,865	508,862	567,468	539,960	567,671
Retrieve and Close SSTs	136,401	108,806	71,703	54,898	115,761	115,140	174,473	297,347	206,817	163,133
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	168,954	166,352	175,096	182,990	161,213	151,475	160,483	166,190	163,649	151,105
Supplemental Treatment	23,061	169,656	171,626	176,101	179,975	183,935	187,981	192,117	195,564	200,663
Treat Waste	406,116	413,095	420,508	431,471	440,964	450,665	460,580	470,712	479,159	491,651
Facility Closures	2,579	2,893	5,985	45,140	7,779	4,728	1,394	1,729	1,336	3,214
Tank Operations Contract - ORP Project Support	45,055	45,931	47,175	52,460	49,210	51,056	51,332	54,637	58,005	56,796
Total	**1,227,364**	**1,372,775**	**1,347,106**	**1,413,849**	**1,451,382**	**1,442,862**	**1,545,104**	**1,750,201**	**1,644,491**	**1,634,233**
Fiscal Year	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Base Operations	548,172	576,550	582,060	632,972	652,033	648,968	628,511	640,206	646,170	557,148
Retrieve and Close SSTs	208,752	266,322	294,811	418,713	470,008	544,391	458,892	456,142	376,011	216,360
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	145,680	146,634	148,180	150,839	157,589	168,245	177,266	204,992	225,126	238,573
Supplemental Treatment	205,078	210,421	214,200	218,044	222,841	225,396	229,445	234,492	239,651	243,952
Treat Waste	502,468	515,560	524,820	534,237	545,990	562,448	572,550	585,146	598,020	608,751
Facility Closures	2,319	1,882	1,844	2,596	11,213	7,983	11,725	4,113	1,326	747
Tank Operations Contract - ORP Project Support	55,192	59,837	60,673	65,146	64,184	69,834	71,263	68,816	73,029	70,324
Total	**1,667,660**	**1,777,206**	**1,826,588**	**2,022,547**	**2,123,858**	**2,227,265**	**2,149,651**	**2,193,908**	**2,159,333**	**1,935,853**

Table E-31. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated). (2 pages)

Fiscal Year	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Base Operations	484,417	462,563	447,632	439,638	407,393	300,834	261,134	187,890	93,459	62,485
Retrieve and Close SSTs	175,960	181,184	104,817	69,822	104,365	52,641	45,307	18,166	0	0
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	265,977	295,917	343,051	335,495	409,323	238,259	194,255	85,757	17,388	757
Supplemental Treatment	250,312	255,819	260,935	267,210	0	0	0	0	0	0
Treat Waste	624,622	559,604	544,302	528,167	513,673	488,927	500,693	253,327	0	0
Facility Closures	11,530	10,195	15,046	13,392	33,132	83,973	43,314	38,195	11,774	3,253
Tank Operations Contract - ORP Project Support	72,943	69,655	73,186	73,232	75,827	16,622	12,602	10,295	4,272	2,850
Total	**1,885,761**	**1,834,937**	**1,788,968**	**1,726,957**	**1,543,712**	**1,181,257**	**1,057,304**	**593,630**	**126,893**	**69,345**

Fiscal Year	Total
Base Operations	**17,937,947**
Retrieve and Close SSTs	**7,428,147**
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	**7,233,362**
Supplemental Treatment	**6,312,318**
Treat Waste	**15,238,379**
Facility Closures	**403,661**
Tank Operations Contract - ORP Project Support	**2,013,009**
Total	**56,566,824**

DOE-ORP = U.S. Department of Energy, Office of River Protection.
PBS = project baseline summary.
DST = double-shell tank.
SST = single-shell tank.

Table E-32. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014), Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (2 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
1	**Radioactive Liquid Tank Waste Stabilization and Disposition, PBS ORP-0014**							
2	**Base Operations**	**326,090**	**254,861**	**263,931**	**356,555**	**366,504**	**367,605**	**1,935,546**
3	Base Operations	83,187	79,473	77,175	80,707	88,836	79,520	**488,898**
3	DST Space Management	9,383	7,353	7,373	23,956	13,627	10,798	**72,490**
3	TOC Facility Operations	35,204	25,271	28,104	34,726	41,214	43,054	**207,573**
3	Tank Farm Upgrades	28,356	6,033	10,339	13,626	10,927	21,278	**90,559**
3	Project Support	169,959	136,731	140,940	203,540	211,900	212,956	**1,076,026**
2	**Retrieve and Close SSTs**	**81,167**	**87,367**	**88,074**	**62,587**	**124,749**	**238,683**	**682,627**
3	Retrieval/Closure Program	24,385	24,396	39,487	23,367	28,756	38,954	**179,345**
3	SST Retrieval East Area	53,107	58,359	30,155	28,207	51,314	108,421	**329,563**
3	SST Retrieval West Area	0	0	0	0	0	10,018	**10,018**
3	Closure Program	2,999	1,561	1,110	1,675	806	456	**8,607**
3	SST Closure	676	3,050	17,322	9,339	43,873	80,834	**155,094**
2	**Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure**	**99,834**	**93,886**	**115,732**	**149,250**	**189,060**	**188,453**	**836,215**
3	WTP Feed Delivery Program	22,599	18,068	17,933	20,575	22,203	23,467	**124,845**
3	Construct DST Systems	14,868	31,571	47,101	59,979	53,872	41,408	**248,799**
3	RA - Transfer System Mod Project	13,155	0	0	0	0	0	**13,155**
3	DST Retrieval/Closure East Area	0	0	0	0	0	0	**0**
3	DST Retrieval/Closure West Area	0	0	0	0	0	0	**0**
3	Immobilization Program	10,353	10,679	24,869	22,978	51,315	32,497	**152,691**
3	WTP Operational Readiness	3,379	3,618	3,543	4,425	4,122	4,221	**23,308**
3	Tank Waste Pretreatment Project	13,348	5,110	1,459	27,083	31,145	39,387	**117,532**
3	Secondary Waste Treatment/ETF	11,892	9,724	6,943	14,209	26,402	47,473	**116,643**
3	Next Generation Projects	10,239	15,117	13,883	0	0	0	**39,239**
2	**Supplemental Treatment**	**4,239**	**8,379**	**8,546**	**44,243**	**97,424**	**213,596**	**376,427**
3	Supplemental Treatment	4,239	8,379	8,546	44,243	97,424	213,596	**376,427**
2	**Treat Waste**	**0**	**6,620**	**6,832**	**19,834**	**20,310**	**33,995**	**87,591**
3	Waste Treatment Facility (WTP)	0	6,620	6,832	19,834	20,310	33,995	**87,591**

Table E-32. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014), Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (2 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
2	**Facility Closures**	**0**	**0**	**0**	**8**	**3,484**	**1,923**	**5,415**
3	TFC Facility and Other Closure	0	0	0	8	3,484	1,923	**5,415**
2	**Tank Operations Contract - ORP Project Support**	**31,127**	**33,808**	**33,290**	**34,101**	**39,498**	**43,420**	**215,244**
3	Tank Operations Contract - ORP Project Support	31,127	33,808	33,290	34,101	39,498	43,420	**215,244**
Total		**542,457**	**484,921**	**516,405**	**666,578**	**841,029**	**1,087,675**	**4,139,065**

DST = double-shell tank.
ETF = Effluent Treatment Facility.
ORP = U.S. Department of Energy, Office of River Protection.
PBS = project baseline summary.
SST = single-shell tank.
TOC = total organic carbon.
WTP = Waste Treatment and Immobilization Plant.

Table E-33. Major Construction – Waste Treatment Plant (PBS ORP-0060) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year ($1,000, Escalated).

Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Pretreatment	237,346	340,112	405,343	303,973	210,178	131,307	100,889	76,461	103,515	5,436	**1,914,560**
Low-Activity Waste	61,717	76,228	65,851	46,713	33,684	80,326	60,474	31,348	42,382	1,208	**499,931**
High-Level Waste	153,894	184,699	142,607	147,373	134,009	97,298	64,995	64,623	64,501	18,718	**1,072,719**
Balance of Facilities	30,350	36,368	57,932	54,967	80,097	52,759	24,727	12,691	10,507	484	**360,881**
Laboratory	22,472	31,998	17,942	28,418	26,726	39,691	28,184	17,030	18,590	1,345	**232,397**
Plant Wide	351,926	335,141	307,033	297,136	265,717	226,809	156,370	59,698	33,130	1,358	**2,034,318**
Total	**857,705**	**1,004,547**	**996,709**	**878,581**	**750,410**	**628,190**	**435,639**	**261,851**	**272,626**	**28,549**	**6,114,805**

PBS = project baseline summary.

Table E-34. Major Construction – Waste Treatment Plant (PBS ORP-0060) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (4 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
1	**Major Construction - Waste Treatment Plant, PBS ORP-0060**							
2	**Pretreatment**	**237,346**	**340,112**	**405,343**	**303,973**	**210,179**	**131,306**	**1,628,259**
3	Engineering Design - PT	46,355	53,925	36,771	6,542	1,425	480	**145,498**
3	Plant Equipment - PT	46,194	108,815	103,908	59,259	13,722	8,976	**340,874**
3	Equipment Engineering - PT	1,208	3	0	0	0	0	**1,211**
3	Environmental and Nuclear Safety - PT	2,424	1,841	997	2,246	2,544	3,444	**13,496**
3	Research and Technology - PT	6,430	2,819	2,550	0	0	0	**11,799**
3	Plant Material - PT	17,330	19,513	33,794	14,222	0	0	**84,859**
3	Startup - PT	163	174	181	286	10,982	15,768	**27,554**
3	Construction Field Non Manual - PT	12,441	14,761	17,182	16,788	13,079	3,427	**77,678**
3	Crafts (Construction) - PT - Civil	19,893	19,137	16,451	21,521	12,360	3,625	**92,987**
3	Crafts (Construction) - PT - Distribs	5,781	5,581	4,204	3,238	2,680	656	**22,140**
3	Crafts (Construction) - PT - Electrical	1,320	2,980	20,269	16,037	18,336	4,395	**63,337**
3	Crafts (Construction) - PT - Mechanical	1,161	3,486	11,243	13,895	9,517	396	**39,698**
3	Crafts (Construction) - PT - Piping and Instrumentation	27,666	32,286	53,433	44,843	31,501	7,464	**197,193**
3	Construction Subcontracts - PT	2,593	11,256	11,063	23,909	19,368	3,249	**71,438**
3	Liner Plate and Vessel Const Subcontract - PT	1,200	30	223	3,664	1,341	0	**6,458**
3	Special Protective Coating Const Subcontract - PT	3,141	2,726	2,654	4,782	599	3	**13,905**
3	Intermech Construction Subcontract - PT	2,114	6,091	13,272	8,473	2,358	0	**32,308**
3	Commissioning - PT	1,115	1,000	1,267	5,865	18,664	32,688	**60,599**
-	Fee	11,078	14,531	20,913	16,738	17,279	9,343	**89,882**
-	Contingency	27,739	39,157	54,968	41,665	34,424	37,392	**235,345**
2	**Low-Activity Waste**	**61,716**	**76,227**	**65,851**	**46,715**	**33,682**	**80,325**	**364,516**
3	Engineering Design - LAW	5,976	3,329	1,383	456	194	19	**11,357**
3	Plant Equipment - LAW	12,197	13,718	8,874	3,795	0	20,780	**59,364**
3	Equipment Engineering - LAW	1,676	418	14	14	14	15	**2,151**
3	Environmental and Nuclear Safety - LAW	736	694	1,290	1,106	1,043	2,386	**7,255**

Table E-34. Major Construction – Waste Treatment Plant (PBS ORP-0060) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (4 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
3	Research and Technology - LAW	370	424	240	232	239	247	**1,752**
3	Plant Material - LAW	585	1,604	0	0	0	0	**2,189**
3	Startup - LAW	156	168	212	2,594	8,345	2,136	**13,611**
3	Construction Field Non Manual - LAW	6,037	6,750	6,790	5,926	1,318	115	**26,936**
3	Crafts (Construction) - LAW	14,572	24,756	25,786	10,424	0	0	**75,538**
3	Crafts (Construction) - LAW - Distribs	2,379	2,124	1,613	1,507	1,082	339	**9,044**
3	Construction Subcontracts - LAW	1,391	10,329	10,708	1,443	0	0	**23,871**
3	CB&I Construction Subcontract - LAW	275	345	142	0	0	0	**762**
3	Special Protective Coating Const Subcontract - LAW	269	1,094	1,057	7	0	0	**2,427**
3	Intermech Construction Subcontract - LAW	39	342	520	129	0	0	**1,030**
3	Commissioning - LAW	601	788	954	5,363	11,330	29,573	**48,609**
-	Fee	9,281	5,445	761	8,076	914	3,191	**27,668**
-	Contingency	5,176	3,899	5,507	5,643	9,203	21,524	**50,952**
2	**High-Level Waste**	**153,894**	**184,701**	**142,609**	**147,372**	**134,006**	**97,297**	**859,879**
3	Engineering Design - HLW	15,869	14,434	6,086	1,223	1,235	563	**39,410**
3	Plant Equipment - HLW	55,623	44,084	32,557	17,137	12,277	725	**162,403**
3	Equipment Engineering - HLW	2,255	820	22	4	34	177	**3,312**
3	Environmental and Nuclear Safety - HLW	564	578	548	1,584	2,209	3,337	**8,820**
3	Research and Technology - HLW	292	300	335	451	370	252	**2,000**
3	Plant Material - HLW	17,765	24,244	0	0	0	0	**42,009**
3	Process Engineering and Flowsheet Modeling - HLW	157	147	153	158	255	11,151	**12,021**
3	Startup - HLW	8,416	9,322	11,063	11,138	8,868	3,504	**52,311**
3	Construction Field Non Manual - HLW	19,919	26,329	17,486	16,757	10,700	3,154	**94,345**
3	Crafts (Construction) - HLW - Civil	4,363	4,878	2,249	2,229	1,679	549	**15,947**
3	Crafts (Construction) - HLW - Distribs	1,002	4,021	6,064	7,497	10,714	7,527	**36,825**
3	Crafts (Construction) - HLW - Electrical	2,636	5,574	9,347	9,612	7,449	2,275	**36,893**
3	Crafts (Construction) - HLW - Mechanical	3,356	6,817	9,632	18,916	18,588	6,387	**63,696**
3	Crafts (Construction) - HLW - Piping and	1,355	2,874	4,242	12,477	15,671	4,835	**41,454**

Table E-34. Major Construction – Waste Treatment Plant (PBS ORP-0060) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (4 pages)

Schedule Level	Scope	Fiscal Year 2011	2012	2013	2014	2015	2016	Total
	Instrumentation							
3	Construction Subcontracts - HLW	1,392	2,091	5,391	449	14	0	**9,337**
3	Liner Plate and Vessel Const Subcontract - HLW	412	2,083	3,468	2,913	1,082	0	**9,958**
3	Special Protective Coating Const Subcontract - HLW	3,367	5,299	5,152	6,723	4,306	2,878	**27,725**
3	Intermech Construction Subcontract - HLW	698	617	661	2,341	8,368	15,456	**28,141**
3	Commissioning - HLW	15,869	14,434	6,086	1,223	1,235	563	**39,410**
-	Fee	6,451	19,614	8,245	10,079	6,189	6,177	**56,755**
-	Contingency	8,002	10,575	19,908	25,684	23,998	28,350	**116,517**
2	**Balance of Facilities**	**30,351**	**36,367**	**57,932**	**54,965**	**80,098**	**52,759**	**312,472**
3	Engineering Design - BOF	4,142	6,780	3,345	1,080	466	22	**15,835**
3	Plant Equipment - BOF	4,015	5,487	11,603	1,980	18,633	0	**41,718**
3	Equipment Engineering - BOF	113	127	516	432	484	502	**2,174**
3	Environmental and Nuclear Safety - BOF	466	555	1,067	539	0	0	**2,627**
3	Plant Material - BOF	208	815	10,646	11,310	9,153	5,497	**37,629**
3	Startup - BOF	3,231	3,371	3,755	4,752	5,236	3,000	**23,345**
3	Construction Field Non Manual - BOF	5,012	4,359	7,901	12,661	12,070	5,265	**47,268**
3	Crafts (Construction) - BOF	1,547	1,057	1,000	1,054	834	301	**5,793**
3	Crafts (Construction) - BOF - Distribs	928	2,406	2,718	5,665	4,184	2,709	**18,610**
3	Construction Subcontracts - BOF	2,352	4,577	5,747	6,414	13,258	22,122	**54,470**
3	Commissioning - BOF	4,142	6,780	3,345	1,080	466	22	**15,835**
-	Fee	7,863	3,324	3,559	3,034	3,935	1,902	**23,617**
-	Contingency	474	3,509	6,075	6,044	11,845	11,439	**39,386**
2	**Laboratory**	**22,473**	**31,998**	**17,943**	**28,416**	**26,726**	**39,691**	**167,247**
3	Engineering Design - Lab	1,814	1,557	542	66	50	0	**4,029**
3	Plant Equipment - Lab	1,474	912	2,460	6,371	1,671	1,398	**14,286**
3	Equipment Engineering - Lab	0	394	908	148	0	0	**1,450**
3	Environmental and Nuclear Safety - Lab	168	208	1,200	691	792	773	**3,832**
3	Research and Technology - Lab	155	171	1,056	5,507	643	0	**7,532**
3	Plant Material - Lab	2,694	2,618	1,706	400	0	0	**7,418**

Table E-34. Major Construction – Waste Treatment Plant (PBS ORP-0060) Near-Term Schedule and Costs, Level 3, by Fiscal Year ($1,000, Escalated). (4 pages)

Schedule Level	Scope	Fiscal Year						Total
		2011	2012	2013	2014	2015	2016	
3	Startup - Lab	7,060	8,335	2,653	216	0	0	**18,264**
3	Construction Field Non Manual - Lab	988	962	249	249	195	66	**2,709**
3	Crafts (Construction) - Lab	1,210	6,527	859	0	0	0	**8,596**
3	Crafts (Construction) - Lab - Distribs	0	171	0	0	0	0	**171**
3	Construction Subcontracts - Lab	323	583	0	0	0	0	**906**
3	CB&I Construction Subcontract - Lab	11	78	30	0	0	0	**119**
3	Special Protective Coating Const Subcontract - Lab	1,023	1,292	4,442	11,657	19,546	28,499	**66,459**
3	Intermech Construction Subcontract - Lab	1,814	1,557	542	66	50	0	**4,029**
3	Commissioning - Lab	1,474	912	2,460	6,371	1,671	1,398	**14,286**
-	Fee	4,700	6,922	356	879	1,089	1,508	**15,454**
-	Contingency	853	1,268	1,482	2,232	2,740	7,447	**16,022**
2	**Plant Wide**	**351,926**	**335,141**	**307,033**	**297,136**	**265,717**	**226,809**	**1,783,762**
Total		**857,705**	**1,004,547**	**996,709**	**878,581**	**750,410**	**628,190**	**5,116,142**

BOF = Balance of Facilities.
HLW = High-Level Waste (Facility).
LAB = Analytical Laboratory.
LAW = Low-Activity Waste (Facility).
LOE = level of effort.
ORP = U.S. Department of Energy, Office of River Protection.
PBS = project baseline summary.
PT = Pretreatment (Facility).

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APPENDIX F

CENTRAL PLATEAU CLEANUP ACTION - REMEDIATE 200-SW-2 OPERABLE UNIT COST ESTIMATE ALTERNATIVE ANALYSIS

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TERMS

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
OU	operable unit
PBS	project baseline summary
PUREX	Plutonium Uranium Extraction (Plant)
RCRA	*Resource Conservation and Recovery Act of 1976*
RTD	remove, treat, and dispose
TPA	Tri-Party Agreement
TRU	transuranic
TSD	treatment, storage, and disposal
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing (Facility)

APPENDIX F

CENTRAL PLATEAU CLEANUP ACTION - REMEDIATE 200-SW-2 OPERABLE UNIT COST ESTIMATE ALTERNATIVE ANALYSIS

F.1 BACKGROUND

Twenty-five solid waste landfills (often referred to as burial grounds or burial trenches) are located within the 200-SW-2 Operable Unit (OU) on the Central Plateau (13 landfills are in the 200-West Area and 12 landfills are in the 200-East Area). Collectively, the 200-SW-2 landfills received between 450,000 and 460,000 cubic meters of a heterogeneous mixture of solid waste during operations that began in the mid-1940s. The 200-SW-2 landfills cover a cumulative area of over 680 acres, including layback and working margin within the perimeter. Each landfill is made up of burial trenches. The cumulative area of the trenches considered as part of this analysis is 545 acres (this area excludes unused landfills and trench sections where active remedial/storage efforts are occurring). To date, no regulatory decisions have been made for the 200-SW-2 OU.

Much of the available information regarding the 200-SW-2 OU is summarized in DOE/RL-2004-60, *200-SW-1 Nonradioactive Landfills Group Operable Unit and 200-SW-2 Radioactive Landfills Group Operable Unit Remedial Investigation/Feasibility Study Work Plan*. Waste volume and other information relevant to the 200-SW-2 OU were derived from DOE/RL-2004-60 and used for preparation of PFM-00011, *Rough Order of Magnitude Cost and Schedule Estimate for Hanford Lifecycle Report (DOE/RL-2010 25 Rev. A) Evaluation of 200-SW-2 Remove, Treat, Dispose (RTD) Alternative*. The quantity and quality of burial records and/or relevant historical information varies greatly; information generally is sparse for the earlier years and more substantive for waste buried after the late 1960s.

For planning purposes and to aid in assessing potential remedial paths, the 25 landfills in the 200-SW-2 OU have been sorted into six main categories, or bins, based on similar characteristics, as follows (DOE/RL-2004-60):

- **Bin 1: TSD Unit Landfills.** This bin includes landfills that are regulated as R*esource Conservation and Recovery Act of 1976* (RCRA) hazardous and mixed waste treatment, storage, and disposal (TSD) units and are included in the 2008 Hanford Facility Low-Level Burial Grounds Dangerous Waste Permit Application Part A (EPA 1994 as amended).
- **Bin 2: Industrial Landfills.** This bin includes past practice landfills that received radioactive waste, packaged primarily in large wooden or concrete boxes and containing large quantities of fission products. For the most part, these sites were restricted to burial of large pieces of failed or obsolete equipment from the chemical processing facilities in the 200 Area, although some items came from the 100 Areas.
- **Bin 3: Dry Waste Alpha Landfills.** This bin includes past practice landfills that received radioactive waste packaged primarily in fiberboard or small wooden boxes, wrapped in heavy brown paper or burlap, or placed in the trench without packaging. A small proportion of the waste is packaged in metal drums. Historical documentation

indicates that these sites contain at least 90 percent of the 200 Areas' landfill alpha inventory of solid wastes disposed of prior to 1970.

- **Bin 4: Dry Waste Landfills.** This bin includes past practice landfills that received radioactive waste packaged primarily in fiberboard or small wooden boxes, wrapped in heavy brown paper or burlap, or placed in the trench without packaging. A small portion of the waste is packaged in metal drums.
- **Bin 5: Construction Landfills.** This bin includes past practice landfills that mainly were limited to burial of wastes resulting from construction work on existing facilities or demolition of surplus facilities. Waste in these sites is believed to contain very little radioactive contamination.
- **Bin 6: Caissons.** This bin includes caissons and vertical pipe units used for disposal of hot cell waste or high plutonium concentration waste. This bin also includes caissons that are believed to be empty/unused, according to historical documentation. One group of caissons contains retrievably stored waste that will be dispositioned by the Waste Retrieval Project under Project Baseline Summary (PBS) RL-0013C, Solid Waste Stabilization and Disposition–200 Area.

F.2 200-SW-2 OPERABLE UNIT RANGE OF PLAUSIBLE ALTERNATIVES

During the *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA) remedial investigation/feasibility study work planning process for the 200-SW-2 OU (DOE/RL-2004-60), the U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and Washington State Department of Ecology (together the Tri-Party Agreement [TPA] agencies) identified potential remedial alternatives that include the following:

- Excavation, treatment (as necessary), and disposal of waste from within individual landfills.
- Excavation, treatment (as necessary), and disposal of waste from selected sections of individual landfills.
- Capping of individual landfills.
- In situ treatment/stabilization (e.g., vitrification or grouting) of portions of individual landfills.
- Some combination of the above.
- No action with continued monitoring.

The CERCLA remedial investigation/feasibility study process is not yet complete for the 200-SW-2 OU and uncertainty remains concerning the nature and extent of contamination and remedy selection.

To support preparation of this Lifecycle Report, the TPA agencies participated in working sessions to develop a range of plausible alternatives and describe a reasonable upper bound. The range of plausible alternatives was identified as follows:

- Excavation, treatment (as necessary), and disposal of all waste from within individual landfills (this is the reasonable upper bound).

- Excavation, treatment (as necessary), and disposal of waste from selected sections of individual landfills followed by capping of remaining waste; includes continued cap maintenance and monitoring.
- Capping of individual landfills (includes continued cap maintenance and monitoring).
- In situ treatment/stabilization (e.g., vitrification or grouting) of portions of individual landfills followed by capping; includes continued cap maintenance and monitoring (this is the lower bound).

The TPA agencies agreed that while fully removing all the 200-SW-2 OU waste may or may not ultimately be selected as the CERCLA remedy, providing information on a complete removal scenario (remove, treat, and dispose) would represent an upper bound in terms of cost and effort for these waste sites.

F.2.1 Current Lower Bound Work Scope and Cost Assumptions

The work scope and cost estimates for the 200-SW-2 OU are included in PBS RL-0040, Nuclear Facility D&D–Remainder of Hanford. Based on the cleanup assumptions of grout injection and capping, remaining estimated cleanup costs range from $686 million (unescalated, 2010 constant dollars, without uncertainty) to $823 million with 20 percent cost and/or schedule uncertainty (unescalated, 2010 constant dollars). Table F-1 summarizes estimated costs for each project management activity and landfill bin that constitute the lower bound alternative consisting of in situ treatment/stabilization of portions of the landfills, followed by capping and continued cap maintenance and monitoring.

Table F-1. 200-SW-2 Operable Unit Lower Bound Cleanup Cost Estimate (shown in 2010 Constant Dollars).

Activities	Cost (Million $)
Overall Project Management and Support Activities	$195
Remediation Definition	$2
Operations and Maintenance	$108
Bin 1 - TSD Unit Landfills	$260
Bin 2 - Industrial Landfills	$47
Bin 3 - Dry Waste Alpha Landfills	$46
Bin 4 - Dry Waste Landfills	$18
Bin 5 - Construction Landfills	$10
Bin 6 - Caissons	$0
Total (minus Cost and Schedule Uncertainty)	**$686**
Cost and Schedule Uncertainty (20%)	**$137**
Grand Total	**$823**

TSD = treatment, storage, and disposal.

Table F-2 provides a more detailed view of the current lower bound cost estimate. In Table F-2, the costs per category/bin are fragmented because of the difference between bin and closure zone membership (DOE/RL-2004-60; DOE/RL-2009-81, *Central Plateau Cleanup Completion Strategy*; CP-22319-DEL, *Plan for Central Plateau Closure*). Additionally, the caissons (Bin 6) were consolidated as part of the overall cost of their parent waste site, thus there is no discrete cost for them in this estimate.

Table F-2. Project Baseline Summary Level 3 Work Element, for the 200-SW-2 Operable Unit Lower Bound Cost Estimate (shown in 2010 Constant Dollars). (2 pages)

PBS Schedule Level	Work Element	Cost (Million $)
2	**Overall Project Management & Support Activities**	**$195**
3	Overall Project Management	$195
2	**Remediation Definition**	**$2**
3	Solid Waste Zone – Waste Sites	$0.375
3	Waste Management Zone – Waste Sites	$1.13
3	PUREX Zone – Waste Sites	$0.28
3	Semi-Works Zone – Waste Sites	$0.028
2	**Operations and Maintenance**	**$108**
3	Solid Waste Zone	$51.3
3	Waste Management Zone	$51.4
3	PUREX Zone	$0.7
3	Semi-Works Zone	$4.8
2	**Bin 1 - TSD Unit Landfills**	**$260**
3	Solid Waste Zone	$102
3	Waste Management Zone	$158
3	PUREX Zone	$0
3	Semi-Works Zone	$0
2	**Bin 2 - Industrial Landfills**	**$47**
3	Solid Waste Zone	$8.7
3	Waste Management Zone	$37.9
3	PUREX Zone	$0
3	Semi-Works Zone	$0
2	**Bin 3 - Dry Waste Alpha Landfills**	**$46**
3	Solid Waste Zone	$0
3	Waste Management Zone	$46
3	PUREX Zone	$0
3	Semi-Works Zone	$0
2	**Bin 4 - Dry Waste Landfills**	**$18**
3	Solid Waste Zone	$0
3	Waste Management Zone	$15.8
3	PUREX Zone	$2.6
3	Semi-Works Zone	$0

Table F-2. Project Baseline Summary Level 3 Work Element, for the 200-SW-2 Operable Unit Lower Bound Cost Estimate (shown in 2010 Constant Dollars). (2 pages)

PBS Schedule Level	Work Element	Cost (Million $)
2	**Bin 5 - Construction Landfills**	**$10**
3	Solid Waste Zone	$2.9
3	Waste Management Zone	$0
3	PUREX Zone	$0
3	Semi-Works Zone	$7
2	**Bin 6 - Caissons** (Caissons not separately costed from parent burial ground in current planning case)	**$0**
	Total (minus Cost and Schedule Uncertainty)	**$686**
	Cost and Schedule Uncertainty (20%)	**$137**
Grand Total		**$823**

PBS = project baseline summary.
PUREX = Plutonium-Uranium Extraction (Plant).
TSD = treatment, storage, and disposal.

F.2.2 200-SW-2 Operable Unit Reasonable Upper Bound

The scope of the reasonable upper bound is provided as a sensitivity analysis and includes removal of the individual waste trenches in each of the 25 200-SW-2 OU landfills, from the surface to the bottom of each waste trench, with the exception of the 218-W-6 Burial Ground (it has been assumed that confirmational sampling and analysis will show this burial ground never received waste). The waste contained in the burial grounds ranges from low-dose rate materials, to high-dose rate materials, to potential alpha-contaminated materials. The associated processes for excavating and handling these varying materials also range in complexity, cost, and time requirements.

As radioactive components increase in concentration/activity within the waste, additional measures are required to protect workers, the environment, and the public; therefore, costs associated with these measures also increase, as does the time needed to complete the work scope. These more complex wastes may also necessitate special handling requirements, such as containment structures, air-flow controls, remotely controlled equipment, and repackaging or treatment processes. Disposal requirements also vary with the waste type; some material may require special disposal, such as at the Waste Isolation Pilot Plant (WIPP) or a similar facility.

To account for the variability in the waste and to address the range of associated cost and schedule impacts, DOE, Richland Operations Office (DOE-RL) developed three cost models for this Lifecycle Report to address the different waste types and disposal pathways for the 200-SW-2 OU landfill wastes. This approach takes into account the bins that have been used previously to categorize the types of burial grounds in the 200-SW-2 OU, anticipates three potential waste disposition choices that will need to be made as waste is retrieved, and estimates the quantity of waste from each burial ground that, based on available information, is likely to be diverted to each of the three waste disposition pathways.

The three waste type/disposition groups associated with the cost models are as follows:

- **Group 1 (Cost model 1).** This group addresses wastes that are expected to be suitable for disposal at the Environmental Restoration Disposal Facility and uses estimates for excavation volumes similar to the River Corridor burial ground remediation.
- **Group 2 (Cost model 2).** This group addresses solid wastes disposed of prior to 1970 and which, when retrieved, may contain more than 100 nanoCuries per gram of radioisotopes with periodic table element numbers greater than uranium. Excavation volumes containing the solid wastes disposed of prior to 1970 were estimated using historic costs or current estimates for comparable Hanford Site activities and quantities for retrieving transuranic (TRU) wastes (e.g., TRU retrieval; HNF-19169, *Transuranic Mixed/Mixed Low-Level Waste Project Management Plan*).
- **Group 3 (Cost model 3)**. This group represents work involving excavation of wastes containing high-dose materials that are not included in Group 1 or Group 2. These wastes have no readily identifiable handling or processing methods at the Hanford Site and are assumed to require negative pressure containment structures to support waste retrieval and conditioning.

An upper-bound waste volume estimate was developed from a review of the DOE complex for comparable work currently being performed at the Hanford Site and other DOE sites. Additional upper bound assumptions were identified based on the current status of the remedial investigation/feasibility study process for the OU (i.e., in the early work planning phases with some non-intrusive soil gas sampling, surface geophysics, and a varying degree of process knowledge), the uncertainty of the waste form (burial grounds are a heterogeneous mixture of waste and contamination types), and current estimates of waste volumes in each waste category/bin, with an associated working margin.

Table F-3 provides the estimated waste volumes for each group (waste disposition pathway) associated with each burial ground. Excavation volumes are based on engineering drawings and other documentation; waste volumes are based on documented quantities assumed disposed and the proportion and/or type of waste. Retrieval rates are estimates drawn from historic or actual values from similar DOE work. Detailed assumptions regarding the calculation of the waste quantities and other processing requirements for Groups 1, 2, and 3 are provided in PFM-00011.

The geometry and configuration of the trenches, coupled with conservatively applied contaminated material controls, results in a larger quantity of material to be removed from the trenches than was initially buried. The estimated amount of soil cover, and thus the quantity of potentially contaminated material to be removed from the burial grounds, results in approximately ten times the amount of waste originally disposed. In the absence of specific characterization data, it has been assumed that all materials removed from the landfills would be contaminated and require management and disposal. DOE expects that effective project management, careful retrieval techniques, and field work controls would substantially reduce the actual amount of contaminated wastes. However, for purposes of estimating upper bound waste quantities, no credit has been taken for advantageous work practices.

Table F-3. 200-SW-2 Operable Unit Estimated Waste Volume Quantities for Upper Bound Remove, Treat, and Dispose Alternative. (2 pages)

Burial Ground Bin	Burial Ground	Wastes Suitable for ERDF, Corresponding to Group 1 (cubic meters)	Potential Pre-1970 Solid Waste >100 nanoCuries per gram, Corresponding to Group 2 (cubic meters)	High-Dose Rate Waste, Corresponding to Group 3 (cubic meters)
Bin 1 – TSD Unit Landfills	218-E-10	276,155	0	18,667
	218-E-12B	378,278	121	59,185
	218-W-3A	546,704	50	78,491
	218-W-3AE	304,436	0	33,633
	218-W-4B	55,566	1,110	6,641
	218-W-4C	154,867	0	14,567
	218-W-5	460,678	0	78,982
	218-W-6	0	0	0
Total Cubic Meters	**—**	**2,176,682**	**1,281**	**290,166**
Number of Days [1]	**—**	**6,219**	**160**	**3,673**
Bin 2 – Industrial Landfills	218-E-2	25,368	0	3,251
	218-E-2A	4,666	0	0
	218-E-5	48,679	142	1,252
	218-E-5A	83,699	0	2,993
	218-E-9	26,261	0	0
	218-W-1A	102,463	0	5,400
	218-W-2A	622,175	178	14,366
	218-W-11	3,450	0	0
Total Cubic Meters	—	916,761	320	27,262
Number of Days [1]	—	2,619	40	345
Bin 3 – Dry Waste Alpha Landfills	218-W-1	17,740	6,560	0
	218-W-2	158,750	8,240	0
	218-W-3	191,282	5,930	0
	218-W-4A	263,491	5,140	0
Total Cubic Meters	**—**	**631,263**	**25,870**	**0**
Number of Days [1]	**—**	**1,804**	**3,234**	**0**
Bin 4 - Dry Waste Landfills	218-E-1	26,237	0	0
	218-E-12A	595,193	0	0
Total Cubic Meters	**—**	**621,430**	**0**	**0**
Number of Days [1]	**—**	**1,776**	**0**	**0**
Bin 5 -	218-E-8	23,322	0	0

Table F-3. 200-SW-2 Operable Unit Estimated Waste Volume Quantities for Upper Bound Remove, Treat, and Dispose Alternative. (2 pages)

Burial Ground Bin	Burial Ground	Wastes Suitable for ERDF, Corresponding to Group 1 (cubic meters)	Potential Pre-1970 Solid Waste >100 nanoCuries per gram, Corresponding to Group 2 (cubic meters)	High-Dose Rate Waste, Corresponding to Group 3 (cubic meters)
Construction Landfills	218-E-4	63,325	0	0
	218-C-9	21,378	0	0
Total Cubic Meters	—	**108,025**	**0**	**0**
Number of Days [1]	—	**309**	**0**	**0**
Bin 6 - Caissons	218-W-4A	1,299	0	35
	218-W-4B	1,773	0	106
Total Cubic Meters	—	**3,072**	**0**	**141**
Number of Days [1]	—	**9**	**0**	**2**

[1] The number of days is how many days it would take to retrieve, condition, transfer, and disposition (to disposal or interim storage) the waste volume for each bin. The number of days can be used to estimate potential duration and schedule for performing the remove, treat, and dispose alternative. The number of days is calculated by dividing the total cubic meters by the daily retrieval rate for each waste disposition group (Group 1, Group 2, and Group 3). The daily retrieval rate has been estimated to be 350 m^3/day for Group 1; 8 m^3/day for Group 2; and, 79 m^3/day for Group 3 (PFM-00011).

ERDF = Environmental Restoration Disposal Facility.

TSD = treatment, storage, and disposal.

DOE-RL generated unit rate and cost elements that were used to quantify remediation time frames and cost estimates for the 200-SW-2 OU. These estimates are based on different information sources, including actual costs, from such actions as the remediation of 618-7 in the 300 Area, the 618-10 and 618-11 planning estimates, the feasibility study cost estimates for the burial ground remediation in Waste Area Group 7 at the Idaho National Laboratory, and data from the Hanford Site M-091 retrieval activities (see PFM-00011).

Table F-4 provides a cost rollup for each identified PBS level 2 task involved in the upper bound alternative (remove, treat, and dispose all 200-SW-2 OU landfills). Table F-5 provides a more detailed view of the cost estimate illustrating the component values of the principal activities down to PBS Level 3. Project cost estimates were calculated using the U.S. Army Corps of Engineers Micro-Computer Aided Cost Estimating System (MII) software application. MII is used by the Corps of Engineers and many architect/engineering firms for the preparation of detailed construction cost estimates and is a Hanford Site accepted software for this purpose. The software is used for the preparation of programming estimates, current working estimates, bid opening estimates, and construction modification estimates in support of the MILCON, Civil Works, and Hazardous, Toxic, and Radiological Waste programs.

Table F-4. 200-SW-2 Operable Unit Estimated Costs for Upper Bound Retrieve, Treat, and Dispose Alternative (2010 Constant Dollars).

Activities	Cost (Million $)
01.01 Overall Project Management and Support Activities	$1,268
01.02 ERDF Expansion	$180
01.03 Central Characterization Project	$332
01.04 WRAP Base Operations and Min Safe	$91
01.05 Bin 1 - TSD Unit Landfills	$7,070
01.06 Bin 2 Industrial Landfills	$903
01.07 Bin 3 Dry Waste Alpha Landfills	$887
01.08 Bin 4 Dry Waste Landfills	$130
01.09 Bin 5 Construction Landfills	$23
01.10 Bin 6 Caissons	$142
Transport to WIPP [1]	$50
Total (minus uncertainty)	**$11,076**
Cost and Schedule Uncertainty (50%)	$5,538
Grand Total	**$16,614**

[1] Costs for transport to WIPP, for purposes of DOE planning, would be carried in the WIPP budget and not included in the Hanford Site PBS. This cost estimate has been developed only for purposes of this Lifecycle Report and does not appear in DOE's current budget for WIPP.

DOE = U.S. Department of Energy.
ERDF = Environmental Restoration Disposal Facility.
PBS = project baseline summary.
TSD = treatment, storage, and disposal.
WRAP = Waste Receiving and Processing (Facility).
WIPP = Waste Isolation Pilot Plant.

The cost data generated by MII, tailored for Hanford Site activities and the processing/quantity data provided in Table F-3, was used to calculate the values presented in Tables F-4 (PBS Level 2 costs) and F-5 (PBS Level 3 costs). Estimated cost information is provided for each general category of activity and its corresponding components. The total estimated cost in 2010 constant dollars for the upper bound alternative is $16.6 billion, including a reasonable provision of $5.5 billion to account for cost and schedule uncertainty associated with the early level of maturity for this upper bound alternative.

The cost estimate for transport to WIPP has been included as a line item cost for Group 2 wastes only. The cost is based on an average rate of $5 per shipment mile and an assumed typical shipment comprised of packages that contain a total average quantity of 10 cubic meters of waste. Based on these assumptions, and an estimated Group 2 waste volume of approximately 27,500 cubic meters, the number of shipments to WIPP would be 2,750 (at 10 cubic meters per shipment); the number of roundtrip shipment miles would be 9,993,000 (2,750 shipments times 3,612 miles per roundtrip from the Hanford Site to WIPP); and, the total cost would be $49,665,000 (9,993,000 shipment miles times $5 per shipment mile).

Table F-5. 200-SW-2 Operable Unit Estimated Costs, by Project Baseline Summary Level 3 Work Element, for Upper Bound Retrieve, Treat and Dispose Alternative (2010 Constant Dollars). (2 pages)

PBS Schedule Level	Work Element	Cost [1] (Million $)
2	**01.01 Overall Project Management & Support Activities**	**$1,268**
3	01.01.01 Overall Project Management & Support Activities	$1,268
2	**01.02 ERDF Expansion**	**$180**
3	01.02.01 ERDF Expansion	$180
2	**01.03 Central Characterization Project**	**$332**
3	01.03.01 Central Characterization Project	$332
2	**01.04 WRAP Base Operations and Min Safe**	**$91**
3	01.04.01 WRAP Base Operations and Min Safe	$91
2	**01.05 Bin 1 - TSD Unit Landfills**	**$7,070**
3	01.05.02 Excavation & Drum/Box Retrieval	$7,047
3	01.05.03 Close-Out Sampling and Closure Reporting	$1
3	01.05.06 Backfill and Reveg	$22
2	**01.06 Bin 2 Industrial Landfills**	**$903**
3	01.06.02 Excavation & Drum/Box Retrieval	$893
3	01.06.03 Close-Out Sampling and Closure Reporting	$0
3	01.06.06 Backfill and Reveg	$9
2	**01.07 Bin 3 Dry Waste Alpha Landfills**	**$887**
3	01.07.01 Non-Intrusive Characterization	$0
3	01.07.02 Excavation & Drum/Box Retrieval	$881
3	01.07.03 Close-Out Sampling and Closure Reporting	$0
3	01.07.06 Backfill and Reveg	$6
2	**01.08 Bin 4 Dry Waste Landfills**	**$130**
3	01.08.02 Excavation & Drum/Box Retrieval	$124
3	01.08.03 Close-Out Sampling and Closure Reporting	$0
3	01.08.06 Backfill and Reveg	$6
2	**01.09 Bin 5 Construction Landfills**	**$23**
3	01.09.02 Excavation & Drum/Box Retrieval	$22
3	01.09.03 Close-Out Sampling and Closure Reporting	$0
3	01.09.06 Backfill and Reveg	$1
2	**01.10 Bin 6 Caissons**	**$142**
3	01.10.06 Backfill and Reveg	$0
3	01.10.07 Caissons	$142
NA	Transport to WIPP [2]	$50
	Total (minus uncertainty)	**$11,076**
	Cost and Schedule Uncertainty (50%)	**$5,538**
	Grand Total	**$16,614**

Table F-5. 200-SW-2 Operable Unit Estimated Costs, by Project Baseline Summary Level 3 Work Element, for Upper Bound Retrieve, Treat and Dispose Alternative (2010 Constant Dollars). (2 pages)

PBS Schedule Level	Work Element	Cost [1] (Million $)
[1] Estimated costs for some work elements are less than $500,000 and rounding to the nearest $1 Million results in the estimate being shown as $0. [2] Costs for transport to WIPP, for purposes of DOE planning, are carried in the WIPP budget and are not included in the Hanford Site PBS. This cost estimate has been developed only for purposes of this Lifecycle Report and does not appear in DOE's current budget for WIPP.		

DOE = U.S. Department of Energy.
ERDF = Environmental Restoration Disposal Facility.
PBS = project baseline summary.
TSD = treatment, storage, and disposal.
WIPP = Waste Isolation Pilot Plant.
WRAP= Waste Receiving and Processing (Facility).

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