

# 2022 Hanford Lifecycle Scope, Schedule and Cost Report



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Revision 0

# 2022 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT

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U.S. DEPARTMENT OF  
**ENERGY**

Richland Operations  
Office

P.O. Box 550, MS A7-75  
Richland, Washington 99352

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By Julia Raymer at 4:26 pm, Dec 27, 2021

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## PREFACE

The 2022 *Hanford Lifecycle Scope, Schedule and Cost Report* (Lifecycle Report [LCR]) summarizes the remaining work scope, schedule and cost estimates for Hanford Site cleanup. The report is prepared and submitted by the U.S. Department of Energy (DOE) to the U.S. Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) in accordance with milestone, M-036-01, which requires submittal of a LCR in a rolling three (3) year cycle that coincides with M-062-40 submittal of the System Plan starting with M-036-01J by January 31, 2022.

The LCR provides both a low-range and a high-range cost estimate associated with the Hanford cleanup work scope, which includes the estimated cost to complete cleanup within the River Corridor, Central Plateau, tank waste, and mission support components as well as allowances for cost and schedule uncertainties. Information provided in the LCR has been developed for the sole purpose of preparing the LCR and fulfilling the requirements of TPA M-036-01; the LCR is not a decision-making document that substitutes for, or preempts, the cleanup decision processes as set forth in the following:

- *Hanford Federal Facility Agreement and Consent Order*<sup>1</sup> (Tri-Party Agreement or TPA)
- The Consent Decree in *State of Washington v. Department of Energy*, Case No 08-5085-RMP (E.D. Wa. October 25, 2010) (DOE and Ecology 2010), the Amended Consent Decree (DOE and Ecology 2016), the Second Amended Consent Decree (DOE and Ecology 2016), the Third Amended Consent Decree (DOE and Ecology 2018), and Order Modifying Amended Consent Decree (DOE and Ecology 2020).

The low-range cost estimate of approximately \$319.6 billion reflects the baseline planning case with allowances for schedule and cost estimate uncertainty. The high-range cost estimate of approximately \$660.0 billion fully incorporates the realization of risks associated with uncertainty in discrete elements of work. The likelihood, and schedule and cost consequences, of risk events occurring have been quantified to provide cost impacts. The largest component to risk and to the high-range cost estimate is completion of the tank waste cleanup mission.

The inclusion of high-range cost estimates herein represents an enhancement in projecting the future Hanford Site cleanup costs. These costs, as presented in Table ES-1, reflect and account for the high degree of technical complexity and uncertainty associated with the large volume of work to be completed. A summary of the assumptions, risks, and uncertainties associated with each project baseline summary (PBS) is contained in the individual PBS sections discussed herein.

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<sup>1</sup>Ecology et al. 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.



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## EXECUTIVE SUMMARY

### PURPOSE

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

The LCR is prepared and submitted by DOE to the U.S. Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) every three years by January 31 per TPA Milestone M-036-01 to coincide with submittal of the *River Protection Project System Plan* (System Plan).

The LCR serves as an agreed-on foundation for preparing budget requests and for informational briefings to affected Tribal Nations, the State of Oregon, and Hanford stakeholders. The LCR supports continued discussions with EPA and Ecology on how and when RL and 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 is, it is equally important to understand what it is not. The LCR is not a *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (42 USC 9601) or *Resource Conservation and Recovery Act of 1976* (42 USC 6901) document. The report is not a decision document that substitutes for, or preempts, the cleanup decision processes as set forth in the following:

- *Hanford Federal Facility Agreement and Consent Order*<sup>2</sup> (Tri-Party Agreement or TPA)
- The Consent Decree in *State of Washington v. Department of Energy*, Case No 08-5085-RMP (E.D. Wa. October 25, 2010) (DOE and Ecology 2010), the Amended Consent Decree (DOE and Ecology 2016), the Second Amended Consent Decree (DOE and Ecology 2016), the Third Amended Consent Decree (DOE and Ecology 2018), and Order Modifying Amended Consent Decree (DOE and Ecology 2020).

### BACKGROUND

On October 25, 2010<sup>3</sup>, DOE, EPA, and Ecology (Tri-Party agencies) agreed to modify the TPA to incorporate a new milestone, M-036-01, requiring annual submittal of a LCR. On February 25, 2019, Tri-Party agencies agreed to modify milestone M-036-01 to coincide with the Interim Milestone M-062-40, Completing System Plan Negotiations On A Three Year Rolling Cycle. This most recent modification revised the delivery date for M-036-01J by two years to January 31, 2022, and subsequent versions to follow the three year rolling cycle. The LCR reflects all actions necessary for DOE to meet all applicable environmental obligations.

The 2022 LCR is the eighth edition and reflects scope, schedule, and cost status that is current as of August 31, 2021. Significant changes to cleanup obligations and related costs that have occurred after this date are noted in section 1.4 and will be incorporated into future reports.

### PUBLIC INVOLVEMENT PROCESS

The Tri-Party agencies encourage and support public participation, and believe it is essential to the cleanup process, as stated in *Hanford Public Involvement Plan* (Ecology et al. 2012). The 2022 LCR will be

<sup>2</sup>Ecology et al. 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.

<sup>3</sup>M-036-01 was negotiated as part of broader negotiations that occurred between the parties, culminating in the Consent Decree and a package of TPA modifications, all of which became effective when the Consent Decree was signed and entered into Federal District Court on October 25, 2010.

available to all interested parties on the DOE website at [www.hanford.gov](http://www.hanford.gov). Feedback regarding the 2022 LCR will be considered as future reports are developed. Feedback can be emailed to [lcssc@rl.gov](mailto:lcssc@rl.gov).

## **SUMMARY OF LIFECYCLE SCOPE, SCHEDULE, AND COST**

Hanford Site cleanup has three major components: River Corridor cleanup, Central Plateau cleanup, and tank waste cleanup. The tank waste cleanup area is located geographically on the Central Plateau. The cleanup also includes mission support activities that provide essential infrastructure and services to support the Hanford Site cleanup.

Hanford's remaining active cleanup schedule covers activities for cleanup and waste management, leading to transition of portions of the Hanford Site to long-term stewardship (LTS). The active cleanup schedule, using the baseline planning case, is from fiscal year (FY) 2022 to FY 2078, and LTS extends through FY 2095. Although the time period evaluated in this report ends at 2095, LTS actually extends longer because some waste sites and disposal facilities will have institutional controls requiring stewardship activities beyond that date. The Federal Government plans to have a presence at the Hanford Site well beyond FY 2095.

This LCR presents the RL and ORP planning cases encompassing a low- and high-range estimate. The ORP planning horizon represented in the low-range estimate is predicated on the baseline case of the *River Protection Project System Plan* (ORP-11242, Rev. 9 [System Plan 9]). System Plan 9 is a computer modeling exercise that evaluated a set of 5 main technical scenarios with 9 sensitivities providing rough cost and schedule estimates for completing the Site's River Protection Project (RPP) mission. While the baseline case reflects a theoretically achievable technical approach for completing the RPP mission based on conditions, constraints, assumptions, and direction existing at the time the System Plan 9 modeling effort began in early FY2019, it does not account for delays associated with COVID-19 and makes other technical assumptions that have not been proven to be implementable. In contrast, the high-range estimate accounts for the impact of these and other technical challenges across all PBSs, and is intended to ensure transparency among all Hanford stakeholders of the inherent risks in achieving the agreed upon cleanup goals (i.e., milestones).

The baseline case (low-range estimate) identifies estimated tank waste retrieval and treatment completion dates that incorporate the revised milestones contained in the 2018 Third Amended Consent Decree. Under the baseline technical approach, System Plan 9 forecasts a similar lifecycle cost and schedule for completing the RPP mission as documented in the most recent 2019 LCR. While technical assumption changes may have slightly increased the mission duration, lifecycle costs were offset by utilization of improved glass formulation models (decreased number of immobilized glass containers) and revised cost estimates for operating the Hanford Tank Waste Treatment and Immobilization Plant (WTP). The high-range cost estimate presented for each PBS incorporates an unconstrained estimate for identified risks and increases the confidence of completion at or below this estimate.

The remaining estimated cleanup costs<sup>4</sup> for Hanford include a low-range estimate of approximately \$293.2 billion (Figure ES-1) and a high-range estimate of approximately \$633.6 billion (Figure ES-2). This includes the estimated cost to complete cleanup within the River Corridor, Central Plateau, tank waste, and mission support components, as well as allowances for cost and schedule uncertainties. The largest contributor to the high-range estimate is comprised of the estimated cost, the likely risks that could be realized, and the uncertainties associated with the tank waste cleanup mission, including the WTP (estimate of \$527.5 billion). Table ES-1 summarizes total low-range and high-range estimated costs by PBS.

Remaining estimated cleanup costs do not include upper bound cost estimates prepared for selected future cleanup actions in prior LCRs. These future actions to be analyzed are identified in Appendix B, Table B-5.

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<sup>4</sup>The expression "cleanup costs" is used to represent the costs for those remaining actions that are necessary for DOE to fully meet all applicable environmental obligations and complete the Hanford Site cleanup mission.

## COST ESTIMATE ALTERNATIVE ANALYSES FOR SELECTED CLEANUP ACTIONS

The Tri-Party agencies considered the remaining cleanup actions to be analyzed (Appendix B, Table B-6) and agreed that the 2022 LCR would not include an alternatives analysis.

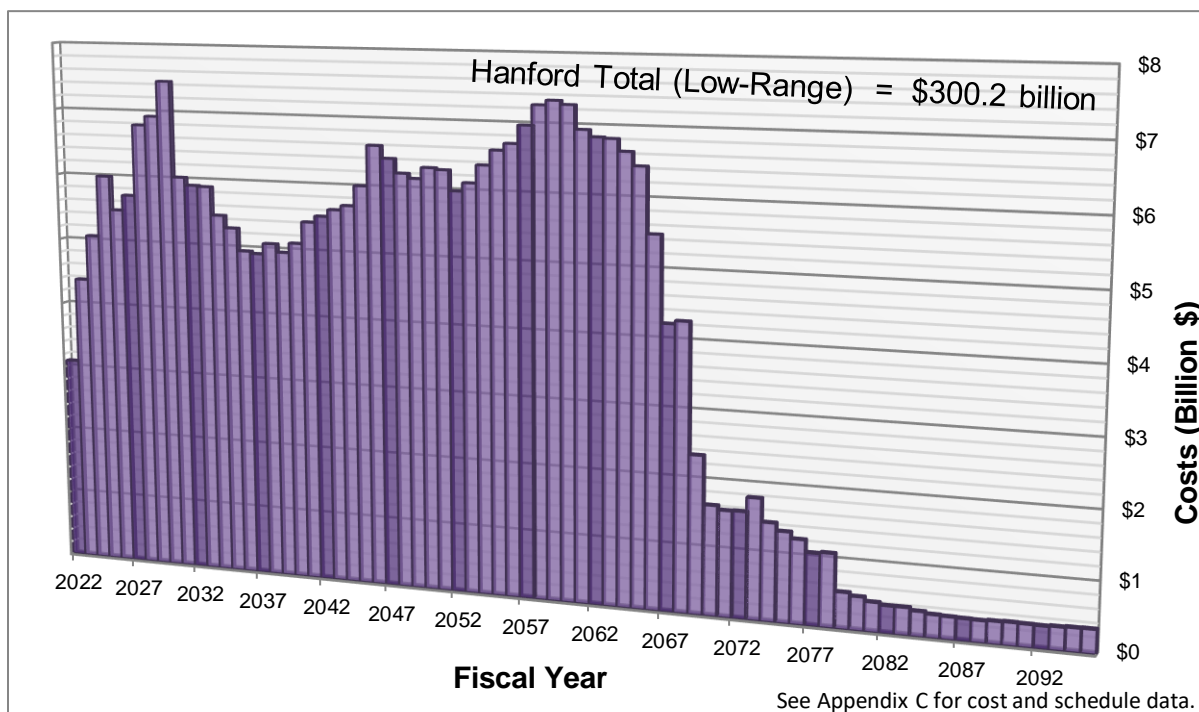


Figure ES-1. Hanford Site Remaining Estimated Cleanup Costs (Low-Range) by Fiscal Year (includes both RL and ORP).

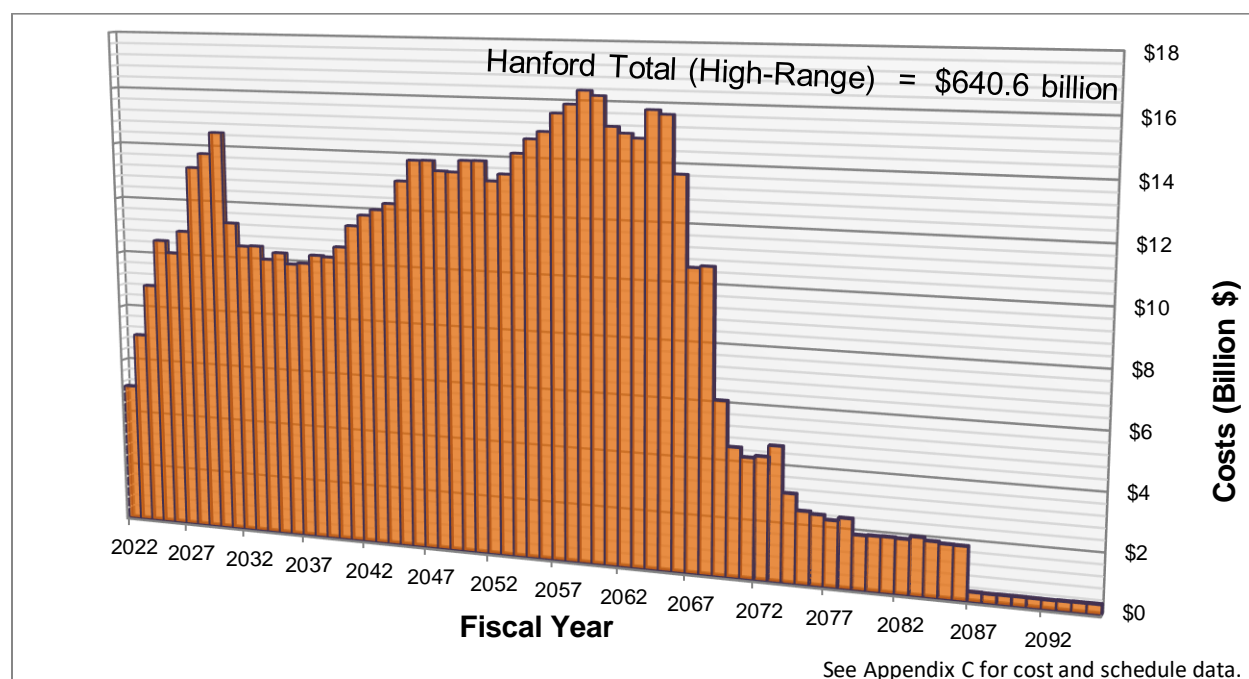


Figure ES-2. Hanford Site Remaining Estimated Cleanup Costs (High-Range) by Fiscal Year (includes both RL and ORP).

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

<b>Project Work Scope</b>	<b>Estimated Cleanup Costs<sup>1</sup> (Billion \$)</b>
Solid Waste Stabilization and Disposition - 200 Area (PBS RL-0013C)	\$15.5 - \$21.2
Safeguards and Security (PBS RL-0020)	\$10.4 - \$15.0
Soil and Water Remediation - Groundwater/Vadose Zone (PBS RL-0030)	\$8.0 - 12.3
Nuclear Facility D&D - Remainder of Hanford (PBS RL-0040)	\$17.4 - \$22.0
Nuclear Facility D&D - River Corridor Closure Project (PBS RL-0041)	\$2.0 <sup>2</sup>
Nuclear Facility D&D - Fast Flux Test Facility Project (PBS RL-0042)	\$0.9 - \$1.1
Richland Community and Regulatory Support (PBS RL-0100)	\$0.7 - \$1.1
Hanford Sitewide Services (PBS RL-0201)	\$19.1 - \$31.4
Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014)	\$199.6 - \$496.3
Major Construction - Waste Treatment Plant (PBS ORP-0060)	\$19.6 - \$31.1
Waste Treatment Plant Operations (PBS ORP-0070)	\$0 <sup>3</sup>
<b>DOE-Office of Environmental Management Total Remaining Estimated Cleanup Costs</b>	<b>\$293.2 - \$633.6</b>
Long-Term Stewardship (PBS RL-LTS) <sup>4</sup>	\$5.2
Final Reactor Disposition <sup>4</sup>	\$1.9
<b>Hanford Site Total Remaining Estimated Cleanup Costs</b>	<b>\$300.2 - \$640.6</b>
<sup>1</sup> Cost ranges are shown in this table to reflect cost and schedule uncertainty; the lower number is used throughout this report. Values are rounded and may not sum to total; see Appendix C for the low-range details. <sup>2</sup> While high-range uncertainty exists, it is minimal and contained within rounding of the low-range value. <sup>3</sup> Includes \$50 million in FY 2022 only. WTP operational costs are currently reflected within ORP-0014. <sup>4</sup> Shown separately to align with DOE-Headquarters fund source accounting. D&D = decontamination and decommissioning.                      PBS = project baseline summary. DOE = U.S. Department of Energy.                                      RL = DOE, Richland Operations Office. ORP = DOE, Office of River Protection.	



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## TERMS

CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
CH	contact-handled
CPCC	Central Plateau Cleanup Contract
CSB	Canister Storage Building
CWC	Central Waste Complex
D&D	decontamination and decommissioning
D4	deactivation, decontamination, decommissioning, and demolition
DFLAW	direct-feed of low-activity waste
DOE	U.S. Department of Energy
DST	double-shell tank
Ecology	Washington State Department of Ecology
EIS	environmental impact statement
EM	U.S. Department of Energy, Office of Environmental Management
EMF	Effluent Management Facility
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ETF	Effluent Treatment Facility
FFTF	Fast Flux Test Facility
FY	fiscal year
HAB	Hanford Advisory Board
HAMMER	Volpentest HAMMER Federal Training Center
HFFACO	<i>Hanford Federal Facility Agreement and Consent Order</i>
HMESC	Hanford Mission Essential Services Contract
HSF	Hanford Shipping Facility
HLW	high-level waste
HQ	U.S. Department of Energy, Headquarters
HWMA	<i>Hazardous Waste Management Act</i> (Washington State)
IDF	Integrated Disposal Facility
IHLW	immobilized high-level waste
IHS	Interim Hanford Storage
ISS	interim safe storage
Lab	WTP Analytical Laboratory
LAW	low-activity waste
LBL	LAW Facility, Balance of Facilities, and Lab
LCR	Lifecycle Report
LDR	Land Disposal Restrictions
LERF	Liquid Effluent Retention Facility
LM	U.S. Department of Energy, Office of Legacy Management
LTS	long-term stewardship
MLLW	mixed low-level waste
NEPA	<i>National Environmental Policy Act</i>
NM	nuclear materials
NRDAR	Natural Resource Damage Assessment and Restoration
OMB	Office of Management and Budget
ORP	U.S. Department of Energy, Office of River Protection
OU	operable unit
PBS	project baseline summary
PFP	Plutonium Finishing Plant
PJM	Pulse Jet Mixer
PNNL	Pacific Northwest National Laboratory



PT	pretreatment
PUREX	Plutonium Uranium Extraction (Plant)
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
REDOX	Reduction-Oxidation Facility (S Plant)
RH	remote-handled
RI/FS	remedial investigation/feasibility study
RL	U.S. Department of Energy, Richland Operations Office
ROD	record of decision
RPP	River Protection Project
RTD	remove, treat and dispose of
S&M	surveillance and maintenance
SALDS	State-Approved Land Disposal Site
SNF	spent nuclear fuel
SST	single-shell tank
TBD	to be determined
TEDF	Treated Effluent Disposal Facility
TFPT	tank farm pretreatment capability
TOC	Tank Operations Contract
TPA	Tri-Party Agreement
Tri-Party agencies	U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington State Department of Ecology
Tri-Party Agreement	<i>Hanford Federal Facility Agreement and Consent Order</i>
TRIDEC	Tri-City Development Council
TRU	transuranic
TRUM	transuranic mixed (waste)
TSD	treatment, storage, and disposal
TWCS	Tank Waste Characterization and Staging
USDOE	U.S. Department of Energy
WBS	work breakdown structure
WESF	Waste Encapsulation and Storage Facility
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing (Facility)
WTP	Hanford Tank Waste Treatment and Immobilization Plant
WTPC	Hanford Tank Waste Treatment and Immobilization Plant Contract

## 1.0 INTRODUCTION

On October 25, 2010, the U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and Washington State Department of Ecology (Ecology) (Tri-Party agencies) added a new milestone, M-036-01, to the *Hanford Federal Facility Agreement and Consent Order* ([Ecology et al. 1989](#)), commonly referred to as the Tri-Party Agreement (TPA). TPA M-036-01 requires DOE to submit a *Hanford Lifecycle Scope, Schedule and Cost Report* (Lifecycle Report [LCR]) to EPA and Ecology each year. On February 25, 2019, Tri-Party agencies agreed to modify milestone M-036-01 to coincide with the Interim Milestone M-062-40, Completing System Plan Negotiations On A Three Year Rolling Cycle. This most recent modification revised the delivery date for M-036-01J by two years to January 31, 2022 and subsequent versions to follow the three year rolling cycle.

The 2022 LCR reflects the Hanford scope, schedule, and cost estimate information from fiscal years (FY) 2022 to 2095. The 2022 LCR information reflects scope, schedule, and costs that are current as of August 31, 2021. Significant changes that have occurred after August 31, 2021 are noted in Section 1.4 and will be incorporated into future reports. The costs shown have been escalated for inflation and include ranges for discrete scopes of work to account for the technical and estimate uncertainty associated with completing the cleanup actions.

### 1.1 PURPOSE OF THE LIFECYCLE REPORT

To plan for the future and make the best use of funding, the Tri-Party agencies work together and share information about the scope, schedule, and cost of cleaning up the Hanford Site. TPA M-036-01 states that the LCR should serve:

*...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.*

TPA M-036-01 includes a number of requirements for the LCR. Table 1-1 provides the full text of the approved TPA M-036-01J.

Detail regarding logic used by the Tri-Party agencies to meet the intent of the milestone can be found in section 1.5 of the 2013 LCR ([DOE/RL-2012-13](#)).

### 1.2 HANFORD CLEANUP OVERVIEW

The 580-square-mile Hanford Site<sup>5</sup> is located along the Columbia River in south-central Washington State (Figure 1-1). Beginning in the 1940s with the Manhattan Project, Hanford 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 workforce is now engaged in the environmental cleanup of contaminated facilities, tank waste, groundwater, and soil. Hanford cleanup is further described in *Hanford Site Cleanup Completion Framework* ([DOE/RL-2009-10](#)). The *Hanford Site 5-Year Plan* placemat depicts the goals and major components of the Hanford Site cleanup mission including the

<sup>5</sup>This area accounts for the September 2015 land transfer from DOE to the Tri-City Development Council (TRIDEC).

critical activity accomplishments anticipated within the near-term planning horizon FY 2022 through FY 2026.

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

<p><b>M-036-01J (Subsequent Milestones to be Lettered K, L, M, etc.)</b>  <i>Due date to submit the report to be January 31 [2022] and every three years thereafter.</i></p>
<p><i>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. DOE, 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. DOE, 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.</i></p> <p><i>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.</i></p> <p><i>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.</i></p> <p><i>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.</i></p> <p><i>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.</i></p>

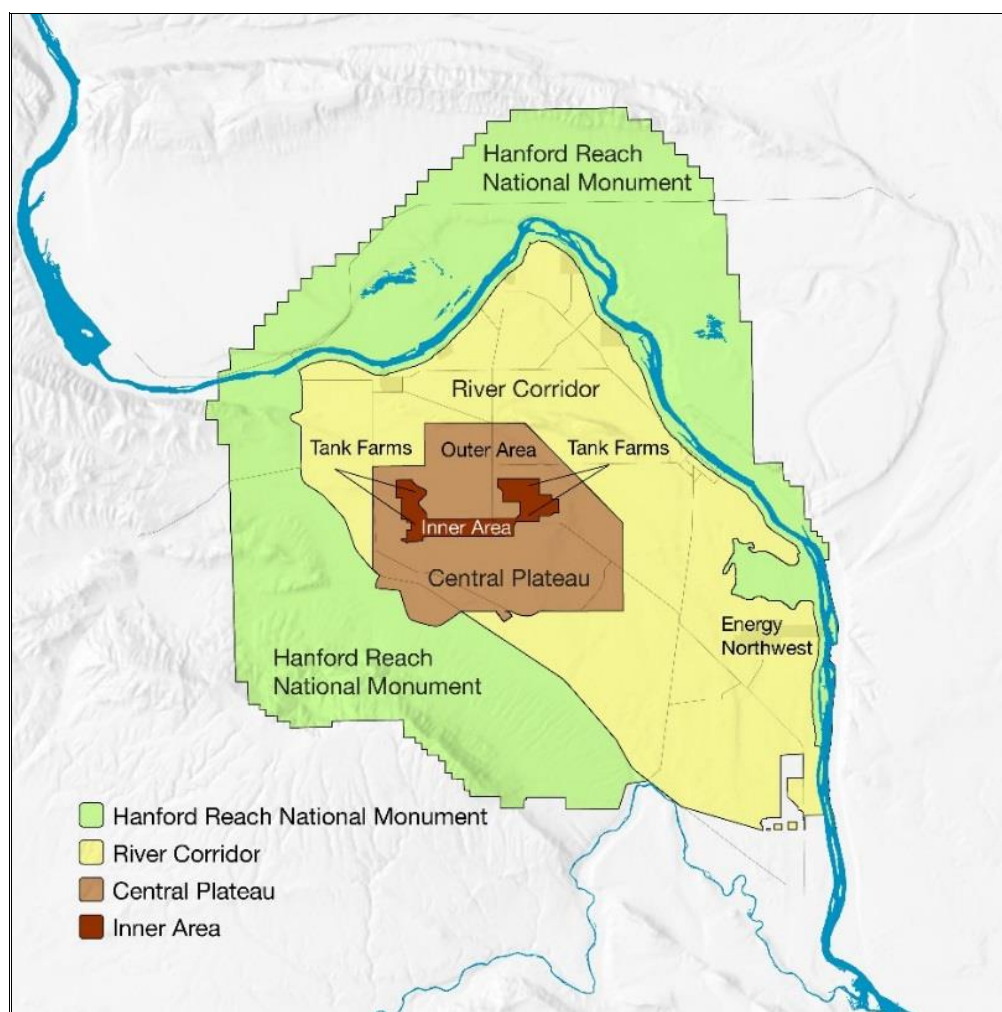


Figure 1-1. Hanford Site Map Showing Principal Areas Designated for Cleanup.

### 1.2.1 Hanford Cleanup Goals

The overarching cleanup goals are noted in Table 1-2. These goals build on more than 30 years of dialogue among the Tri-Party agencies, Tribal Nations, State of Oregon, stakeholders, and the public. The goals carry forward key values captured in earlier forums such as the Hanford Future Site Uses Working Group, the Tank Waste Task Force, Hanford summits, and Hanford Advisory Board (HAB) Exposure Scenario Workshops, as well as over 300 advice letters issued by the HAB (<http://www.hanford.gov/page.cfm/hab>). These goals help guide all aspects of cleanup and help set priorities to apply resources and sequence cleanup efforts for the greatest benefit. Cleanup activities at various areas of the Site support the achievement of one or more of these goals.

Significant progress has been made along the River Corridor in executing the *2015 Vision* to protect the Columbia River as a critical resource for the people and ecology of the Pacific Northwest. Additionally, further delays in initiation of integrated tank waste treatment, resulting in extended mission duration and increased life-cycle costs, have resulted in DOE recognizing that it must achieve the treatment of tank waste through the DFLAW program, thus becoming its new top priority.

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

**Goal 1: MINIMUM SAFE OPERATIONS:**

- Safely, securely, and compliantly manage Hanford’s critical resources efficiently including rejuvenated, re-configured, and right-sized infrastructure to reliably sustain Hanford cleanup mission
- Maintain safeguards and security for Hanford Site access

**Goal 2: WASTE TREATMENT:**

- Initiate treatment of tank waste, initially operating the Hanford Tank Waste Treatment and Immobilization Plant (WTP) via direct-feed low-activity waste (DFLAW), to vitrify tank waste into a stable glass form for disposal
- Treat high-level waste through High-Level Waste Vitrification Facility in WTP
- Manage secondary liquid waste and solid wastes generated in the treatment processes
- Characterize waste generated from remedial actions for treatment and disposal
- Explore opportunities for alternative treatment and disposition pathways

**Goal 3: RISK REDUCTION:**

- Clean up Central Plateau and River Corridor waste sites and demolish facilities to support decisions that are protective of ongoing groundwater remedial actions
- Minimize the footprint requiring extensive surveillance and maintenance activities
- Safely store tank waste until it can be transferred to treatment facilities
- Proceed to closure of waste management areas

**Goal 4: WASTE DISPOSITION:**

- Manage the interim storage of K Basins sludge, cesium/strontium capsules, loaded ion-exchange columns, spent nuclear fuel and transuranic wastes until final decisions regarding their treatment and/or disposition are established
- Oversee disposal facilities (i.e., Environmental Restoration Disposal Facility, Mixed-Low Level Waste Burial Trenches 31 & 34, Integrated Disposal Facility, and State Approved Land Disposal Site) operations

**Goal 5: LONG-TERM STEWARDSHIP:**

- Transition geographic areas where facility demolition and waste site remediation activities are complete to a surveillance and maintenance program, ensuring long-term protection of human health and safety and environmental resources.
- Perform institutional controls monitoring and performance reporting in support of *Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)* 5-year reviews

**1.2.2 Hanford Cleanup and Management Areas**

Hanford cleanup is overseen at DOE Headquarters (HQ) by the Office of Environmental Management (EM) and is directed and implemented locally by two DOE field offices: the Richland Operations Office (RL) and the Office of River Protection (ORP).<sup>6</sup> 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. ORP was established in response to section 3139 of the *Strom Thurmond National Defense Authorization Act for Fiscal Year 1999 (Public Law 105-261)* to manage the

<sup>6</sup>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.



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 Hanford Tank Waste Treatment and Immobilization Plant (WTP) to process and immobilize the tank waste in a process known as vitrification; and associated tank farm operation, maintenance, engineering, and construction activities.

Hanford cleanup focuses on two broad geographic areas: The River Corridor and the Central Plateau. Tank waste cleanup is a separate cleanup component located in the Central Plateau. The River Corridor includes approximately 220 square miles of the Hanford Site, encompassing the 100 and 300 Areas 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. This includes a considerable land area not directly affected by production operations (non-operational areas). The 100 Area contains nine retired plutonium production reactors, numerous support facilities, and solid and liquid waste disposal sites that have contaminated soil and groundwater. The 300 Area, located north of the city of Richland, includes former fuel fabrication facilities, nuclear research and development facilities, and associated solid and liquid waste disposal sites that have contaminated soil and groundwater. The non-operational areas include substantial land area adjacent to the 100 and 300 Areas and extending to the Central Plateau that was never used for production operations.

For sites in the River Corridor, the goal of remedial action is to restore groundwater to drinking water standards wherever practicable and to achieve ambient water quality standards in the groundwater before it discharges into the Columbia River. In those instances where remedial action objectives are not achievable in a reasonable time frame, or are determined to be technically impracticable, programs will be implemented to limit contaminant migration and prevent exposure to contaminated groundwater. River Corridor Cleanup work also removes sources of contamination close to the Columbia River to the Central Plateau for final disposal. The intent is to shrink the footprint of active cleanup to within the Central Plateau by removing excess facilities and remediating waste sites. Cleanup actions will support anticipated future land uses consistent with the Hanford Reach National Monument, where applicable, and the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (DOE/EIS-0222-F).

The River Corridor has been divided into six geographic areas to obtain and implement source and groundwater cleanup remedies. These decisions will provide comprehensive coverage for all areas within the River Corridor and will incorporate ongoing interim action cleanup activities. Cleanup levels will be achieved that support the anticipated land uses of conservation and preservation for most of this area and industrial use for the 300 Area. At the conclusion of cleanup actions, the Federal Government will retain ownership of most land in the River Corridor and will implement LTS activities to ensure protection of human health and the environment.

The Central Plateau consists of about 75 square miles in the central portion of the Hanford Site and includes an Inner Area (about 10 square miles) and Outer Area (about 65 square miles). The Inner Area contains major nuclear fuel processing, waste management, and disposal facilities. The Inner Area will be dedicated to long-term waste management and containment of residual contamination. The Outer Area is that portion of the Central Plateau outside the boundary of the Inner Area. The Outer Area will be remediated to be protective of human health, the environment, and groundwater. Cleanup levels will support future reasonably anticipated land uses.

Cleanup of the Central Plateau is highly complex because of the large number of waste sites, surplus facilities, active treatment and disposal facilities, and areas of deep soil contamination. Past discharges of more than 450 billion gallons of liquid waste and cooling water to the soil have resulted in about 59 square miles of contaminated groundwater across the Site (DOE/RL-2020-60, *Hanford Site Groundwater Monitoring Report for 2020*). Today, some plumes extend far beyond the plateau. Containing and remediating these plumes remains a high priority. For areas of groundwater contamination in the Central Plateau, the goal is to restore the aquifer to achieve drinking water standards. In those instances where remediation goals are not achievable in a reasonable time frame, programs will be implemented to contain the plumes, prevent exposure to contaminated groundwater, and evaluate further

risk reduction opportunities as new technologies become available. Near-term actions will be taken to control plume migration until remediation goals are achieved.

At the completion of cleanup efforts, some residual hazardous and radioactive contamination will remain, both in surface disposal facilities and in subsurface media within portions of the Inner Area. DOE's goal is to limit the area used for long-term waste management activities that require institutional controls to ensure protection of human health and the environment.

Tank waste cleanup focuses on retrieving and treating Hanford's tank waste and closing or remediating the tank farms. The tank farms comprise 18 distinct waste storage units that include 177 underground storage tanks (149 single-shell tanks [SST] and 28 double-shell tanks [DST]) located in the Inner Area of the Central Plateau. The storage tanks range in capacity from about 55,000 to 1,250,000 gallons and, in total, contain approximately 56 million gallons of radioactive and chemical waste from past processing operations. Sixty of the SSTs are confirmed or presumed to have collectively leaked up to 1 million gallons. In some areas, releases from some SST farms have reached groundwater. DOE expects these impacts to groundwater could increase in the future unless near-term actions are taken.

Today, actions are being taken to slow the movement of contaminants that were previously released. DOE also is containing and recovering those contaminants once they reach groundwater. A key step in reducing the risk that tank waste poses to human health and the environment is retrieval, treatment and disposition/disposal of the tank waste. A number of associated tank waste facilities, waste transfer lines, the 242-A Evaporator, and the WTP (under construction) are associated with the tank waste cleanup component. This component is one of Hanford's most challenging legacies.

Significant portions of the Hanford Site have been designated and preserved as part of the Hanford Reach National Monument (Figure 1-1). 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 project. Through *Proclamation 7319 - Establishment of the Hanford Reach National Monument*, the U.S. Department of Interior, U.S. Fish and Wildlife Service will manage the Hanford Reach National Monument lands under existing agreements with DOE. The *Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year 2015 (Public Law 113-291)* authorized the Manhattan Project National Historical Park. The B Reactor, the world's first production reactor, is a signature facility of the Manhattan Project National Historical Park.

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's only operating commercial nuclear power reactor, the Columbia Generating Station. These operations are not part of cleanup at Hanford and are not included in the LCR.

### **1.3 CLEANUP DECISIONS AND ALTERNATIVES**

Cleanup is achieved through an ongoing process for making and then implementing cleanup decisions as outlined in the TPA; the bases for execution of cleanup actions are described in approved work plans and procedures. When making cleanup decisions, the Tri-Party agencies ensure compliance with applicable laws and regulations, compare various cleanup alternatives, consider the interests of the public and other affected parties, consult with Tribal Nations, and document selected cleanup actions in legally binding agreements.

In portions of the cleanup, the Tri-Party agencies have agreed to schedule final cleanup decisions until which time more information and experience has been 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 Tri-Party agencies have determined when T Plant will not be needed to support Hanford cleanup.

The LCR is required to include scope, schedule, and cost information for the entire Hanford Site regardless of whether final cleanup decisions have been made. Where cleanup decisions are not known (i.e., there are alternatives being considered) or are only partially defined (i.e., not final), the LCR base case (low-range estimate) assumes the options representing the reasonable upper cost bound for the range of plausible alternatives are implemented. The low-range estimate, as presented in the LCR, is predicated on the selected scope within the framework of the assumptions and constraints established for the lifecycle analysis. These bases introduce several concepts that are not fully defined in TPA 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 determining 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 A describes the multiple kinds of cleanup decisions made at Hanford and identifies decisions that are considered to be final for the Site. Appendix B describes future actions required to complete Hanford cleanup and presents information on plausible alternatives for future cleanup actions. Table 1-3 lists the cleanup actions for which final cleanup decisions have not yet been made.

Table 1-3. Cleanup Actions for which Final Decisions Have Not Been Made

River Corridor Cleanup Actions	
<ul style="list-style-type: none"> <li>• Disposition N Reactor</li> <li>• Disposition 100 Area K West Basin</li> <li>• Remediate 100 Area Contaminated Soil Sites</li> <li>• Restore 100-BC-5 Groundwater OU to Beneficial Use</li> <li>• Restore 100-KR-4 Groundwater OU to Beneficial Use</li> </ul>	<ul style="list-style-type: none"> <li>• Restore 100-NR-2 Groundwater OU to Beneficial Use</li> <li>• Disposition 300 Area Facilities Retained by PNNL</li> <li>• Disposition 100 Area former Orchard Contaminated Soil Sites (100-OL-1 OU)</li> </ul>
Central Plateau Cleanup Actions <sup>1</sup>	
<ul style="list-style-type: none"> <li>• Disposition Remaining Outer Area Buildings and Facilities (200-OA-1 OU)</li> <li>• Remediate Remaining Outer Area Contaminated Soil Sites (200-OA-1, 200-CW-1, 200-CW-3 OUs)</li> <li>• Disposition Below-Grade Portions of Plutonium Finishing Plant</li> <li>• Disposition B Plant Canyon Building/Associated Waste Sites (200-CB-1 OU)</li> <li>• Disposition PUREX Canyon Building/Associated Waste Sites (200-CP-1 OU)</li> <li>• Disposition PUREX Storage Tunnels (200-CP-1 OU)</li> <li>• Disposition REDOX Canyon Building/Associated Waste Sites (200-CR-1 OU)</li> <li>• Disposition T Plant Canyon Building/Associated Waste Sites</li> <li>• Disposition Cesium/Strontium Capsules</li> <li>• Remediate Solid Waste Landfill and Non-Radioactive Dangerous Waste Landfill (200-SW-1 OU)</li> <li>• Disposition Remaining Liquid Waste Disposal Facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Disposition Remaining Waste Treatment, Storage, and Disposal Facilities</li> <li>• Remediate Pipelines, Pits, Diversion Boxes and Associated Tanks (200-IS-1 OU)</li> <li>• Remediate Land Disposal Units (200-SW-2 OU)</li> <li>• Remediate Remaining 200 West Inner Area Contaminated Soil Sites (200-WA-1 OU) including the BC Control Area (200-BC-1)</li> <li>• Remediate Remaining 200 East Inner Area Contaminated Soil Sites (200-EA-1 OU)</li> <li>• Disposition Remaining Inner Area Buildings and Facilities</li> <li>• Remediate Contaminated Deep Vadose Zone (200-DV-1 OU)</li> <li>• Restore 200 West Groundwater (200-UP-1 OU) to Beneficial Use</li> <li>• Restore 200 East Groundwater (200-PO-1/200-BP-5 OUs) to Beneficial Use</li> </ul>

Table 1-3. Cleanup Actions for which Final Decisions Have Not Been Made

Tank Waste Cleanup Actions	
<ul style="list-style-type: none"> <li>• Tank Retrieval and Single-Shell Tank Farm Closure</li> <li>• Tank Waste Treatment</li> <li>• Secondary Waste Treatment</li> </ul>	<ul style="list-style-type: none"> <li>• Double-Shell Tank Closure</li> <li>• Waste Treatment and Immobilization Plant Closure</li> </ul>

<sup>1</sup>While the 200-IA-1 OU has been administratively created and waste sites reassigned to it from other OU (primarily 200-WA-1 and 200-EA-1), the remediation scope for these waste sites had not be separated from their previous OU assignments. The decision documentation and cost will be reflected in future LCR.

OU = operable unit.

PNNL = Pacific Northwest National Laboratory.

PUREX = Plutonium Uranium Extraction (Plant).

REDOX = Reduction-Oxidation Facility (S Plant).

The LCR includes many assumptions about future cleanup actions and decisions, considers the ranges of plausible alternatives for specific cleanup actions, and what would be reasonable upper bounds for the ranges of alternatives. 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 Nations, and stakeholders.

The Tri-Party agencies have agreed the LCR should consider developing in-depth information about some of the future cleanup actions for which final decisions have not been made. The Tri-Party agencies identified the cleanup actions for which final cleanup decisions are still needed (Table 1-3), and Appendix B (Table B-6) proposes a schedule for preparing cost estimate alternative analyses for these cleanup actions. The Tri-Party agencies considered the remaining cleanup actions to be analyzed and agreed that the 2022 LCR would not include an alternatives analysis.

## 1.4 CHANGES FROM PREVIOUS REPORT

### 1.4.1 Incorporated Changes

Written feedback related to prior LCRs was considered when preparing this report. Feedback received on the previous LCRs is available on the DOE website at [www.hanford.gov](http://www.hanford.gov).

Significant changes made in the 2022 LCR include the following:

- Updated cost and schedule planning basis for each project baseline summary (PBS) to incorporate updated scope, regulatory changes, and contract changes so this information reflects the RL and ORP planning cases that are current as of August 31, 2021.
  - RL-0011 [Nuclear Materials] NM Stabilization and Disposition – PFP - Cleanup and demolition to slab-on-grade of the Plutonium Finishing Plant (PFP) complex is expected to be completed prior to release of this report in FY 2022 using funds carried over from prior years. Future subsurface investigation and cleanup will be done under Nuclear Facility [Decontamination and Decommissioning] D&D-Remainder of Hanford (PBS RL-0040).
  - RL-0012 [Spent Nuclear Fuel] SNF Stabilization and Disposition – Cleanup and stabilization of the SNF sludge from the K West Reactor Fuel Storage Basin was completed in FY 2020. The subsequent 105-KW Basin deactivation and removal work scope will be performed under Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041) and the subsequent sludge disposition work scope will be performed under Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C).
  - ORP-0014 Radioactive Liquid Tank Waste Stabilization and Disposition – The ORP planning case includes the baseline case of the *River Protection Project System Plan* (ORP-11242, Rev. 9 [System Plan 9]). System Plan 9 is a computer modeling exercise, which evaluated a set of 5 main technical scenarios with 9 sensitivities providing rough cost and schedule estimates for completing the RPP mission at the Hanford Site. While the baseline case reflects a theoretically achievable technical approach for completing the

RPP mission based on conditions, constraints, assumptions, and direction existing at the time the System Plan 9 modeling effort began in early 2019, it does not account for delays associated with COVID-19 and makes other technical assumptions that have not been proven to be implementable. The baseline case identifies estimated tank waste retrieval and treatment completion dates that incorporate the revised milestones contained in the Third Amended Consent Decree (DOE and Ecology 2018).

#### 1.4.2 Future Report Changes

The scope, schedule, and cost information presented in this LCR is current as of August 31, 2021. This section summarizes regulatory decisions and other changes that occurred or have been completed after that date. Other pending changes that are not reflected in this LCR but will be incorporated in future reports also are noted.

Because several complex technical issues arose during design and construction activities that adversely affected ORP's ability to meet negotiated milestones in the 2010 Consent Decree, these milestone dates were extended in an Amended Consent Decree issued by the court on March 11, 2016 with a Second Amended Consent Decree issued on April 12, 2016. As a result of that litigation, the Court extended the start of initial operations milestone date for the WTP to December 31, 2036, thus necessitating changes to the TPA end dates for completing all remaining SST retrievals and completing all tank waste treatment commitments as these milestone dates were predicated on the WTP start of initial operations by December 31, 2022, as negotiated in the 2010 Consent Decree. Additionally, the Third Amended Consent Decree issued October 12, 2018, extended milestone due dates for near-term SST retrieval commitments. These and related TPA milestones were the subject of formal negotiations between the Tri-Party Agencies beginning in 2018.

On September 4, 2019, ORP provided a notice of "serious risk" for the Amended Consent Decree milestones associated with Pretreatment (PT) and High-Level Waste (HLW) Facility. An outcome of these negotiations has resulted in new interim milestones that have been incorporated into this LCR. The major TPA milestone dates have yet to be renegotiated and as negotiations continue, additional interim milestones or modification to existing milestones are anticipated. The results of these ongoing negotiations will be incorporated in future LCRs.

In April/May 2019, ORP initiated an Analysis of Alternatives (AoA)<sup>7</sup> to further assess alternatives identified in cooperative workshops between Ecology and DOE on effective approaches to achieve the HLW treatment mission. These workshops and AoA were initiated following the analysis by, and the DOE's assessment of, the U.S. Army Corps of Engineers report, Parametric Evaluation of the Waste Treatment and Immobilization Plant (July 10, 2018), which suggested that the HLW Facility and Pretreatment (PT) Facility could be delayed beyond the milestones contained in the Amended Consent Decree. The results and decision(s) from the AoA will be incorporated in future LCRs.

The approach outlined within IAMIT Determination 2020-006, *Representative Analogous Site Coordinating Agency Liaisons (RASCAL) Recommendations for Expediting Remedial Cleanup on the Hanford Central Plateau*, has not been negotiated as new and/or modified milestones are anticipated for establishment of a new inner area operable unit where sufficient information exists to determine final end states (200-IA-1 OU) including development of a focused feasibility study, revisions to existing 200-WA-1 and 200-EA-1 OU RI/FS Work Plans to incorporate waste site reassignments and initiation of a focused

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<sup>7</sup> AoAs are analytical comparisons of the operational effectiveness, suitability, risk, and life cycle cost of alternatives that satisfy validated capability needs. AoAs are conducted independent of the contractor organization responsible for the project and do not produce decisional documents. AoAs provide inputs that may be used by the Department to derive preferred alternatives for further analyses to support decisions on the approach that best meets the overall mission need at the best value to the taxpayer.



feasibility study for the 200-BC-1 OU. These and other milestones listed below continue to be negotiated and will be incorporated in future LCRs.

The following TPA milestones are statused as “In Abeyance,” as documented in *IAMIT Determination 2021-003, Extension for the Temporary Suspension of Tri-Party Agreement Milestones from the Agreement in Principle for the Negotiation of Hanford Federal Facility Agreement and Consent Order Revisions in Response to Federal Fiscal Year 2018-2020 Appropriation in Conjunction with the RASCAL Recommendations (Interagency Management Integration Team Determination 2020-006) for Expediting Remedial Cleanup on the Hanford Central Plateau:*

- M-015-93C – Initiate Characterization Field Work for 200-SW-2 Operable Unit Landfills
- M-015-98 – Complete RI of U Plant related waste sites in 200-WA-1
- M-085-70 – Submit RI/FS Work Plan for 200-CB-1
- M-015-99 – Complete RI of PFP related waste sites in 200-WA-1
- M-015-84 – Complete RI for 200-BC-1 and 200-WA-1
- M-015-92B – Submit RFI/CMS & RI/FS & PCAD/PP for 200-EA-1
- M-015-93B – Submit RFI/CMS & RI/FS & PCAD/PP for 200-SW-2
- M-015-92C – Submit RFI/CMS & RI/FS & PCAD/PP for 200-IS-1
- M-015-38B – Submit FS & PP for 200-CW-1, 200-CW-3 and 200-OA-1
- M-015-91B – Submit RI/FS & PP for 200-BC-1 and 200-WA-1
- M-015-110B – Submit CMS & FS & PCAD/PP for 200-DV-1
- M-016-200A – Complete U Plant Canyon (221U) Demolition
- M-016-200B – Complete U Plant Canyon (221U) Barrier Construction

These milestones, along with M-015-112 – Submit RFI/CMS & RI/FS Work Plan for 200-IS-1, are anticipated to be renegotiated and included within future LCRs. They are likely to affect associated coordinated closure milestones for treatment, storage and disposal units, as listed below:

- M-037-20 – Submit Coordinated Closure Proposal with 200-EA-1 Proposed Plan (M-015-92B)
- M-037-22 – Submit Coordinated Closure Proposal with 200-OA-1 Proposed Plan (M-015-38B)
- M-037-25 – Submit Coordinated Closure Proposal with 200-IS-1 Proposed Plan (M-015-92C)
- M-037-26 – Submit Coordinated Closure Proposal with 200-SW-2 Proposed Plan (M-015-93B)

The LCR only provides a snapshot of a complex, ongoing planning process, and the RL and ORP planning cases in this report have only been partially aligned. Continued alignment and refinement will be incorporated in future LCRs.

## **1.5 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 LCR, particularly where information about project costs is presented.

### **1.5.1 Annual Budget Formulation Process**

Each year, DOE formulates budget requests as part of the Congressional appropriations process. The planning cycle begins during December and January, nearly 2 years before the start of a budgeted fiscal year. The process begins with budget formulation where funding requirements are analyzed, prioritized, requested, and received. Budget requests are submitted by the DOE field offices to HQ in early spring and continue 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.** This is the first phase of DOE’s annual budget formulation process. RL and ORP submit field budget data to HQ for use in the corporate review budget process.
2. **HQ Corporate Review Budget Process.** The 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.** This 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.** This process determines DOE’s final appropriations for the next Federal fiscal year based on policy determinations in conjunction with Federal budget deliberations by Congress.

Annual appropriations from 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. Sometimes this can result in cost and schedule changes to reconfigure activities resulting from budget or other constraints. DOE 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 replanning are intertwined and involve iterative processes with similar steps. DOE’s process for defining and managing projects and their baseline summaries are described in section 1.5.2.

### 1.5.2 U.S. Department of Energy Project Formulation Process

DOE follows a structured approach that organizes all EM activities into discrete projects. The following summarizes key components of DOE’s cleanup project management approach.

**Project Baseline Summary (PBS).** EM projects that have common attributes, such as 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, schedule, and cost baselines; defining performance metrics; and providing financial history, budget request justification, as well as other information (e.g., 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; e.g., 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.

**Uncertainty and Project Risk.** Risk management is essential for project management. Cost and schedule uncertainty are included in the development of Total Project Cost and the approved DOE planning case and are reserved to accommodate additional work scope related to risk events that may occur from conditions and events that were not known during project planning and other unanticipated changes or uncertainties. This includes estimates for cost and schedule uncertainty based on risk analysis methods that comply with DOE guidelines and orders. These estimates are identified as "cost and/or schedule uncertainty" in the Appendix C tables.

Uncertainty addresses cost-based and schedule-based impacts on a project. Cost uncertainty is the portion of the project budget that is available for risk uncertainty related to the project but is held outside the contract budget and is part of the government's planning case estimate. Schedule uncertainty is the risk-based, quantitatively derived portion of the overall project schedule duration that is estimated to allow for time-related risk impacts and other project uncertainties.

Cost and schedule uncertainty is established to manage or cover the cost of unexpected events (e.g., changed conditions discovered by environmental sampling and characterization as cleanup proceeds). Money and time that have been reserved to address risks may be used to account for their effects or the handling actions necessary to mitigate or avoid risk events, but may not be used for work that is outside the scope of the planning case. Uncertainty is calculated based on DOE risks that are contained in a centralized risk register for each project. The risks are derived from various sources including project team members, project documentation and review teams. These risks are documented and are used in calculating cost uncertainty. To identify the required amount of uncertainty, a quantitative risk analysis (using a Monte Carlo methodology) is performed using the project schedule, complete with the costs of each work activity, and applying risks and uncertainty to the schedule. Stochastic modeling is used to develop a probability distribution and to calculate project cost and schedule uncertainty.

**Escalation.** In a budget request, cost is represented in escalated dollars. Escalation is the provision in a cost estimate for increases in cost of such resources as equipment, material, and labor to account for 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. An escalation rate of between 2 and 4 percent per year is used.

## **1.6 SCOPE, SCHEDULE AND COST FOR HANFORD CLEANUP**

RL and ORP have organized their work into PBSs. These PBSs include detailed work breakdowns to describe in greater context the scope of DOE's projects and operations at Hanford. Hanford cleanup encompasses 12 PBSs; nine managed by RL and three managed by ORP, as shown in Table 1-4 and discussed further in other chapters of this LCR.

Table 1-4. Hanford Site Cleanup Project Baseline Summary

<b>PBS</b>	<b>Title</b>
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
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-0201	Hanford Sitewide Services
RL-LTS	Long-Term Stewardship
TBD	Final Reactor Disposition
ORP-0014	Radioactive Liquid Tank Waste Stabilization and Disposition
ORP-0060	Major Construction–Waste Treatment and Immobilization Plant
ORP-0070	Waste Treatment and Immobilization Plant Operations
D&D = decontamination and decommissioning.      PBS = project baseline summary. LTS = Long-Term Stewardship.                              RL = DOE, Richland Operations Office. ORP = DOE, Office of River Protection.                      TBD = to be determined.	

Table 1-5 shows Level 2 and Level 3 work breakdown associated with a single PBS. This presents a typical EM cleanup project down to a third tier of planning detail. Most work at Hanford is similarly broken down to at least Level 3.

Table 1-5. Example Cleanup Project Baseline Summary and Work Breakdown to Level 3

<b>PBS (Level 1)</b>	<b>RL-0040 Nuclear Facility D&amp;D-Remainder of Hanford</b>
Level 2	RL-0040.02 Remediation of Geographic Areas
Level 3	RL-0040.02.30 PFP Implementation Area
	RL-0040.02.31 U Plant Implementation Area
	RL-0040.02.36 B Plant Implementation Area
	RL-0040.02.39 PUREX Implementation Area
	RL-0040.02.40 T Plant Implementation Area
	RL-0040.02.41 REDOX Implementation Area
D&D = decontamination and decommissioning. PBS = project baseline summary. RL = DOE, Richland Operations Office.	

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

Table 1-6. Example of a Level 6 Work Breakdown Structure

<b>PBS (Level 1)</b>	<b>RL-0040 Nuclear Facility D&amp;D– Remainder of Hanford</b>
Level 2	0040.50 Maintain Safe and Compliant Facilities and Waste Sites
Level 3	0040.50.02 Central Plateau Nuclear Facilities Min-Safe
Level 4	0040.50.02.02 U Plant Min-Safe
Level 5	0040.50.02.02.02 U Plant Min-Safe Maintenance
Level 6	0040.50.02.02.02.13 U Plant Min-Safe Corrective Maintenance
D&D = decontamination and decommissioning. PBS = project baseline summary. RL = DOE, Richland Operations Office.	

For the years beyond the contractor's near-term work, DOE maintains "out-year" planning estimates for the remaining cleanup. Out-year planning estimates are not as well developed as near-term planning (typically no further than Level 3 or Level 4).

Cost information is updated annually to support EM Environmental Liability and will be incorporated into each LCR to reflect work completion, recent decisions, and other changes affecting the lifecycle scope (e.g., upgrades or infrastructure modernization to support major projects). Chapters 3.0 through 6.0 summarize information at PBS Level 2, including work breakdown for each PBS, and descriptions of the lifecycle work scope and associated work elements. Each chapter provides estimated cleanup costs for corresponding work elements.

Appendix C provides more cost detail at Level 3 for near-term work and at Level 2 for all Hanford cleanup supporting the low-range estimate.

## 2.0 HANFORD LIFECYCLE SUMMARY

This chapter presents the overall Hanford cleanup scope, schedule, and cost. Chapters 3.0 through 6.0, as well as Appendix C, present additional details on the PBSs that cover the lifecycle cleanup work scope in the three major scope components and mission support.

### 2.1 HANFORD SITE LIFECYCLE SCOPE

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). Cleanup also includes mission support activities that provide key infrastructure and services for Hanford. Cleanup is a complex task that involves multiple contractors performing discrete, yet interdependent, scopes of work. The scope of cleanup work is broken down into a series of PBSs. The prime contract related to each PBS is noted in Table 2-1, which describes the general scope of each PBS and the chapter/section where it is addressed.

Table 2-1. Hanford Project Baseline Summaries (PBS) – RL and ORP Contracts

LCR Section	PBS	Official Title	Alternate Titles	General Scope	Prime Contract
<b>CHAPTER 3.0 – RIVER CORRIDOR CLEANUP</b>					
River Corridor (Section 3.1)	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). Includes 105-KW SNF Basin deactivation and removal work scope that was transferred from RL-0012 in FY 2012.	CPCC
River Corridor (Section 3.2)	TBD	TBD	Final Reactor Disposition	Disposition of 100 Area production reactors (excluding B Reactor).	TBD
<b>CHAPTER 4.0 – CENTRAL PLATEAU CLEANUP</b>					
Central Plateau (Section 4.1)	RL-0013C	Solid Waste Stabilization and Disposition–200 Area	Solid and Liquid Waste Disposition Project	Waste management operations including treatment, storage, and disposal of Hanford Site waste streams and offsite wastes <sup>1</sup> .	CPCC
Central Plateau (Section 4.2)	RL-0030	Soil and Water Remediation–Groundwater/Vadose Zone	Groundwater Project	Decision-making process for groundwater and waste sites and Hanford Sitewide groundwater remediation.	CPCC
Central Plateau (Section 4.3)	RL-0040	Nuclear Facility D&D–Remainder of Hanford	Central Plateau Remediation	Cleanup of the Central Plateau waste sites and facilities, including canyon facilities.	CPCC
Central Plateau (Section 4.4)	RL-0042	Nuclear Facility D&D–Fast Flux Test Facility Project	None	Disposition of the Fast Flux Test Facility and disposition of associated waste sites and structures.	CPCC
<b>CHAPTER 5.0 – TANK WASTE CLEANUP</b>					
Tank Waste Cleanup (Section 5.1)	ORP-0014	Radioactive Liquid Tank Waste Stabilization and Disposition	None	Tank Farm operations, retrieval, pretreatment, and closure of the single-shell and double-shell tanks.	TOC

Table 2-1. Hanford Project Baseline Summaries (PBS) – RL and ORP Contracts

LCR Section	PBS	Official Title	Alternate Titles	General Scope	Prime Contract
Tank Waste Cleanup (Section 5.2)	ORP-0060	Major Construction–Waste Treatment and Immobilization Plant	None	Construction of the Hanford Tank Waste Treatment and Immobilization Plant.	WTPC
Tank Waste Cleanup (Section 5.2)	ORP-0070	Waste Treatment Plant Operations	None	Activities required to support the treatment of tank wastes in the WTP including implementation of the DFLAW strategy.	TOC
<b>CHAPTER 6.0 – MISSION SUPPORT</b>					
Mission Support (Section 6.1)	RL-0020	Safeguards and Security	None	Protection of the Hanford Site, special materials, resources, and workers.	HMESC
Mission Support (Section 6.2)	RL-0100	Richland Community and Regulatory Support	None	Support for community interaction, including Hanford Advisory Board, Oregon Department of Energy and other entities.	Various grants
Mission Support (Section 6.3)	RL-0201	Hanford Sitewide Services	None	Management, repair, and capital upgrades to infrastructure and other Sitewide services.	HMESC
Mission Support (Section 6.4)	RL-LTS	Long-Term Stewardship (LTS)	Post-cleanup LTS <sup>2</sup>	Infrastructure support, surveillance and maintenance, community support, and management activities following completion of cleanup activities.	TBD
<sup>1</sup> Waste from other sites will not be received until the Waste Treatment and Immobilization Plant is operational. <sup>2</sup> See section 6.3 for the current ongoing LTS program.  CPCC = Central Plateau Cleanup Contract. D&D = decontamination and decommissioning. HMESC = Hanford Mission Essential Services Contract. LTS = long-term stewardship. ORP = DOE, Office of River Protection. PBS = project baseline summary. RL = DOE, Richland Operations Office. TBD = to be determined TOC = Tank Operations Contract. WTPC = Waste Treatment and Immobilization Plant Contract.					

## 2.2 HANFORD CLEANUP SCHEDULE

The remaining cleanup schedule covers activities for waste cleanup and waste management, leading to transition of portions of the Hanford Site to LTS. Chapters 3.0 through 6.0, as well as Appendix C, present additional schedule details for the River Corridor, Central Plateau, tank waste, and mission support activities.

To support cleanup, RL has responsibility for mission support activities related to safeguards and security, community and regulatory support, and Hanford Sitewide Services. These activities align with the cleanup through FY 2078, as represented in the baseline planning case (low-range estimate). RL has planned for an LTS period that runs from FY 2079 through FY 2095 as part of mission support.

Figure 2-1 shows River Corridor cleanup complete by FY 2041, final reactor disposition completed by FY 2068, tank waste cleanup complete by FY 2071, and Central Plateau cleanup complete by FY 2078 (including schedule uncertainty).

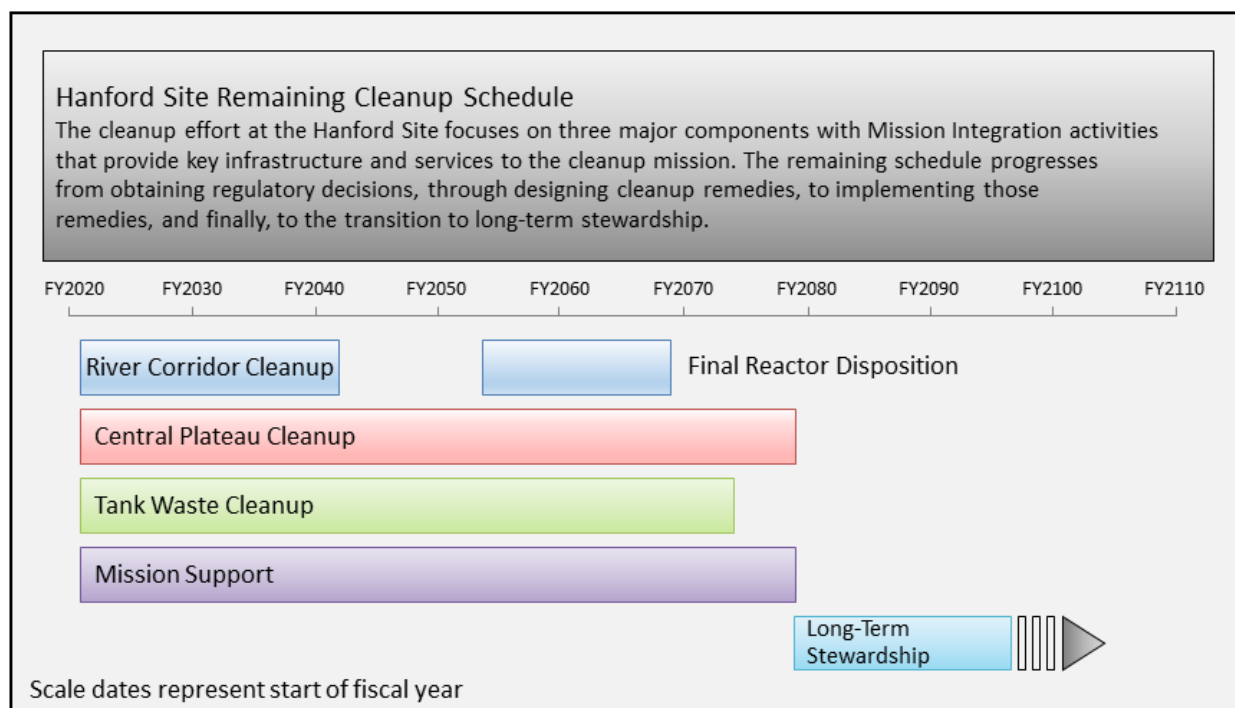


Figure 2-1. Hanford Site Remaining Cleanup Schedule.

### 2.3 HANFORD SITE ESTIMATED CLEANUP COSTS

The low-range of the remaining cleanup costs<sup>8</sup> are estimated to be about \$300.2 billion to complete the scope for the River Corridor, final reactor disposition, Central Plateau, tank waste, and mission support activities, and LTS. RL's scope accounts for about \$81.0 billion of the total costs and ORP's scope accounts for about \$219.3 billion. 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. The high-range of the remaining cleanup costs are estimated at approximately \$640.6 billion. ORP's scope accounts for about \$527.5 billion of the total high-range cost while the RL scope accounts for approximately \$113.2 billion.

Figure 2-2 summarizes the estimated remaining cleanup cost for RL and ORP for both the low- and high-ranges. Figure 2-3 shows the low-range remaining cleanup costs by year for RL and ORP. Figure 2-4 summarizes the low-range estimated cleanup costs by RL and ORP PBSs. Figure 2-5 shows the Hanford high-range remaining cleanup costs by year. Table 2-2 summarizes the total estimated cleanup costs for each PBS, incorporating both the low- and high-ranges.

<sup>8</sup> The expression "cleanup costs" is used to represent the costs for those remaining actions that are necessary for DOE to fully meet all applicable environmental obligations and complete the Hanford Site cleanup mission.



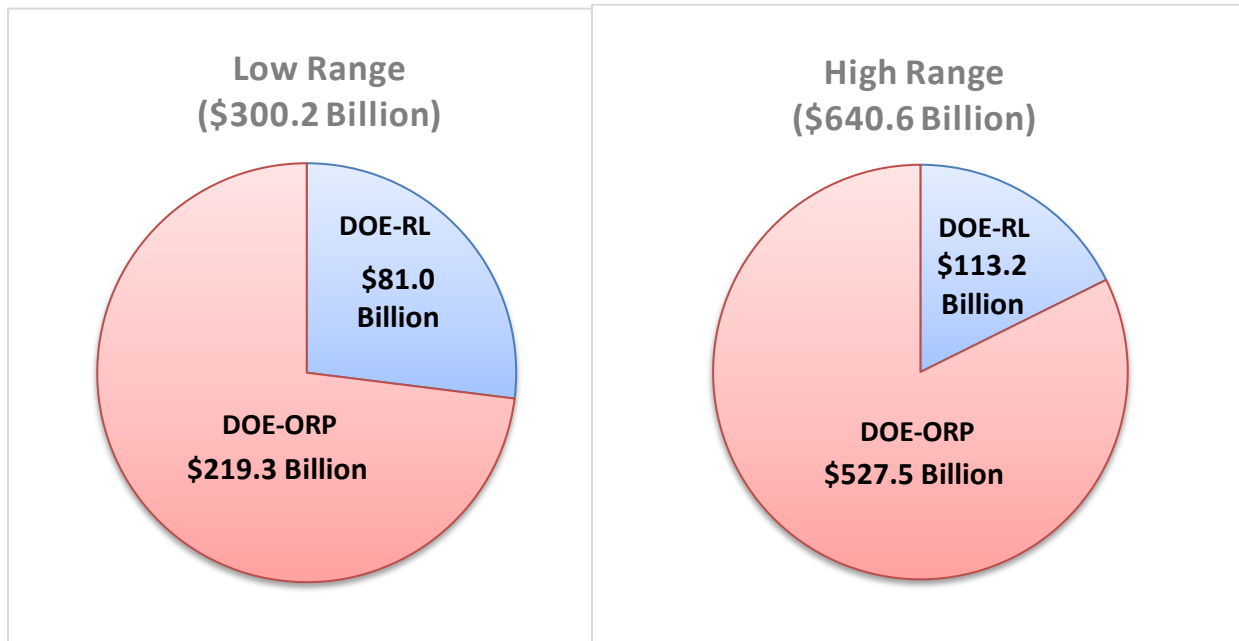


Figure 2-2. Hanford Site Estimated Cleanup Cost Distribution by DOE Field Office.

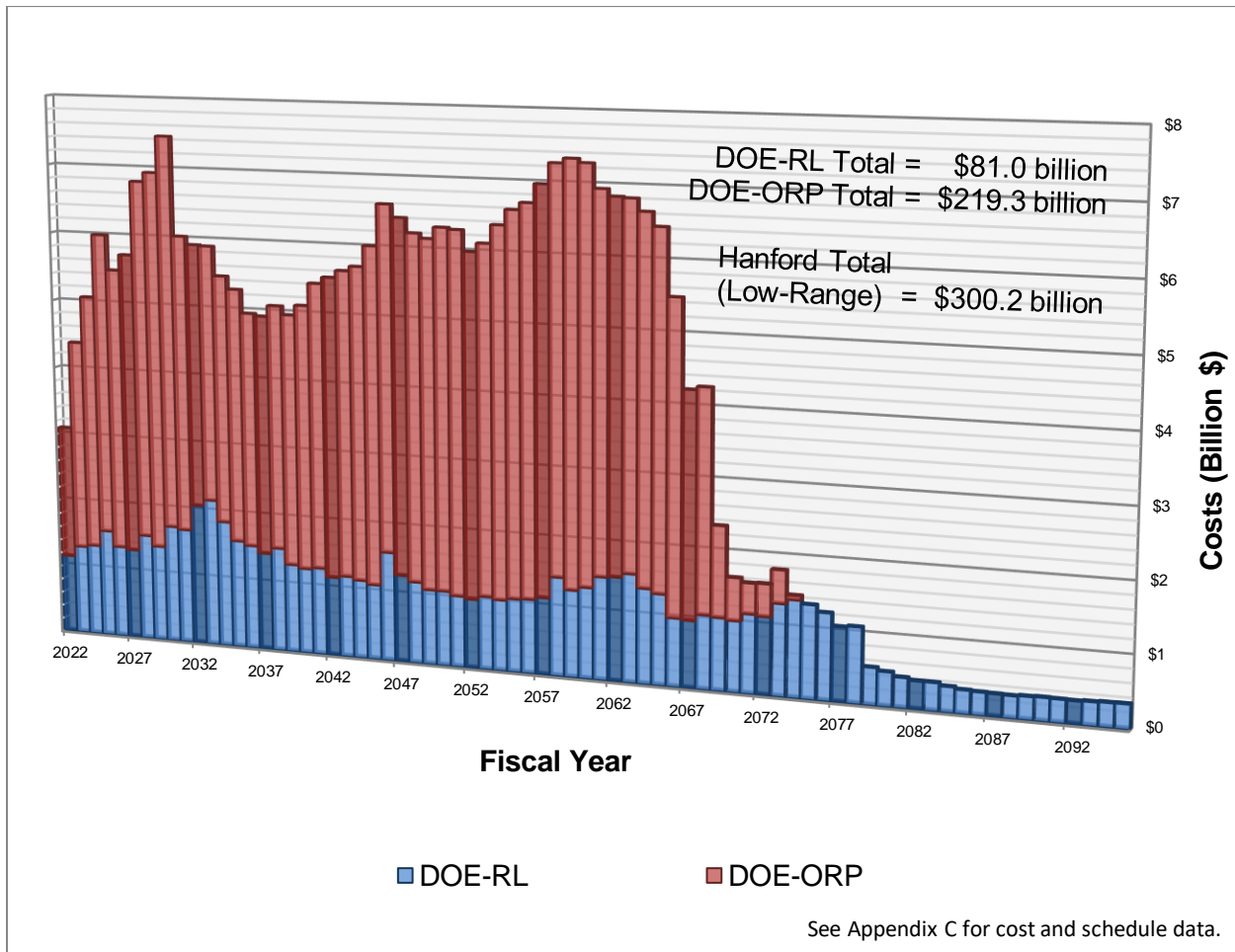


Figure 2-3. Hanford Site Low-Range Remaining Cleanup Costs by Fiscal Year.

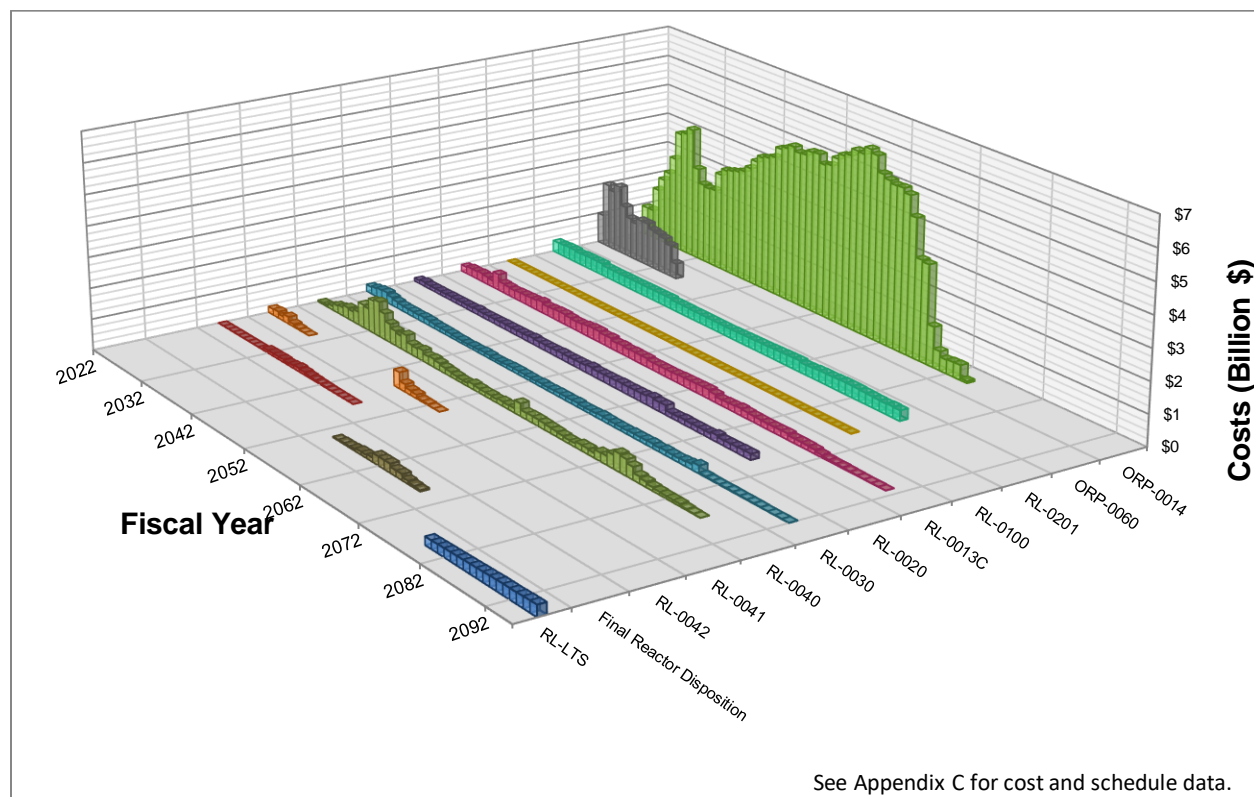


Figure 2-4. Hanford Site Low-Range Remaining Cleanup Costs by Project Baseline Summary.

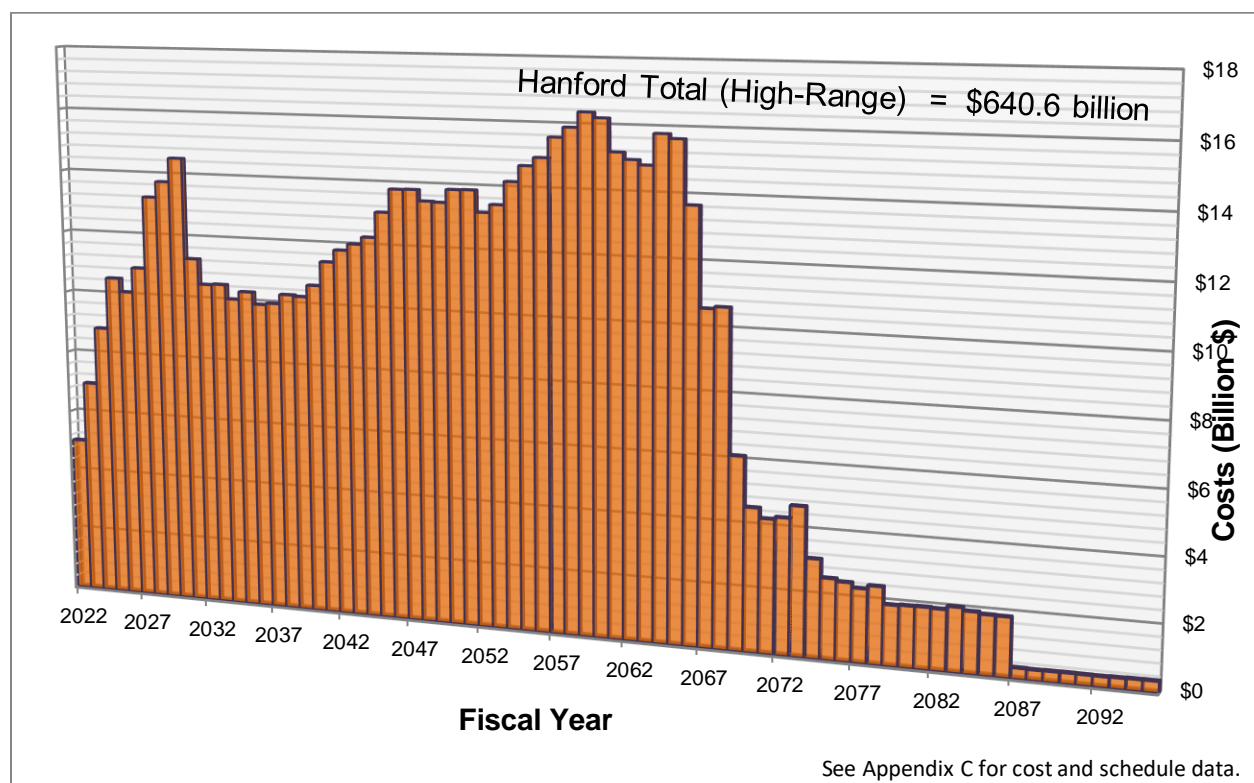


Figure 2-5. Hanford Site High-Range Remaining Estimated Cleanup Costs by Fiscal Year (includes both RL and ORP).

Table 2-2. Hanford Site Remaining Cleanup Cost Estimated Ranges by PBS

<b>Project Work Scope</b>	<b>Estimated Cleanup Costs<sup>1</sup> (Billion \$)</b>
Solid Waste Stabilization and Disposition - 200 Area (PBS RL-0013C)	\$15.5 - \$21.2
Safeguards and Security (PBS RL-0020)	\$10.4 - \$15.0
Soil and Water Remediation - Groundwater/Vadose Zone (PBS RL-0030)	\$8.0 - \$12.3
Nuclear Facility D&D - Remainder of Hanford (PBS RL-0040)	\$17.4 - \$22.0
Nuclear Facility D&D - River Corridor Closure Project (PBS RL-0041)	\$2.0 <sup>2</sup>
Nuclear Facility D&D - Fast Flux Test Facility Project (PBS RL-0042)	\$0.9 - \$1.1
Richland Community and Regulatory Support (PBS RL-0100)	\$0.7 - \$1.1
Hanford Sitewide Services (PBS RL-0201)	\$19.1 - \$31.4
Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014)	\$199.6 - \$496.3
Major Construction - Waste Treatment Plant (PBS ORP-0060)	\$19.6 - \$31.1
Waste Treatment Plant Operations (PBS ORP-0070)	\$0 <sup>3</sup>
<b>DOE-Office of Environmental Management Total Remaining Estimated Cleanup Costs</b>	<b>\$293.2 - \$633.6</b>
Long-Term Stewardship (PBS RL-LTS) <sup>4</sup>	\$5.2
Final Reactor Disposition <sup>4</sup>	\$1.9
<b>Hanford Site Total Remaining Estimated Cleanup Costs</b>	<b>\$300.2 - \$640.6</b>
<sup>1</sup> Cost ranges are shown in this table to reflect cost and schedule uncertainty; the lower number is used throughout this report. Values are rounded and may not sum to total; see Appendix C for the low-range details. <sup>2</sup> While high-range uncertainty exists, it is minimal and contained within rounding of the low-range value. <sup>3</sup> Includes \$50 million in FY 2022 only. WTP operational costs are currently reflected within ORP-0014. <sup>3</sup> Shown separately to align with DOE-Headquarters fund source accounting. D&D = decontamination and decommissioning.                      PBS = project baseline summary. DOE = U.S. Department of Energy.                                      RL = DOE, Richland Operations Office. ORP = DOE, Office of River Protection	

### 3.0 RIVER CORRIDOR CLEANUP

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

- **100 Area.** Location of nine former production reactors, associated support facilities, and related waste sites.
- **300 Area.** Location of research and development facilities, former fuel fabrication facilities, and related waste sites.
- **600 Area.** Location of a major burial ground (618-11) with some additional soil and debris sites.

DOE manages the remaining River Corridor cleanup through the Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041). PBS RL-0041 addresses cleanup of waste sites, burial grounds, and facilities in the 100, 300, and 600 Areas and the interim safe storage (ISS) of the KE and KW Reactors. Section 3.1 discusses the scope of this project.

Although currently not considered to be a project, final reactor disposition will address cleanup of the 100 Area surplus production reactors and associated waste sites, excluding B Reactor National Historic Landmark. Section 3.2 discusses the scope of this activity.

Groundwater cleanup is ongoing in the River Corridor. 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. Groundwater associated with the River Corridor is discussed with Central Plateau cleanup in section 4.3.

Cleanup is performed in accordance with interim and final RODs and action memoranda as listed in Appendix A and with key TPA milestones listed in Table 3-1. These TPA milestones provide the structure that the Tri-Party agencies have agreed to for Hanford priorities and scope sequencing.

Table 3-1. River Corridor Cleanup Key Tri-Party Agreement Milestones

Milestone	Title	Compliance Date
<b>Nuclear Facility D&amp;D–River Corridor Closure Project (PBS RL-0041)</b>		
M-016-85A	Complete remote excavation of 300-296 waste site.	11/30/2025
M-016-85	Complete remedial actions for 300-296 waste site and disposition for 324 Building and ancillary buildings.	11/30/2030
M-089-00	Complete closure of mixed waste units in 324 Building Cells B and D.	TBD
M-093-00	Complete final disposal of 100 Areas surplus production reactor buildings.	TBD
<b><i>RL-0041 Milestones in Dispute Resolution or At Risk</i></b>		
M-016-86	Complete remedial actions for 618-11 Burial Ground in accordance with DOE/RL-2014-13-ADD1.	9/30/2021
M-016-181	Complete Deactivation, Demolition and Removal of 105-KW Fuel Storage Basin.	9/30/2023
M-016-186	Initiate Soil Remediation Under 105-KW Fuel Storage Basin.	12/31/2023
M-016-00C	Complete all response actions for the 100-K Area.	9/30/2024
M-016-143	Complete the interim response actions for the 100-K Area within the perimeter boundary and to the river for Phase 2 actions.	9/30/2024
M-093-27	Complete 105-KE and KW Reactor ISS.	9/30/2024
D&D = decontamination and decommissioning.      ISS = interim safe storage.      PBS = project baseline summary. OU = operable unit.      TBD = to be determined.		

### 3.1 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 Hanford located in the River Corridor in accordance with existing records of decision (ROD) and action memoranda (see Appendix A). Anticipated land uses for the River Corridor are described in DOE/EIS-0222-F and in the pursuant ROD. The River Corridor Closure Project established the following cleanup objectives:

- Remediate waste sites.
- Deactivation, decontamination, decommissioning, and demolition (D4) of facilities including those retained within the 300 Area supporting PNNL (Note: facilities supporting groundwater pump-and-treat within the River Corridor are dispositioned under Soil and Water Remediation–Groundwater/Vadose Zone [PBS RL-0030]).
- Place eight plutonium production reactors into ISS. Figures 3-1 and 3-2 depict C Reactor before and after the ISS process. Table 3-1 provides the status of the reactors. (Note: B Reactor’s status as part of the Manhattan Project National Historical Park.)
- Complete substantive remediation to allow the 100 and 300 Areas to be deleted from the National Priorities List.
- The River Corridor Closure Project includes remediation of the 618-11 Burial Ground.



Figure 3-1. C Reactor Before Interim Safe Storage.



Figure 3-2. C Reactor in Interim Safe Storage.

Table 3-2. Reactor Status

Reactor	Status	Remaining Activity
B	Named National Historic Landmark by U.S. Department of Interior in 2008. Reactor open for escorted public tours.	Operation, maintenance and management of B Reactor as a facility of the Manhattan Project National 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.	Reactor ISS began in 2011 and is scheduled for completion by 2024; final disposition of reactor block.

Table 3-2. Reactor Status

Reactor	Status	Remaining Activity
KW	Sludge removed; continued deactivation, decommissioning, and demolition of fuel storage basin; proceed with demolition of adjacent buildings and installation of safe storage enclosure to complete ISS activities.	ISS is scheduled for completion by 2028; final disposition of reactor block.
N	Reactor placed in ISS.	Final end state of the reactor has not been determined.
ISS = interim safe storage.		

Table 3-3 summarizes the scope for the Level 2 work elements.

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

Work Element	Scope Description
River Corridor Cleanup	Includes work remaining to complete 100-K Area, 100-D/H, 100-B/C and 100-N Area remediation, including project management, demolition of K West Basin, disposition of K East and K West Reactors, remediation of the 618-11 burial ground and waste site 300-296 (contaminated soil below the 324 Building B Hot Cell), D4 of support structures, waste site closeout sampling and documentation, and waste site backfill and revegetation.
River Corridor Maintain Safe and Compliant Facilities and Waste Sites	Includes radiation surveys, surface contamination treatment, sign replacement, tumbleweed collection and spraying, inactive waste sites min safe support, min safe for nuclear facilities (K West Basin and 324 Building), and min safe for general purpose facilities.
D4 = deactivation, decontamination, decommissioning, and demolition.	

Figure 3-3 presents the low-range remaining cleanup costs for PBS RL-0041 by FY, and Figure 3-4 presents the low-range remaining estimated costs by work element. The gap between FY 2029 and FY 2045 is primarily caused by the continued Pacific Northwest National Laboratory (PNNL) mission in the 300 Area affecting ability to disposition facilities and affected waste sites. These are anticipated to remain operational until FY 2045.

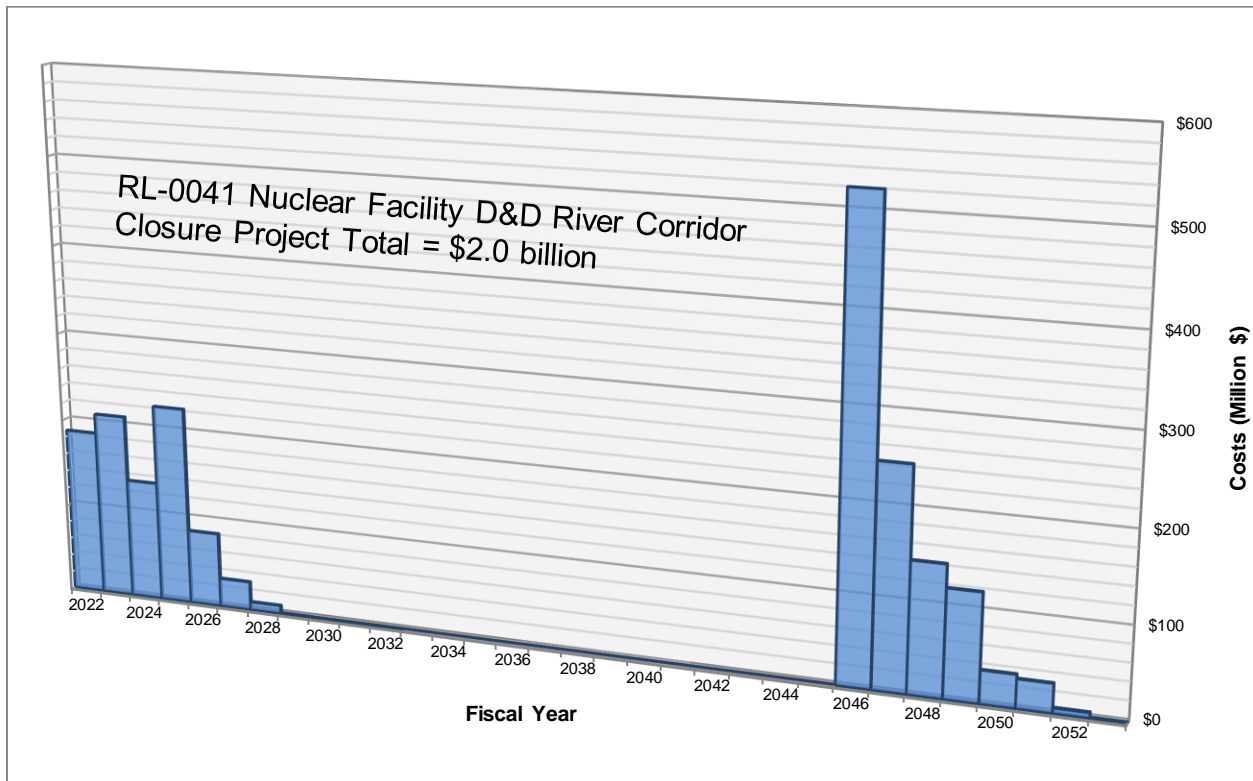
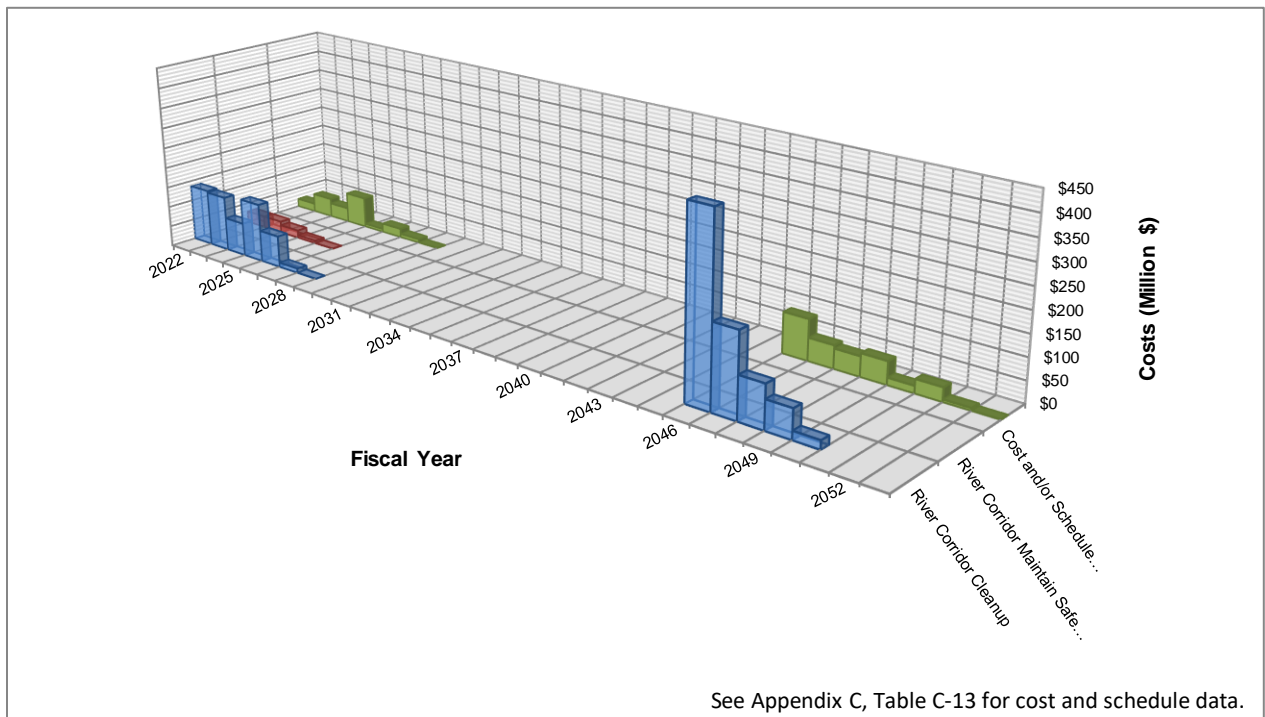


Figure 3-3. Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041)  
Low-Range Remaining Estimated Cleanup Costs by Fiscal Year.



See Appendix C, Table C-13 for cost and schedule data.

Figure 3-4. Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041)  
Low-Range Remaining Estimated Cleanup Costs by Work Element.



### 3.2 FINAL REACTOR DISPOSITION

Final reactor disposition will address cleanup of the 100 Area surplus production reactors in accordance with TPA M-093-00. Disposition of the 100 Area reactors (except for B Reactor, which is being preserved as a national historic landmark and is part of the Manhattan Project National Historical Park) was one of the cost estimate alternative analyses evaluated in the 2011 LCR (DOE/RL-2010-25). See summary in Appendix B, Table B-5, River Corridor - Disposition 100 Area Reactors.

Six reactors (C, D, DR, F, H, and N) have been placed in ISS configuration (see Table 3-2). KE Reactor has completed interim ISS and is in a minimum safe state; KE Reactor and KW Reactor are scheduled to complete ISS by FY 2024 and FY 2028, respectively. After being placed in ISS, the reactors will undergo surveillance, monitoring, and maintenance for 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 Central Plateau Inner Area for disposal.

The 2011 LCR identified the most plausible alternative for the reactors as safe storage followed by deferred one-piece removal. This alternative was developed and evaluated in a final environmental impact statement (EIS) (DOE/EIS-0119F, *Final Environmental Impact Statement Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington*) and in a subsequent engineering evaluation (DOE/RL-2005-45, *Surplus Reactor Final Disposition Engineering Evaluation*). DOE issued 58 FR 48509, "Record of Decision: Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington," in September 1993, which implements the recommendation for safe storage followed by deferred one-piece removal of the surplus reactors. N Reactor was not included in the EIS because it was not available for decommissioning at the time of the *National Environmental Policy Act of 1969* (NEPA) EIS and ISS was approved through the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) process. Final disposition of N Reactor will be determined by a subsequent NEPA or CERCLA decision process. In the planning case presented in this report, N Reactor is assumed to undergo safe storage followed by deferred one-piece removal.

Figure 3-5 presents the remaining estimated costs by fiscal year. The schedule is based on a 14-year implementation period for one-piece removal and completion of reactor removal by FY 2068 based on the ROD issue date of 1993 with a maximum 75-year storage period, so reactor removal would start by FY 2054. The estimated \$1.9 billion to complete final reactor disposition by FY 2068 is the escalated \$676 million removal cost (in 2010 constant dollars) presented in Table 4-5 of the 2011 LCR.

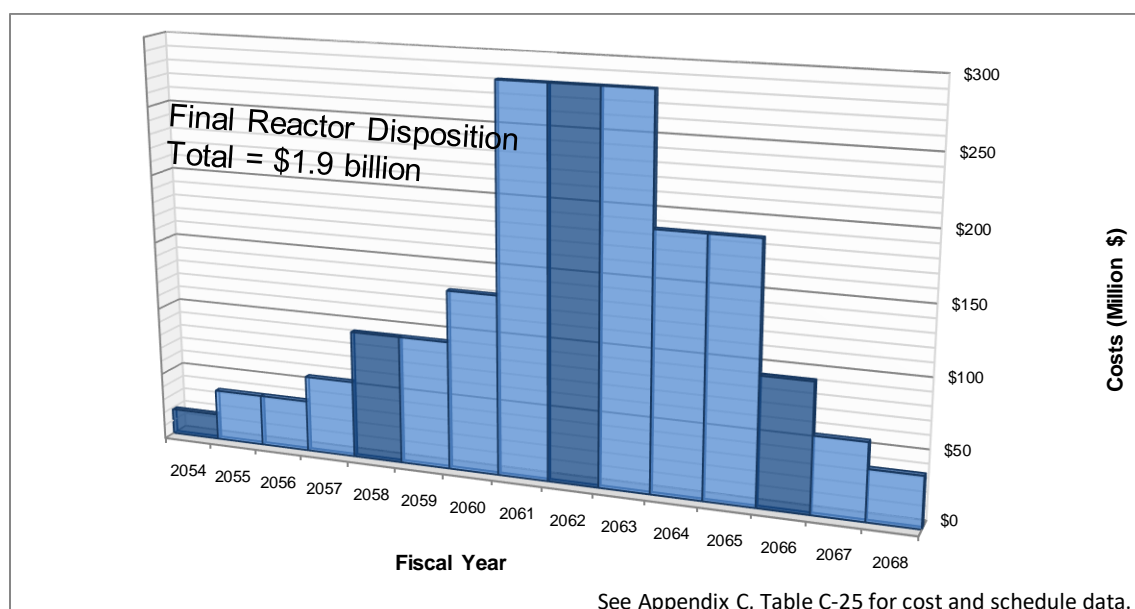


Figure 3-5. Final Reactor Disposition Remaining Estimated Cleanup Costs by Fiscal Year.



### **3.3 RIVER CORRIDOR CLEANUP ASSUMPTIONS AND UNCERTAINTIES**

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

- Regulatory changes will not require additional activities (e.g., document revisions, additional sampling) that would significantly impact costs or schedules.
- PNNL operating facilities will need to be available to support Office of Science missions. After PBS RL-0041 is completed, the facility D&D/waste site cleanup work will transfer to PBS RL-0040 Nuclear Facility D&D – Remainder of Hanford.
- The Hanford Natural Resource Trustee Council activities, including studies and Natural Resource Damage Assessment and Restoration (NRDAR) process will not significantly affect cost or schedule.
- Remaining costs for completion of the NRDAR process range from \$5 million to \$10 million with completion of the injury assessment and Restoration Compensation Plan by 2024.
- Any significant settlement funds for the NRDAR case would be obtained through the U.S. Department of Justice and the U.S. Judgement Settlement Fund.

Factors (risk and/or uncertainty) considered in determining the high-range estimate associated with the Nuclear Facility D&D–River Corridor Closure Project work scope include, but are not limited, to:

- Contamination spread associated with the 618-11 burial ground
- Remediation is more extensive than planned
- Building/system degradation and failures during S&M mode
- Total volume of high-dose 300-296 material exceeds available hot cell space
- K-West Basin residual TRU waste discovered that must be remote handled

These uncertainties and others are accounted for in the schedule and estimate uncertainty for Nuclear Facility D&D–River Corridor Closure Project.

#### 4.0 CENTRAL PLATEAU CLEANUP

The Central Plateau is a 75-square-mile area located near the center of the Hanford Site, that contains about 900 excess facilities, including five massive chemical processing facilities called canyons and roughly 800 non-tank farm waste sites. The Central Plateau is 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, and telecommunication lines), either existing or planned, in the Central Plateau are needed to support cleanup. These facilities, waste sites, canyons, and ongoing waste management operations and infrastructure are spread across the Central Plateau. The tank waste and WTP facilities on the Central Plateau are discussed in Chapter 5.0 as part of ORP's scope.

During Site operations, 450 billion gallons of liquid waste and cooling water 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 that exceed drinking water standards with a combined area of approximately 65 square miles (DOE/RL-2020-60). A significant amount of contamination remains in the soil column above the water table and poses a potential threat to groundwater.

Interim and final groundwater treatment are in place for contaminant plumes in the 200 East and West Areas and in several locations in the 100 Areas. The Central Plateau cleanup is organized into the following three principal components (DOE/RL-2009-10):

- **Inner Area.** The footprint of the Central Plateau that will be dedicated to long-term waste management and containment of residual contamination and will remain under Federal ownership and control as long as a potential hazard exists. The Inner Area contains the majority of Hanford's active waste treatment, storage, and disposal facilities, including hundreds of waste sites, surplus facilities, miles of buried pipelines, tank farms, and large canyon facilities. Cleanup of the Inner Area will make this footprint as small as practical.
- **Outer Area.** 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 (i.e., suitable for unrestricted surface use under continued Federal ownership and control and consistent with DOE's anticipated future land use of conservation/mining). Contaminated soil and debris removed as part of Outer Area cleanup will be placed within the Inner Area for final disposal. Completion of cleanup for the approximately 65-square-mile Outer Area will shrink the active footprint of cleanup for the Central Plateau to the Inner Area.
- **Groundwater and Deep Vadose Zone Remediation.** DOE's goal is to restore groundwater to its beneficial uses, unless restoration is determined to be technically impracticable. An important element of groundwater protection and remediation is to develop and implement ways to protect groundwater from continuing influx of contaminants from the deep vadose zone.

The cleanup work scope in the Central Plateau is managed through four projects:

- Solid Waste Stabilization and Disposition–200 Area, PBS RL-0013C (Inner Area).
- Soil and Water Remediation–Groundwater/Vadose Zone, PBS RL-0030 (entire Hanford Site, including Inner and Outer Areas and the River Corridor).
- Nuclear Facility D&D–Remainder of Hanford, PBS RL-0040 (geographical cleanup of waste sites and facilities in the Inner and Outer Areas, including the remaining canyon facilities as well as the 400 Area).
- Nuclear Facility D&D–Fast Flux Test Facility Project, PBS RL-0042 (includes FFTF located in the 400 Area).

Cleanup is being performed in accordance with RODs and action memoranda as listed in Appendix A and with key TPA milestones listed in Table 4-1. There are several ongoing negotiations that have the potential to affect a significant number of near-term Central Plateau TPA milestones. Milestone directly associated with these negotiations are listed below and not reflected in Table 4-1.

- The M-091 series milestones for RL-0013C are being negotiated under *Tentative Agreement on Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Revisions in Response to the Milestone M-091 Series Negotiations*. The following milestones are affected by this ongoing negotiation and as such are statused as In Abeyance:
  - M-091-00 – Complete the treatment to LDR treatment standards for all Hanford Site Resource Conservation and Recovery Act of 1976 (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. Due date TBD.
  - M-091-48 – Complete the offsite shipment of all TRUM waste (in above ground storage as of June 30, 2009, and in retrievable storage). Due date 9/30/2030.
  - M-091-49 – Complete retrieval and designation of RH and CH retrievably stored waste. Due date 9/30/2028.
- The following TPA milestones are In Abeyance as described in *IAMIT Determination 2021-003, Extension for the Temporary Suspension of Tri-Party Agreement Milestones from the Agreement in Principle for the Negotiation of Hanford Federal Facility Agreement and Consent Order Revisions in Response to Federal Fiscal Year 2018-2020 Appropriation in Conjunction with the RASCAL Recommendations (Interagency Management Integration Team Determination 2020-006) for Expediting Remedial Cleanup on the Hanford Central Plateau*:
  - M-015-93C – Initiate Characterization Field Work for 200-SW-2 Operable Unit Landfills
  - M-015-98 – Complete RI of U Plant related waste sites in 200-WA-1
  - M-085-70 – Submit RI/FS Work Plan for 200-CB-1
  - M-015-99 – Complete RI of PFP related waste sites in 200-WA-1
  - M-015-84 – Complete RI for 200-BC-1 and 200-WA-1
  - M-015-92B – Submit RFI/CMS & RI/FS & PCAD/PP for 200-EA-1
  - M-015-93B – Submit RFI/CMS & RI/FS & PCAD/PP for 200-SW-2
  - M-015-92C – Submit RFI/CMS & RI/FS & PCAD/PP for 200-IS-1
  - M-015-38B – Submit FS & PP for 200-CW-1, 200-CW-3 and 200-OA-1
  - M-015-91B – Submit RI/FS & PP for 200-BC-1 and 200-WA-1
  - M-015-110B – Submit CMS & FS & PCAD/PP for 200-DV-1
  - M-016-200A – Complete U Plant Canyon (221U) Demolition
  - M-016-200B – Complete U Plant Canyon (221U) Barrier Construction

Table 4-1. Central Plateau Cleanup Key Tri-Party Agreement Milestones

Milestone	Description	Compliance Date
<b>Solid Waste Stabilization and Disposition–200 Area, PBS RL-0013C</b>		
M-092-20	Submit to Ecology a disposition pathways evaluation for the cesium and strontium capsules	3/31/2022
M-016-173	Select K Basin sludge treatment and packaging technology and propose new interim sludge treatment and packaging milestones.	9/30/2022
M-062-57	Integrated Disposal Facility (IDF) Operational	9/30/2023
M-092-21	Complete the transfer of cesium and strontium capsules from WESF	8/31/2025
M-092-00	Acquire facilities for cesium and strontium capsules and bulk sodium	12/31/2047
<b>Soil and Water Remediation–Groundwater/Vadose Zone, PBS RL-0030<sup>1</sup></b>		
M-085-90	Submit Remedial Investigation/Feasibility Study for 200-CR-1 to EPA	9/30/2025
M-024-000	Complete required well installations in accordance with the RCRA and CERCLA groundwater requirements.	TBD

Table 4-1. Central Plateau Cleanup Key Tri-Party Agreement Milestones

Milestone	Description	Compliance Date
M-037-20	If requesting the alternative requirements for closure of 216-A-29 Ditch, 216-A-36B Crib, 216-A-37-1 Crib, and 216-B-63 Trench, DOE shall submit a coordinated closure proposal as a permit modification request.	TBD
M-037-21	Submit coordinated closure proposal as a permit modification request for the following TSD units: 216-A-29 Ditch, 216-A-36B Crib, 216-A-37-1 Crib, and 216-B-63 Trench.	TBD
M-037-22	If requesting the alternative requirements for closure of 216-B-3 Pond and 216-S-10 Ditch and Pond, DOE shall submit a coordinated closure proposal as a permit modification request.	TBD
M-037-23	Submit coordinated closure proposal as a permit modification request for the following TSD units: 216-B-3 Pond and 216-S-10 Ditch and Pond.	TBD
M-037-24	Submit coordinated closure proposal as a permit modification request for the following TSD units: 241-CX Tank System (CX-70, CX-71, and CX-72) and Inactive SST Components outside of the Waste Management Areas (WMAs).	TBD
M-037-25	If requesting the alternative requirements for closure of Inactive SST Components outside of WMAs, DOE shall submit a coordinated closure proposal as a permit modification request.	TBD
M-037-26	If requesting the alternative requirements for closure of any TSD Units in the Green Islands of the Low-Level Waste Burial Grounds, DOE shall submit a coordinated closure proposal as a permit modification request.	TBD
M-037-27	Submit coordinated closure proposal as a permit modification request for the following TSD units: Low-Level Burial Grounds Green Islands.	TBD
M-037-28	Submit coordinated closure proposal as a permit modification request for all TSD Units in the 221-B Canyon Facility.	TBD
M-037-29	Submit coordinated closure proposal as a permit modification request for the following TSD units: PUREX Tunnels 1 and 2 and all TSD Units in the PUREX Canyon Facility.	TBD
<b><i>RL-0030 Milestones At Risk</i></b>		
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.	6/30/2026
<b>Nuclear Facility D&amp;D–Remainder of Hanford, PBS RL-0040</b>		
M-016-257	Complete Confirmation Sampling/No Further Action (CS/NFA) for All Waste Sites as Identified in CCF M-016-20-01 in FY 2021	6/30/2022
M-016-258	Complete Confirmation Sampling/No Further Action (CS/NFA) and Remove, Treat, Dispose (RTD) for All Waste Sites as Identified in CCF M-016-21-01 in FY 2022	9/30/2022
M-016-259	Complete Remove, Treat, Dispose (RTD) for All Waste Sites as Identified in CCF M-016-21-01 in FY 2023	9/30/2023
M-085-76	Initiate response actions for B Plant remedial/removal action work plan.	9/30/2025
M-085-84	Initiate response actions for PUREX in accordance with the schedule in the approved remedial/removal action work plan.	9/30/2025
M-085-01	Submit a change package to establish a date for major milestone M-085-00.	6/30/2026
M-016-00	Complete remedial actions for all non-tank farm and non-canyon OUs.	9/30/2042
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
<b>Nuclear Facility D&amp;D–Fast Flux Test Facility Project, PBS RL-0042</b>		
M-092-09	Submit to Ecology a Conceptual Design Report Package (30% Design) for the Sodium Reaction Facility.	12/31/2026

Table 4-1. Central Plateau Cleanup Key Tri-Party Agreement Milestones

Milestone	Description	Compliance Date
<sup>1</sup> The M-037 series milestones are indirectly affected by <i>IAMIT Determination Number 2021-003: Extension for the Temporary Suspension of Tri-Party Agreement Milestones from the Agreement in Principle for the Negotiation of Hanford Federal Facility Agreement and Consent Order Revisions in Response to Federal Fiscal Year 2018-2020 Appropriation in Conjunction with the RASCAL Recommendations (Interagency Management Integration Team Determination 2020-006) for Expediting Remedial Cleanup on the Hanford Central Plateau</i> as they are tied to the milestones for submitting the Proposed Plan for associated OUs.		
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.	PUREX = Plutonium Uranium Extraction (Plant).	
CH = contact-handled.	RCRA = Resource Conservation and Recovery Act.	
D&D = decontamination and decommissioning.	REDOX = Reduction-Oxidation Facility (S Plant).	
Ecology = Washington State Department of Ecology.	RH = remote-handled.	
EPA = U.S. Environmental Protection Agency.	RI/FS = remedial investigation/feasibility study.	
LDR = Land Disposal Restrictions.	TBD = to be determined.	
MLLW = mixed low-level waste.	TRUM = transuranic mixed (waste).	
OU = operable unit.	TSD = treatment, storage, and disposal.	
PBS = project baseline summary.	WIPP = Waste Isolation Pilot Plant.	

#### 4.1 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 facilities and operations. The major mission objectives are to:

- Operate waste treatment facilities, including T Plant and the WRAP Facility.
- Maintain commercial mixed, low-level waste and transuranic (TRU) repackaging capabilities at Perma-Fix Northwest until such time on Site capabilities are obtained.
- Provide base waste management operations at the Canister Storage Building (CSB) and 200 Area Interim Storage Area, Central Waste Complex (CWC), Integrated Disposal Facility (IDF), Waste Encapsulation and Storage Facility (WESF) for cesium/strontium capsule storage, and Low-Level Burial Grounds and mixed waste disposal trenches.
- Operate Environmental Restoration Disposal Facility (ERDF) to provide solid waste treatment and disposal services in support of Hanford cleanup.

Additional objectives are as follows:

- Retrieve and ship transuranic (TRU) waste for disposal to the Waste Isolation Pilot Plant (WIPP) or other permitted facility.
- Develop alternative methods for treatment and disposal of orphan waste. This could include seeking land disposal restrictions variance approvals, expanding commercial treatment facilities permit limits, and constructing and operating additional onsite treatment capabilities.
- Obtain processing capabilities to repackage large and remote-handled (RH) contaminated waste containers.

The Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) project 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.
- Stored underground TRU waste will be retrieved and disposed.
- Mixed low-level waste and low-level waste will be treated as necessary and disposed of.

- Waste management facilities will be deactivated at the end of their useful lives and will be transferred to Nuclear Facility D&D-Remainder of Hanford (PBS RL-0040) for final disposition.
- 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 final disposition and remedial action.
- IDF will be closed according to the closure plan requirements in the Dangerous Waste Permit (WA7890008967). Closure will follow completion of tank waste vitrification.

Table 4-2 summarizes each scope element. As waste management facilities are no longer needed to support Hanford cleanup, they will be transitioned to Nuclear Facility D&D-Remainder of Hanford (PBS RL-0040) for final disposition.

Table 4-2. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C)  
Level 2 Scope Summary

Work Element	Scope Description
Project Management	Provides for the overall project management, coordination, direction, and customer interface to ensure the proper conduct of operation for this project.
Waste Encapsulation Storage Facility (WESF)	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)	Includes safe storage of SNF while awaiting final disposition at a geologic repository, repackaging SNF for shipment, and coordination with the offsite repository for evaluations and information.
Mixed Low Level Waste (MLLW) Trenches	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.
Transuranic (TRU) Waste Retrieval	Consists of the retrieval, designation, and transfer to a TSD facility of both CH and RH solid TRU waste stored underground.
TRU Repackaging	Provides funding for WIPP production, TRU repackaging operations at T Plant and WRAP (or a commercial facility), TRU program support for repackaging, and RH/large packaging capabilities.
Waste Receiving and Processing (WRAP) Facility	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	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)	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 CH TRU waste into shipping containers for shipment to WIPP.
Environmental Restoration Disposal Facility (ERDF)	Addresses the operation of the ERDF through the end of Hanford cleanup, including cell expansion and ERDF interim cover construction.
Integrated Disposal Facility (IDF)	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.

Table 4-2. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C)  
Level 2 Scope Summary

Work Element	Scope Description
TRU Disposition	Provides funding and resources for the TRU Program’s coordination with the Central Characterization Project to certify TRU waste according to the WIPP Waste Acceptance Criteria. This work element also provides funding to perform Hanford WIPP closeout activities, TRU waste characterization activities at the direction or guidance of the Central Characterization Project and to establish shipping capabilities for RH TRU waste and additional CH TRU waste shipping capabilities.
SNF Disposition	Includes design and construction of a Fuel Preparation Facility, turnover of the facility to operations, and level-of-effort support to activities sponsored by the cognizant DOE office and/or programs that have responsibility for management and disposition of spent nuclear fuel.
Low Level Waste Burial Grounds	Includes supervision, work control, surveillance, radiation protection, maintenance, engineering, training, quality assurance, environmental compliance, waste management enhancements, and other support.
Sludge Treatment Phase 2	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.
Management of Cesium and Strontium Capsules (MCSC)	Includes construction of WESF modifications and the capsule storage area (CSA), management and other project costs, design of the cask storage system, identification and development of required transportation safety documentation based on selected cask storage technology, and preparation of transportation safety documentation necessary to support capsule transfer operations.
Capsule Interim Storage Operations	Includes retrieval of capsules from their current storage location in the WESF pool cells, packaging into a cask storage system at WESF, transfer to a new onsite capsule storage area, and interim storage configuration pending final disposition.
General Debris and Excess Cleanup	Includes a disposition decision, cleanup and disposal of general debris and excess material on the Hanford Site.
CH = contact-handled. D&D = decontamination and decommissioning. DOE = U.S. Department of Energy. PBS = project baseline summary. RH = remote-handled. RL = DOE, Richland Operations Office.	
SNF = spent nuclear fuel. TSD = treatment, storage, and disposal. WESF = Waste Encapsulation and Storage Facility. WIPP = Waste Isolation Pilot Plant. WTP = Waste Treatment Plant.	

Figure 4-1 shows the low-range remaining estimated cleanup costs for the Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) by fiscal year; Figure 4-2 shows the low-range remaining estimated cleanup costs by work element.

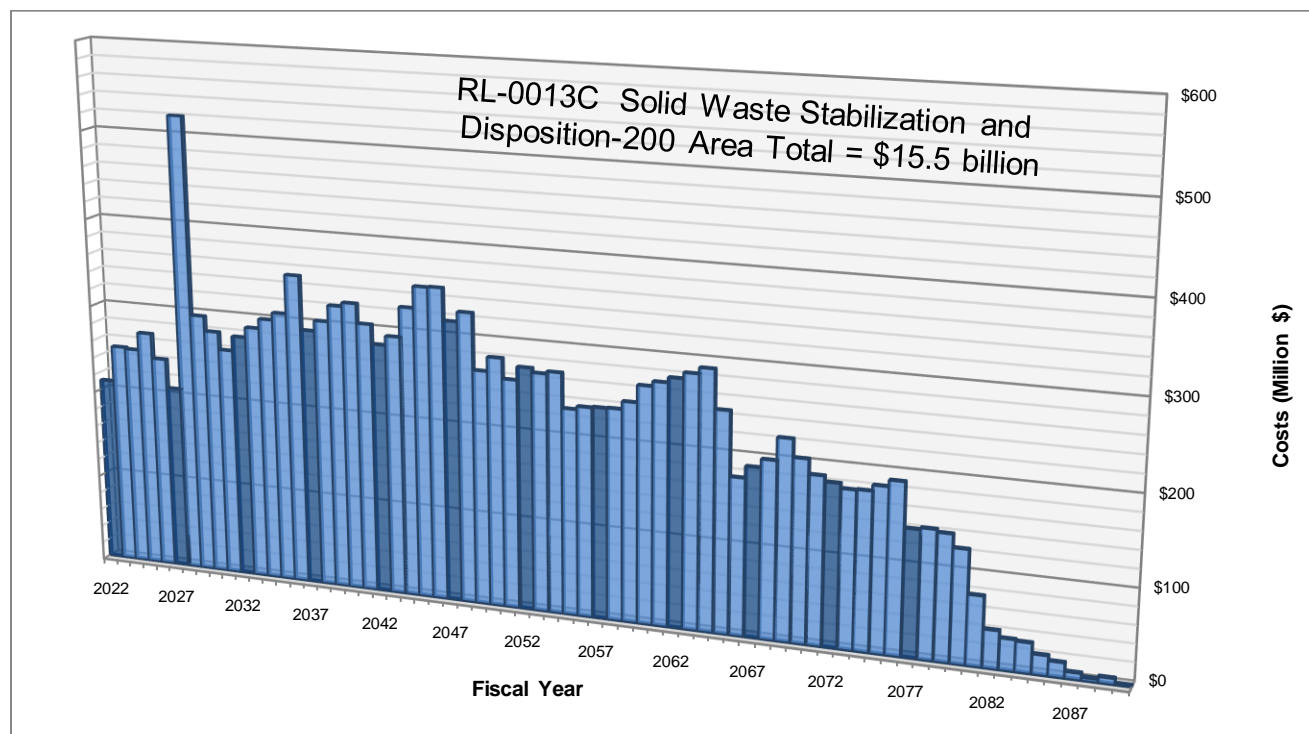


Figure 4-1. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C)  
Low-Range Remaining Estimated Cleanup Costs by Fiscal Year.

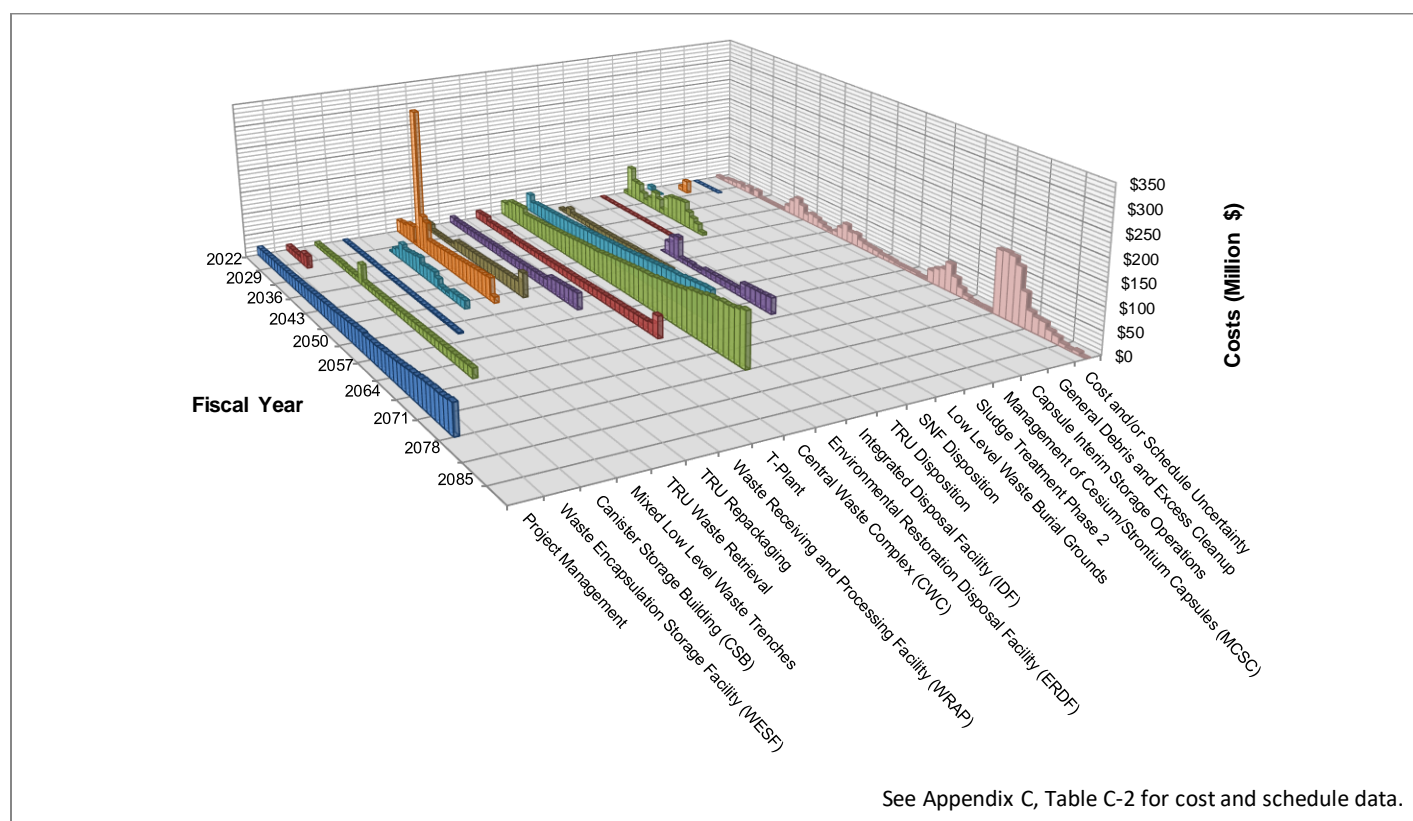


Figure 4-2. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C)  
Low-Range Remaining Estimated Cleanup Costs by Work Element.



## 4.2 SOIL AND WATER REMEDIATION—GROUNDWATER/VADOSE ZONE (PBS RL-0030)

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

- Regulatory decision-making process for all groundwater operable units (OU) on the Hanford Site.
- Remediation of all groundwater on the Hanford Site in accordance with the groundwater OU decisions.
- Deactivation, decontamination, decommissioning, and demolition (D4) of pump-and-treat and supporting facilities
- Regulatory decision-making process for Central Plateau waste sites (remediation of waste sites is part of the Nuclear Facility D&D—Remainder of Hanford [PBS RL-0040] project scope).
- Regulatory decision-making process and remediation for 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 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. The tritium groundwater contaminant plume from the Central Plateau has reached the Columbia River. Additional groundwater contaminant plumes such as hexavalent chromium, strontium-90, and uranium originating in the 100 or 300 Areas also have reached the Columbia River.

The major chemical contaminants present in the groundwater include carbon tetrachloride, hexavalent chromium, nitrate, and trichloroethene. Major radioactive contaminants include iodine-129, strontium-90, technetium-99, tritium, and uranium. Other groundwater contaminants that exceed drinking water standards in several Hanford Site areas, but are of limited extent, include a volatile organic compound (cis-1,2-dichloroethene), petroleum hydrocarbons (diesel) and a radioactive contaminant (carbon-14) (DOE/RL-2020-60). The Groundwater Project (DOE/RL-2002-59, *Hanford Site Groundwater Strategy Protection, Monitoring, and Remediation*) has three major objectives:

- Take actions necessary to prevent degradation of the groundwater
- Remediate groundwater to restore it to beneficial use where practicable and protect the 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. Hanford is divided into 10 groundwater OUs; 6 in the River Corridor (100-BC-5, 100-KR-4, 100-NR-2, 100-HR-3, 100-FR-3, 300-FF-5) and 4 in the Central Plateau (200-ZP-1, 200-UP-1, 200-BP-5, 200-PO-1). Groundwater monitoring activities also are required by the *Atomic Energy Act*, CERCLA, and the *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste* (WA7890008967). Table 4-3 provides additional details on the scope of work for each of the work elements.

Table 4-3. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030)  
Level 2 Scope Summary

Work Element	Scope Description
Groundwater Program Management	Includes program management oversight, integrated field work, training, well access roads, strategic integration, groundwater management plan, technical support and evaluations, project control, performance assessment, remediation decision support, sample management and reporting, environmental databases, and CERCLA 5-Year review.
Groundwater Monitoring	Includes: <ul style="list-style-type: none"> <li>• Geophysical borehole logging.</li> <li>• Groundwater laboratory analysis and sample data management.</li> <li>• Groundwater sample collection, purgewater truck and operation and maintenance of the Hanford 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).</li> <li>• Groundwater data evaluation and reporting including the annual CERCLA, RCRA, and pump-and-treat operations reports.</li> <li>• Well maintenance, monitoring, and reporting.</li> <li>• RCRA well drilling per TPA M-024 milestones.</li> <li>• Miscellaneous well decommissioning.</li> <li>• Operation, maintenance, sampling, and dismantlement of the Modutanks used for disposal of groundwater from onsite well sampling and maintenance, characterization, and remediation activities.</li> </ul>
200-WA-1 OU	For the 200 West Area waste sites, includes implementing the CERCLA/RCRA process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparation of the remedial design/remedial action work plan. Also includes the development of Closure Plans for RCRA TSD Units within the OU.
200-EA-1 OU	For the 200 East Area waste sites, includes implementing the CERCLA/RCRA process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparation of the remedial design/remedial action work plan. Also includes the development of Closure Plans for RCRA TSD Units within the OU.
200-OA-1 OU	For the Outer Area waste sites, includes implementing the RI/FS process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparation of the remedial design/remedial action work plan.
200-IS-1 OU	For the 200 Area pipelines, includes implementing the CERCLA/RCRA process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparation of the remedial design/remedial action work plan. Also includes the development of Closure Plans for RCRA TSD Units within the OU.
200-SW-2 OU	For the 200 Area land disposal units, includes implementing the CERCLA/RCRA process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparation of the remedial design/remedial action work plan.
100-BC-5 OU	For 100-BC groundwater, includes completing the CERCLA process and preparing regulatory decision documents leading to a final ROD, then implementing and monitoring the remedial action to completion, including final reporting and well drilling and decommissioning.
100-KR-4 OU	For 100-KR groundwater, includes completing the CERCLA process and preparing regulatory decision documents leading to a final ROD, then implementing and monitoring the remedial action to completion, including well drilling and decommissioning, pump-and-treat operations, maintenance, and monitoring, remedial process optimization (well realignments), final reporting and remedy D&D.
100-NR-2 OU	For 100-NR groundwater, includes completing the CERCLA process and preparing regulatory decision documents leading to a final ROD, then implementing and monitoring the remedial action to completion, including bioventing operations and maintenance, final reporting, well drilling and decommissioning and remedy D&D.

Table 4-3. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030)  
Level 2 Scope Summary

Work Element	Scope Description
100-HR-3 OU	For 100-HR groundwater, includes implementing and monitoring the remedial action to completion, including well drilling and decommissioning, pump-and-treat operations, maintenance, and monitoring, remedial process optimization (well realignments), final reporting and remedy D&D.
100-FR-3 OU	For 100-FR groundwater, includes implementing and monitoring the remedial action to completion, including final reporting, well drilling and decommissioning.
200-BP-5 OU	For 200-BP groundwater, includes completing the CERCLA process and preparing regulatory decision documents (including for 200-PO-1 OU) leading to a interim ROD, then implementing and monitoring the remedial action to completion, including reporting and well drilling and decommissioning.
200-PO-1 OU	For 200-PO groundwater, includes implementing and monitoring the remedial action to completion, including reporting and well drilling and decommissioning.
200-UP-1 OU	For 200-UP groundwater, includes implementing and monitoring the remedial action to completion, including treatability testing, tracer study, well drilling and decommissioning, pump-and-treat operations, maintenance, and monitoring, final reporting, and remedy D&D.
200-ZP-1 OU	For 200-ZP groundwater, includes implementing and monitoring the remedial action to completion, including well drilling and decommissioning, pump-and-treat operations, maintenance, and monitoring, remedial process optimization (well realignments), final reporting, and remedy D&D.
200-CB-1 OU	For the B Plant Canyon and waste sites, includes implementing the CERCLA/RCRA process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparation of the remedial design/remedial action work plan.
200-CP-1 OU	For the PUREX Canyon and waste sites (including the PUREX Tunnels), includes implementing the CERCLA/RCRA process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparation of the remedial design/remedial action work plan.
200-CR-1 OU	For the REDOX Canyon and waste sites, includes implementing the RI/FS process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparation of the remedial design/remedial action work plan.
300-FF-5 OU	For 300-FF groundwater, includes implementing and monitoring the remedial action to completion, including final reporting, well drilling and decommissioning.
200-DV-1 OU	For the Deep Vadose Zone, includes completing the CERCLA/RCRA process through treatability studies and preparing regulatory decision documents leading to a final ROD, then preparation of the remedial design/remedial action work plan.
<p>CERCLA = <i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980.</i>  D&amp;D = decontamination and decommissioning.  DOE = U.S. Department of Energy.  OU = operable unit.</p> <p>PBS = project baseline summary.  RCRA = <i>Resource Conservation and Recovery Act of 1976.</i>  RI/FS = remedial investigation/feasibility study.  RL = DOE, Richland Operations Office.  ROD = record of decision.</p>	

Figure 4-3 presents the low-range remaining estimated cleanup costs for Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) by fiscal year; Figure 4-4 presents the low-range remaining estimated cleanup costs by work element.

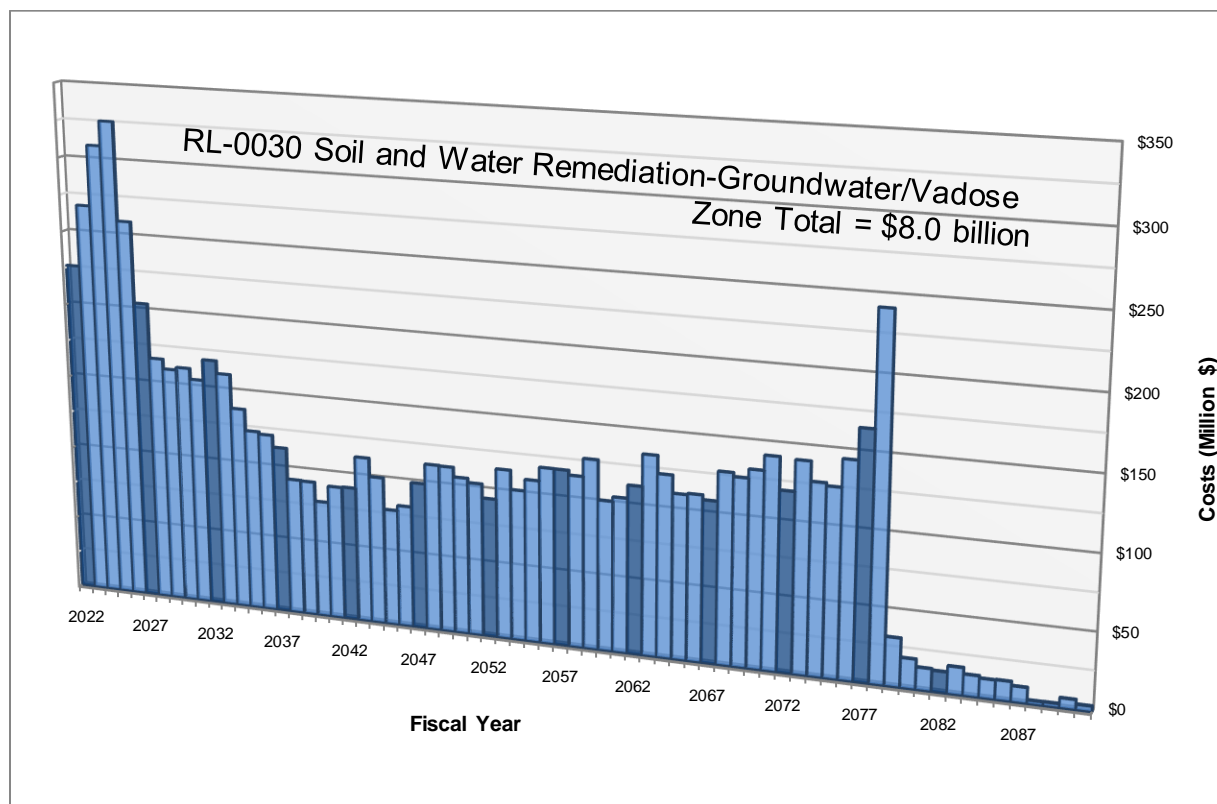


Figure 4-3. Soil and Water Remediation-Groundwater/Vadose Zone (PBS RL-0030)  
Low-Range Remaining Estimated Cleanup Costs by Fiscal Year.

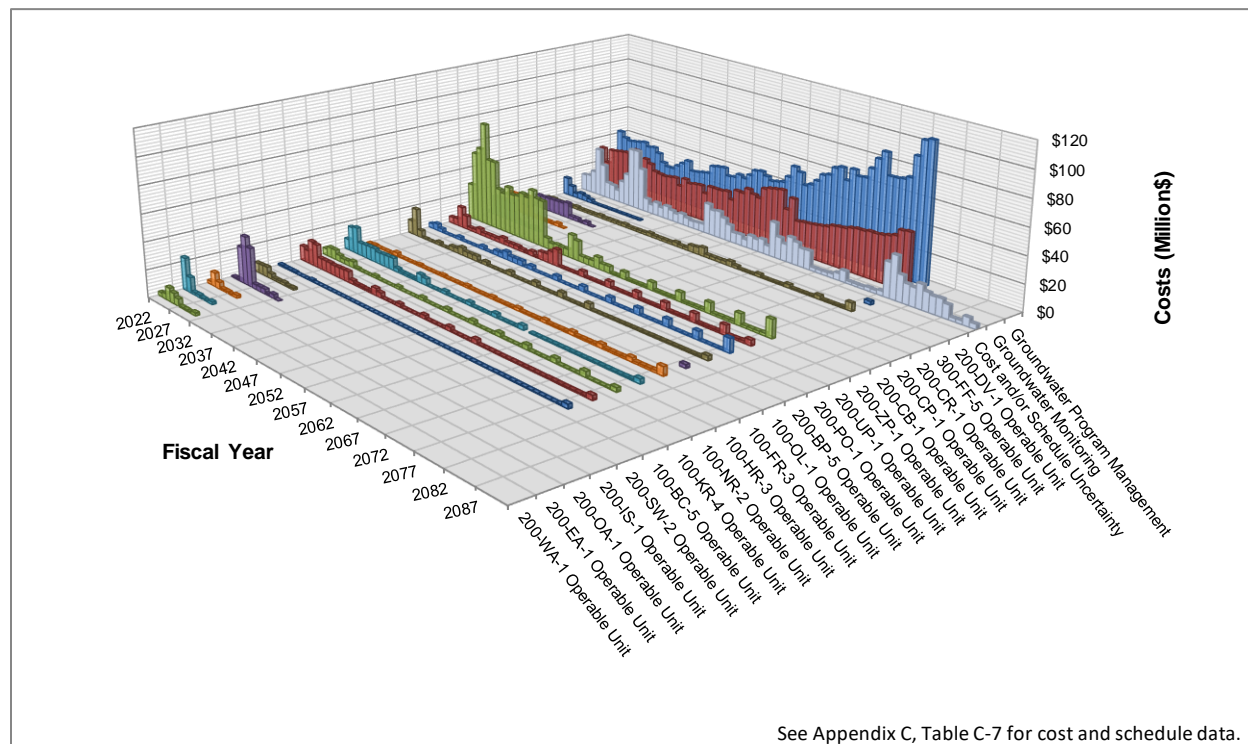


Figure 4-4. Soil and Water Remediation-Groundwater/Vadose Zone (PBS RL-0030)  
Low-Range Remaining Estimated Cleanup Costs by Work Element.

### 4.3 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. It is also known (and referred to in the rest of this section) as the Central Plateau Remediation Project (PBS RL-0040).

The Central Plateau Remediation Project scope includes the demolition and remediation scope that is organized into 25 geographical areas referred to as implementation areas.

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) and completion of the remedial design/remedial action work plan, waste site/facility remediation and/or closure will be addressed under the Central Plateau Remediation Project (PBS RL-0040). The Central Plateau Remediation Project scope includes implementing the decisions through the physical cleanup of canyon facilities, buildings and structures (including utilities), waste sites, and pipelines to ensure appropriate protection has been provided for the cleanup.

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

- Perform S&M of surplus facilities and inactive waste sites
- Integrate disposition planning and execution activities with other Central Plateau projects
- Remediate inactive waste sites and pipelines
- D&D canyons
- D&D surplus facilities
- Construct barriers as required by final RODs
- Transition the Central Plateau Inner Area to LTS.

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

- Canyons and surplus facilities are removed or dispositioned and if necessary transitioned to LTS
- Central Plateau waste sites and pipelines are remediated in accordance with approved decisions and if necessary transitioned to LTS
- Final disposition of Cold War legacy wastes is complete
- Institutional controls are implemented
- Post-remediation operations and maintenance requirements are implemented.

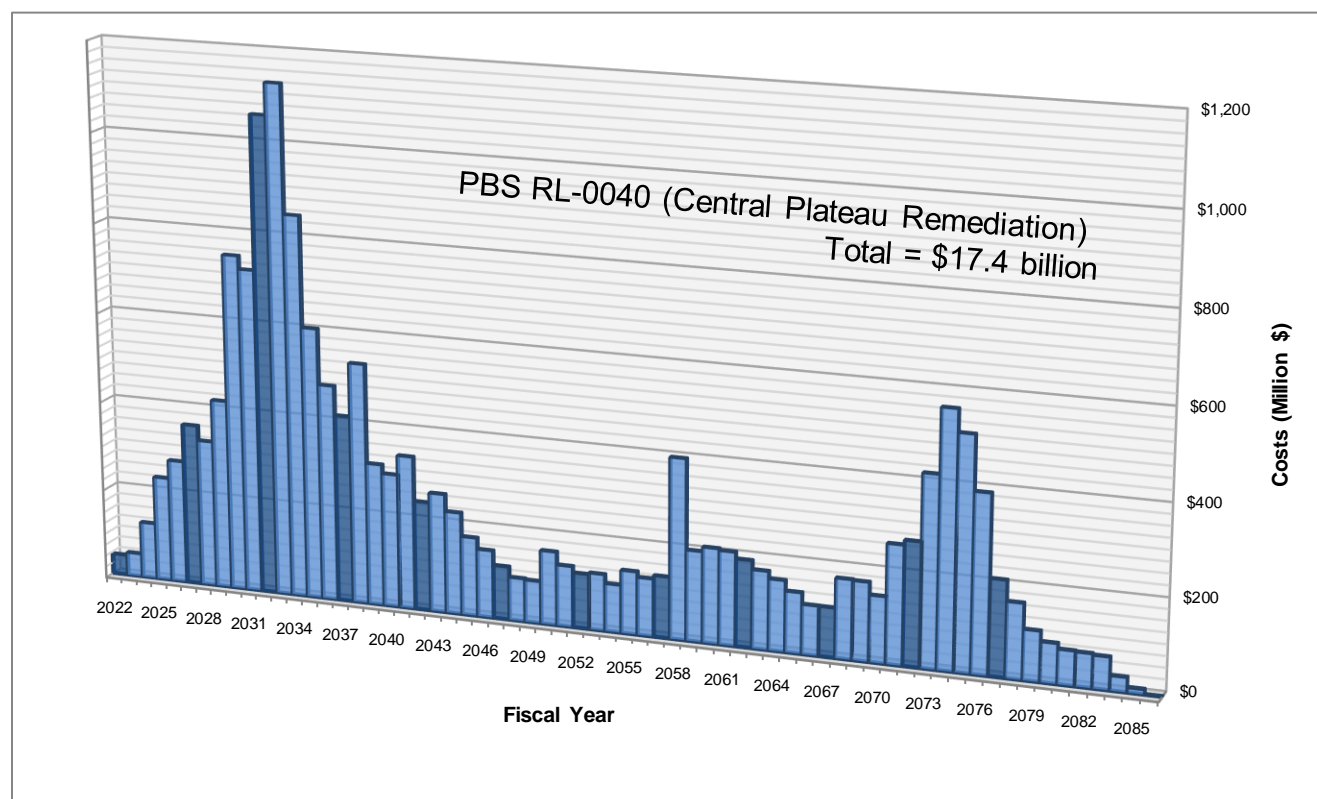
The work scope for the Central Plateau Remediation Project (PBS RL-0040) is organized into the work elements described in Table 4-4, which provides additional details on the scope of work for each work element.

The duration, in part, depends on transition of the Tank Farm Waste Management Areas to the project for final disposition after closure activities are completed by ORP (see Chapter 5.0). It also depends on transition of waste management facilities that are no longer needed to support Hanford cleanup from Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) to the project for final disposition (see section 4.2) as well as any necessary transitions to LTS.

Figure 4-5 presents the low-range remaining estimated cleanup costs for the Central Plateau Remediation Project (PBS RL-0040) by FY; Figure 4-6 presents the low-range remaining estimated cleanup costs by work element.

Table 4-4. Central Plateau Remediation Project (PBS RL-0040) Level 2 Scope Summary.

Work Element	Scope Description
Regulatory Decisions and Closure Integration	Includes program and project management, engineering studies, emergency response tasks necessary to address aging facility or waste site conditions that are above and beyond anticipated operational and maintenance plans, steam line removal, and preparation of the CERCLA 5-Year review documents.
Remediation of Geographic Areas	Includes geographic remediation of implementation areas in the Central Plateau and River Corridor. Each area has a variety of cleanup features that can include waste sites, facilities, canyons, pipelines, and remedial barriers. 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 at ERDF.
Central Plateau Maintain Safe and Compliant Facilities and Waste Sites	Includes min safe oversight and support, radiation surveillances, tumbleweed collection, surface contamination treatment, sign replacement, surveillance, Canyon and nuclear facilities min safe, and general-purpose facilities min safe.
CERCLA = <i>Comprehensive Environmental Response, Compensation and Liability Act.</i> ERDF = Environmental Restoration Disposal Facility PBS = project baseline summary.	

Figure 4-5. Central Plateau Remediation Project (PBS RL-0040)  
Low-Range Remaining Estimated Cleanup Costs by Fiscal Year.

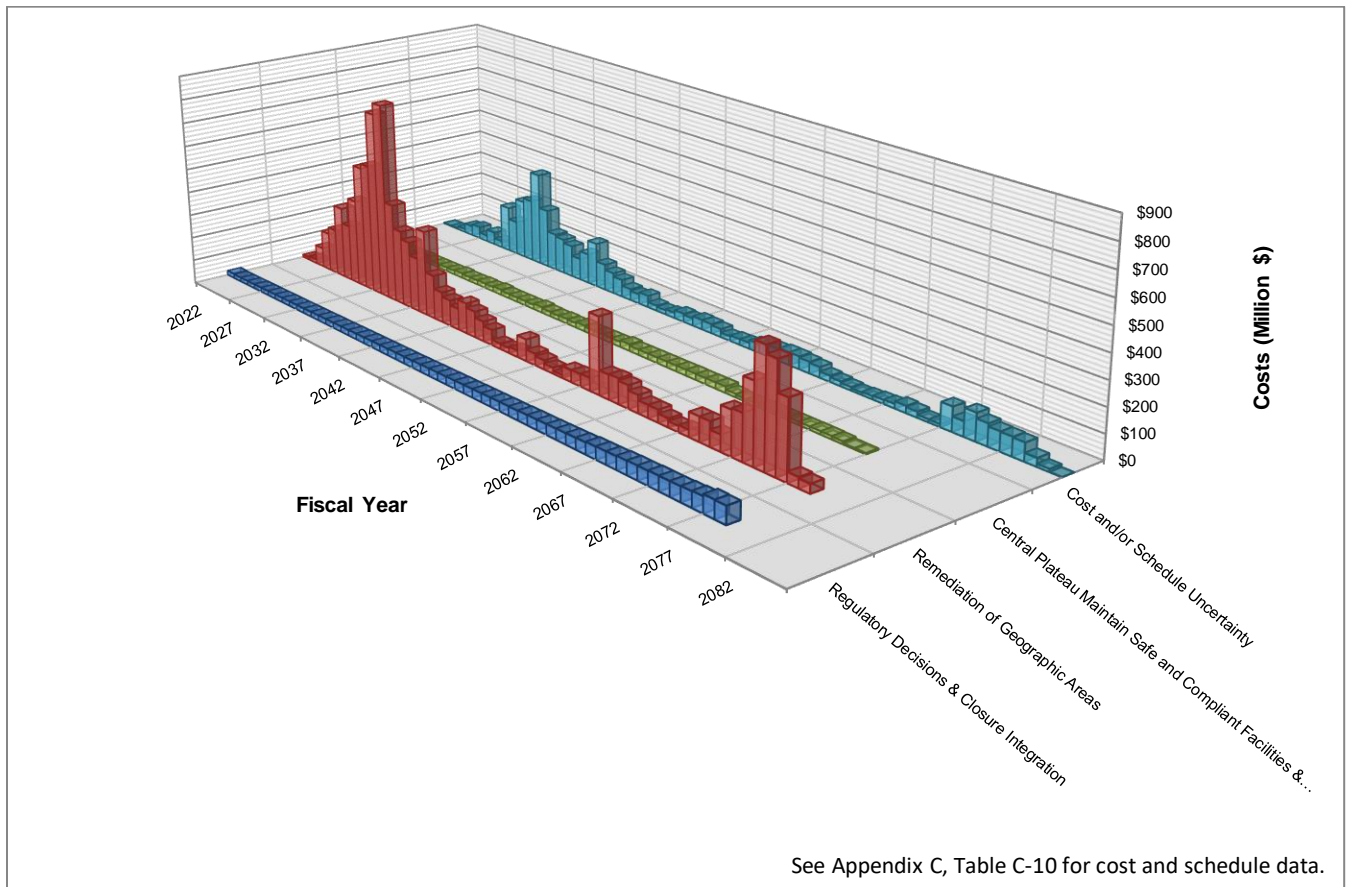


Figure 4-6. Central Plateau Remediation Project (PBS RL-0040)  
Low-Range Remaining Estimated Cleanup Costs by Work Element.

#### 4.4 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. DOE issued a shutdown order for FFTF in December 1993 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 hazardous/radioactive materials, interim maintenance of facilities, demolition, and disposal of the waste. In the ROD ([78 FR 75913](#)), DOE decided to implement FFTF Alternative 2 Entombment. This scope consists of the following:

- RH special components will have the sodium residuals removed by treatment at the Idaho National Laboratory and then be returned to Hanford for disposal in the IDF.
- Bulk sodium inventories located at Hanford will be converted to caustic sodium hydroxide in an onsite sodium reaction facility then stored for ultimate use in the WTP.
- All structures in the 400 Area Protected Area, except for reactor containment, will be demolished to at least 3 feet below grade followed by backfill and revegetation; decommissioning waste would be disposed of at appropriate disposal facilities.
- The above-grade containment dome will be removed and dispositioned.

- The below-grade portion of the reactor containment building and the reactor vessel will be grouted (e.g. entombed).
- A RCRA-compliant engineered barrier will be installed over the grouted area.
- Post-closure care would include long-term monitoring of air, groundwater, and the vadose zone.

Waste sites in the 400 Area are included as part of the 300-FF-2 OU but are being remediated under the Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) and Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042). Table 4-5 summarizes the work scope.

Table 4-5. Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042)  
Level 2 Scope Summary.

Work Element	Scope Description
FFTF Program Management	Annual project management and closure services.
FFTF Cleanup	Includes D4 of the FFTF Reactor and facilities in accordance with the record of decision (78 FR 75913 <sup>1</sup> ), confirmatory radiation surveys, site monitoring plan, monitoring wells, final documentation and project management for these activities.
FFTF Sodium	Includes management, disposition and removal of sodium residuals in FFTF equipment, maintain sodium storage facility operations, and waste transportation and disposal.
Sodium Reaction Facility	Includes design, construction, operational testing and readiness review of a facility to convert the FFTF sodium and Hallam sodium stored in 200 West Area to caustic sodium hydroxide.
Maintain Safe and Compliant FFTF Complex	Includes preventative and scheduled maintenance, corrective maintenance, supervision, work control and training for the FFTF Complex and 400 Area Potable/Fire Water System.
<sup>1</sup> 78 FR 75913, 2013, “Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington,” Record of Decision, <i>Federal Register</i> , Vol 78, No. 240, pp 75913, December 13, 2013. D4 = deactivation, decontamination, decommissioning, and demolition. FFTF = Fast Flux Test Facility.	

Figure 4-7 presents the low-range remaining estimated cleanup costs for the Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042) by FY; Figure 4-8 shows the low-range remaining estimated cleanup costs by work element.



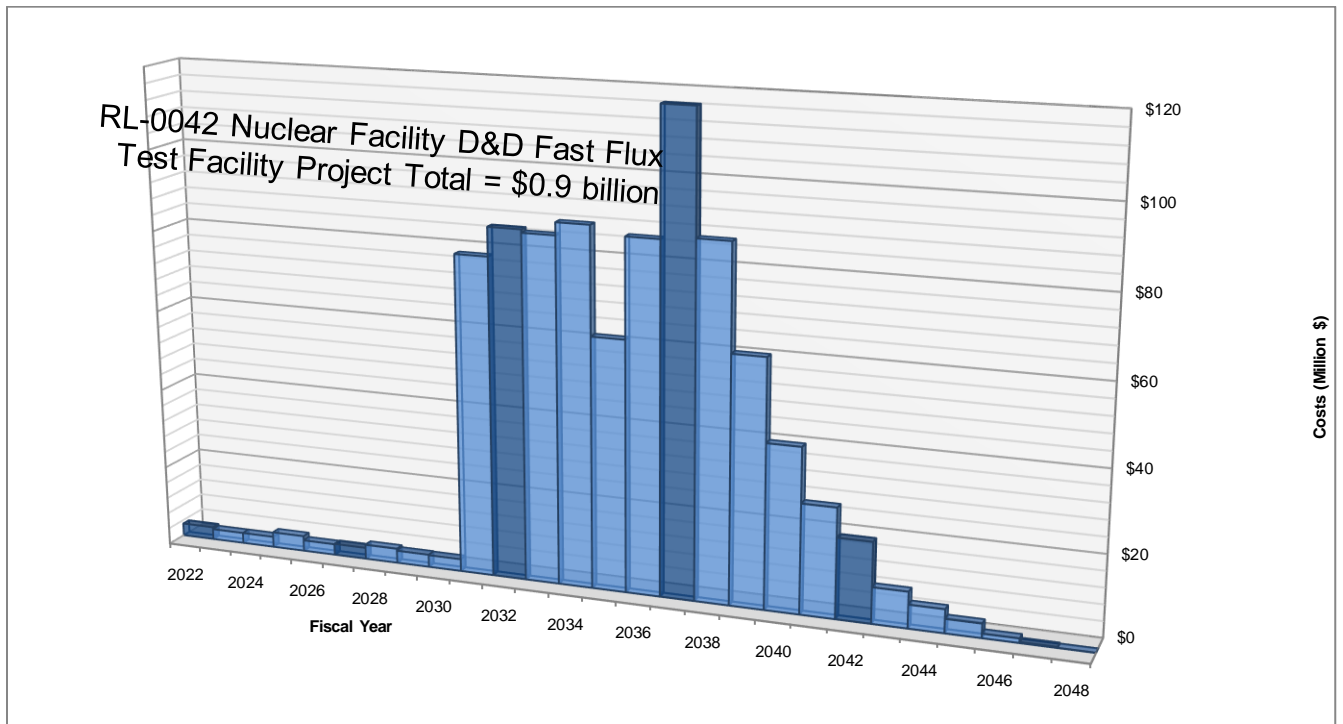


Figure 4-7. Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042)  
Low-Range Remaining Estimated Costs by Fiscal Year.

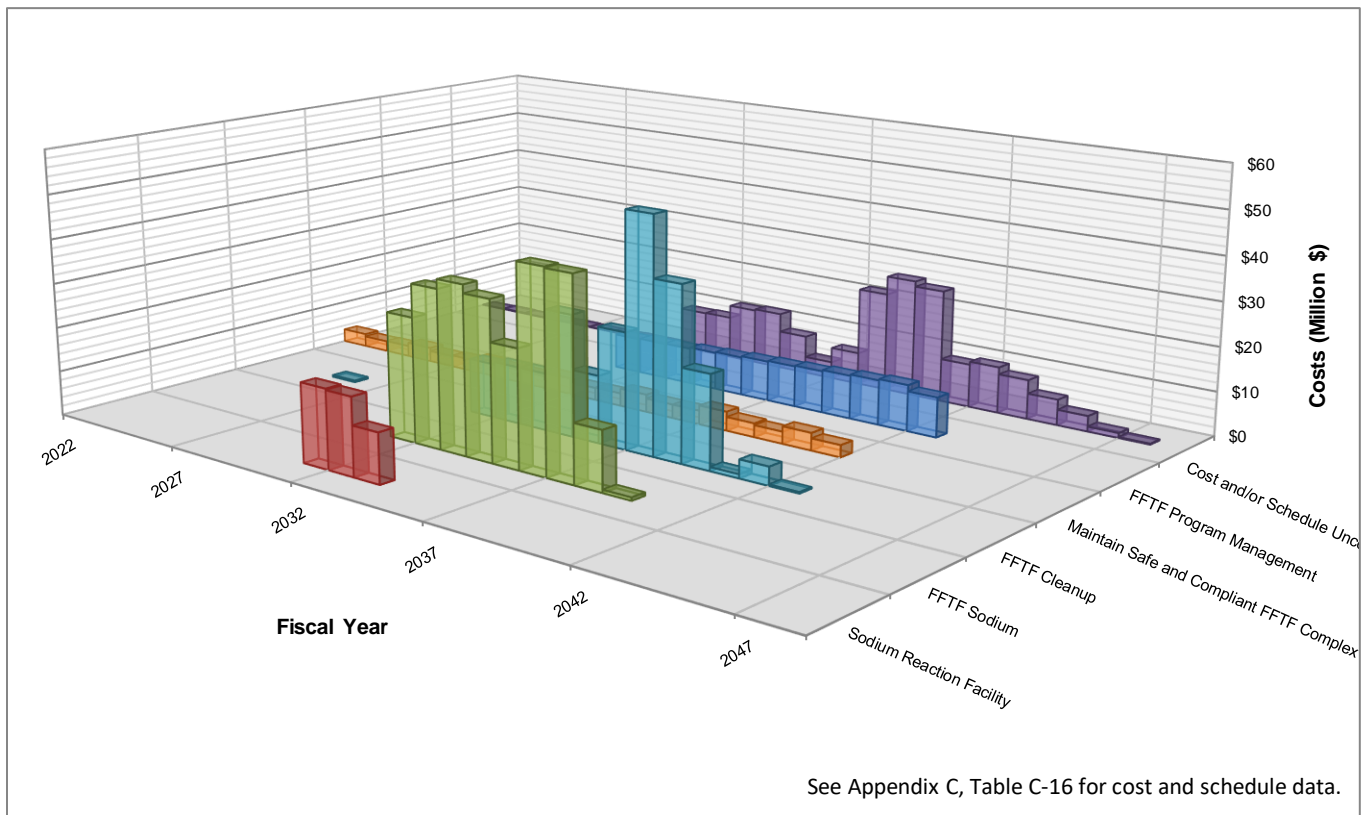


Figure 4-8. Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042)  
Low-Range Remaining Estimated Costs by Work Element.

## 4.5 CENTRAL PLATEAU CLEANUP ASSUMPTIONS AND UNCERTAINTIES

In planning for the Hanford Site lifecycle, uncertainties are considered regarding estimated 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.

For the Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) low-range estimate, the following assumptions were identified:

- 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 RCRA transuranic mixed (TRUM) waste as required by TPA M-091-01
- WIPP will remain operational through the end of Hanford cleanup operations that have the potential to generate TRU waste. Current planning has processing and shipping of TRU waste to WIPP until FY 2050.
- The national geologic repository will be available to accept spent nuclear fuel shipments from Hanford beginning in approximately 2048.

For the Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) high-range estimate, the following assumptions include, but are not limited, to:

- Receipt of non-compliant waste from other projects.
- Spent fuel found in alpha caissons.
- Delays in receiving regulatory approvals (CH retrieval, alpha caisson retrieval and processing).

Discrete risks have been identified and assessed for the aforementioned uncertainties, as well as others, and are representative of the operational challenges associated with this work area. The uncertain timing of waste generation forecasts and waste volume increases risk and uncertainty over the assumed operational life of the various facilities. This may lead to increased durations for ready-to-serve operations awaiting waste inputs, as well as extended durations of base operations. For example, construction of the Integrated Disposal Facility (IDF) is complete, maintaining minimum safe conditions pending waste receipt of immobilized low-activity waste (ILAW). Operations of the Central Waste Complex and the Interim Storage Area are also subject to similar uncertainties.

For Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) low-range estimate, the following assumptions were identified:

- Planned characterization of the vadose zone below the HLW 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.

There is also a high degree of uncertainty with Soil and Water Remediation–Groundwater/Vadose Zone work that includes the following assumptions for the high-range estimate:

- RCRA/CERCLA issues delay records of decision.
- Significant contamination is interpreted or discovered that requires further investigation and/or remediation.
- Pump and treat operations require extended duration.

For Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) low-range estimate, the following assumptions were identified:

- An industrial worker scenario will be used to define the exposure scenarios and the threshold cleanup levels for waste sites located in the Inner Area. Cleanup levels for waste sites in the Outer Area will support the reasonably anticipated future land use of conservation/mining.
- The Central Plateau area will remain under Federal control for the foreseeable future.
- All low-level legacy waste will be managed and treated on Hanford via remove, treat, and dispose of (RTD) to an EPA approved onsite disposal facilities.
- Planning assumes that geographic aggregate barriers will be utilized. The aggregate barriers are assumed to cover canyons or other large facilities and adjacent waste sites or to cover multiple adjacent waste sites.
- Removal excavations are assumed to be 15 feet below grade for planning and estimating purposes. Decision documents will identify the actual removal excavation criteria (soil cleanup level or excavation depth) for waste sites.

There also remains significant uncertainty associated with Nuclear Facility D&D – Remainder of Hanford work that includes, but is not limited to, the following assumptions for the high-range estimate:

- Records of decisions for implementation areas are not consistent with planned assumptions.
- New waste sites are discovered in implementation areas after records of decisions are issued.
- Radioactive material is considered to be contaminated waste that must be removed (rather than hold-up material).
- The nature and extent of contamination is substantially greater than the baseline assumptions for implementation areas.

For Nuclear Facility D&D–Fast Flux Test Facility Project (PBS RL-0042) low-range estimate, the following assumption was identified:

- FFTF funding to accomplish the scope can be carried over from year to year.

The remaining uncertainty associated with Nuclear Facility D&D – Fast Flux Test Facility includes the following assumptions for the high-range estimate:

- Major equipment failure or structural deterioration while in the S&M mode.
- No path to disposition highly radioactive components.
- WTP will not use FFTF bulk sodium.
- ETF may not be available to disposition liquid waste.
- ERDF and/or IDF is not available for demolition waste.
- System piping requires modification to treat residual sodium.
- Technical validation for entombment/residual sodium not defined.

The uncertainties associated with the Central Plateau Cleanup work scope have been assessed and accounted for in the high-range estimates for each of the respective PBSs.

## 5.0 TANK WASTE CLEANUP

The RPP tank waste cleanup is managed by 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* and the *John S. McCain National Defense Authorization Act for Fiscal Year 2019*. This chapter describes the RPP mission, scope, schedule and cost as presented in the baseline case of ORP-11242, Rev. 9. The baseline case reflects how the RPP mission will proceed to meet the Amended Consent Decree (DOE and Ecology 2016) and Third Amended Consent Decree (DOE and Ecology 2018), the Order Modifying Amended Consent Decree (DOE and Ecology 2020), support near-term operational needs, and reduce RPP technical and programmatic risks and challenges given current conditions, constraints, and assumptions.

The RPP mission is to safeguard the nuclear waste stored in 177 underground tanks and to manage the waste safely and responsibly until it can be treated in the Hanford waste treatment processes before final disposition. ORP is responsible for the storage, retrieval, treatment, and disposal of approximately 56 million gallons of radioactive waste contained in the Hanford Site waste tanks and closure of all the tanks and associated equipment. The RPP mission involves two parallel efforts, both aimed at reducing the threat posed to the Columbia River by the Hanford tank waste:

- Retrieve waste from 149 SSTs to DSTs where it can be safely stored awaiting treatment.
- Treat the tank waste, producing a stable waste form that can be permanently disposed.

These efforts must be performed in parallel because the DST system does not have the capacity to hold all of the waste currently in the SSTs at one time.

The RPP comprises the tank farms and WTP systems – nearly 200 interrelated waste storage, transfer, treatment, transportation, and disposal facilities. These systems are in varying stages of design, construction, operation, or future planning, and are briefly described in the following paragraphs.

The underground waste storage tanks were built in groups of 2 to 18 tanks, with each group identified as a tank farm. Seven tank farms (comprising 86 tanks) are located in the 200 West Area and 11 tank farms (comprising 91 tanks) are located in the 200 East Area. The tanks were constructed in below-grade excavations to take advantage of the earth's natural radiation shielding. The 177 underground storage tanks are of two basic design types: 149 SSTs and 28 DSTs. The smallest SSTs have about 55,000 gallons of capacity, while the largest DSTs hold up to about 1,250,000 gallons. One DST is out of service because of a confirmed leak from its primary shell to its annulus.

When Hanford was in production mode, irradiated fuel from the reactors was transported to six separations facilities for 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 operations, the underground waste tanks and their contents remain. The radioactive and chemical liquid waste was transferred from the separations facilities as slurry (liquid with suspended solids). Over time, the solids settled to the bottom of the tanks, creating a layer known as sludge, and leaving a clarified liquid known as supernate above the sludge.

To reduce the total quantity of waste to be stored, the supernate is periodically decanted and transferred out of waste tanks to a waste evaporation process. The evaporation process separates the heated waste slurry into a steam condensate fraction, which is relatively clean, for further treatment at the Effluent Treatment Facility (ETF) and safe onsite disposal, and a waste slurry fraction, which becomes more concentrated and is returned to the DSTs for eventual treatment in the WTP complex followed by disposal.

More information regarding the RPP system and its current state can be found in ORP-11242, sections 3.0.

The baseline case in System Plan 9 strategy for completing the RPP mission involves a number of interrelated activities and facilities. The ORP's objective is to reduce risk to the environment posed by tank wastes by:

- Retrieving the waste from SSTs, transferring it to DSTs, and delivering the waste to the WTP
- Constructing and operating the WTP, which includes the Pretreatment (PT) Facility, LAW Facility, HLW Facility, Analytical Laboratory, and the Balance of Facilities
- Initiating DFLAW operations as part of a phased startup, which includes Tank Side Cesium Removal (TSCR) and/or tank farm pretreatment capability (TFPT) and WTP Effluent Management Facility (EMF)
- Developing and deploying supplemental treatment capability to safely treat the remainder of the low-activity waste not immobilized by the LAW Facility
- Developing and deploying supplemental capability for separating solids, particle size reduction, if required, and removal of soluble cesium as needed (i.e., Tank Waste Characterization and Staging [TWCS] Facility)
- Developing and deploying treatment and packaging capability for potential transuranic tank waste, followed by interim storage at the Central Waste Complex (CWC) pending determination of the final disposal pathway
- Deploying interim storage capacity for the immobilized HLW pending determination of the final disposal pathway
- Disposing of packaged immobilized LAW onsite at the IDF
- Closing the SST and DST farms, ancillary facilities, and associated waste management and treatment facilities
- Sequencing the RPP mission around resolution of technical and programmatic uncertainties
- Upgrading the tank farms to provide a steady, well-balanced feed to the WTP
- Investigating trade-offs of the required amount and type of supplemental treatment and pretreatment and the amount of immobilized HLW and immobilized LAW.

Figure 5-1 illustrates the simplified process for retrieving the waste from the tanks, treatment to reduce hazards, and disposition based on the System Plan 9 baseline case. During the initial phase of DFLAW, liquid tank waste staged in DSTs is delivered to a temporary TSCR system to filter suspended solids and remove the radioactive cesium, producing a LAW feed stream staged in a separate DST for transfer to the LAW Facility where it will be immobilized for disposal at IDF. The TSCR system is expected to operate for five years, and experience obtained from TSCR operations will inform the final design and configuration of the subsequent pretreatment approach (e.g., permanent TFPT, multiple TSCRs, etc.). Potential contact-handled transuranic (CH-TRU) tank waste from the 200 West and 200 East SSTs will be retrieved and treated on Site at a proposed CH-TRU packaging facility and then interim stored at the CWC pending determination of the final disposal pathway. All other waste in the SSTs will be retrieved into the DST system, and waste in the 200 West DSTs will be transferred to the 200 East DSTs.

After 10 years of DFLAW operations, the PT Facility and HLW Facility are scheduled to begin operations. Slurries from the DST system will be staged and sampled in the TWCS Facility tanks and then fed to the PT Facility. Supernate will be fed from the DSTs to the PT Facility instead of the TSCR and/or TFPT. The waste slurries and supernate will be combined, and the solids will then be filtered, washed, and leached, as required, to ensure an acceptable feed to the HLW Facility. Cesium will be removed from the remaining liquid, and the cesium-depleted LAW will be concentrated. The cesium product will be combined with the treated solids. The pretreated slurry from the PT Facility, containing the solids and cesium, will be sent to the HLW Facility, and the pretreated supernate will be sent to either the LAW Facility or a LAW supplemental treatment facility. When the supplemental treatment facility starts operations, the TFPT will be restarted and will provide an additional source of feed to the facility.

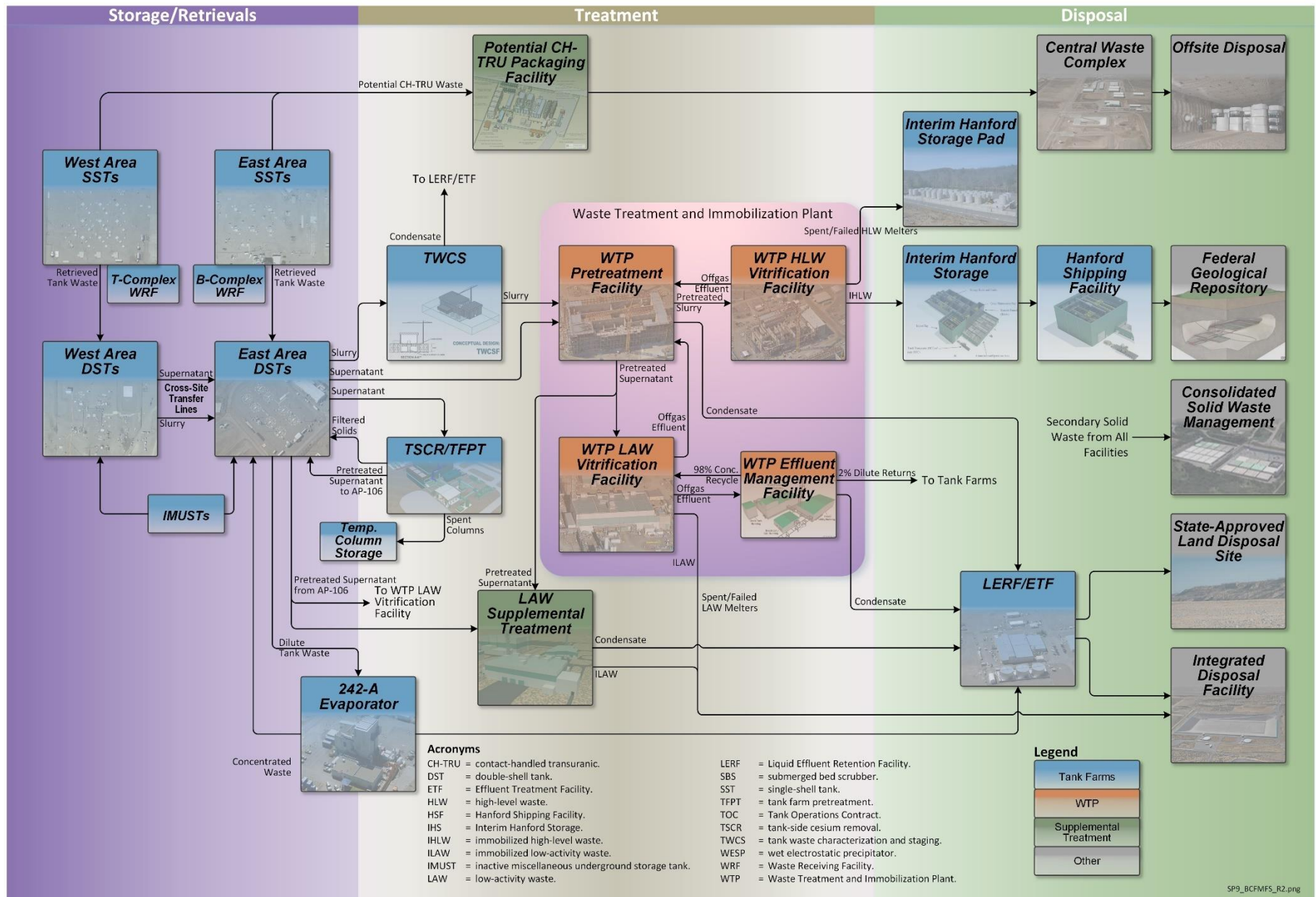


Figure 5-1. Simplified Process Diagram for Tank Waste Retrieval, Treatment and Disposal Based on SP9 Baseline Case.

The Liquid Effluent Retention Facility (LERF) will receive process condensate and other dilute liquid waste streams from the 242-A Evaporator, PT Facility, and WTP EMF. Dilute waste sent to the LERF will be treated by the ETF and then disposed of, either as liquids at the State-Approved Land Disposal Site (SALDS) or as a solidified waste form onsite. Immobilized waste and secondary solid waste from the LAW Facility and LAW supplemental treatment facility are planned to be disposed of at the IDF. Immobilized waste from the HLW Facility will be transported to the Interim Hanford Storage/Hanford Shipping Facility (IHS/HSF), and then to a permanent offsite geologic repository, when available. The LAW Facility is planned to operate for 43 years, and the PT Facility and HLW Facility for 33 years.

DFLAW, in various forms (e.g., TSCR and TFPT), which is the first step in the phased startup of the WTP, is planned to operate from hot commissioning until 2033, at which time the PT and HLW Facilities are scheduled to initiate hot commissioning. The overall schedule objective is to complete retrieval, treatment, and closure activities by the end of FY 2074.

In part, because several complex technical issues arose during design and construction activities that adversely affected ORP's ability to meet negotiated milestones in the 2010 Consent Decree, these milestone dates were extended in an Amended Consent Decree issued March 11, 2016. The Court extended the start of initial operations milestone date for the WTP to December 31, 2036, thus necessitating changes to the TPA end dates for completing all remaining SST retrievals and completing all tank waste treatment commitments. These previous milestone dates were predicated on the WTP start of initial operations by December 31, 2022, as negotiated in the 2010 Consent Decree. These and related TPA milestones were the subject of formal negotiations between the Tri-Party agencies 2018. The outcome of those negotiations and any resulting TPA milestone changes have been incorporated in this LCR and as negotiations continue additional changes will be incorporated in future LCRs. Key TPA and Amended Consent Decree milestones are shown in Table 5-1.

Table 5-1. Tank Waste Cleanup Key Tri-Party Agreement and Consent Decree Milestones

Milestone	Description	Compliance Date
M-045-92Z	Submit to Ecology Design for Barrier 4 in 241-U Farm and Monitoring Plan	10/31/2021
M-045-85	Complete negotiations of HFFACO <sup>1</sup> 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
M-062-53A	Achieve Substantial Completion of EMF Construction	4/30/2022
M-045-98	Submit RFI/CMS Work Plan for Waste Management Area A/AX	9/20/2022
M-045-92Y	Complete Construction for Barrier 3 in 241-TX Farm	10/31/2022
M-062-54B	Achieve Substantial Completion of LAW Pretreatment Capability Construction for Initial DFLAW Operations	12/30/2022
M-062-51	Achieve Substantial Completion of LERF/ETF Construction Upgrades Necessary for LAW Hot Commissioning	4/15/2023
M-062-54	Low Activity Waste Pretreatment Capability: Cold Commissioning Complete	4/30/2022
M-062-52	Achieve Substantial Completion of Secondary Waste Construction Necessary for LAW Hot Commissioning	6/30/2023
M-062-53	EMF Cold Commissioning Start	8/15/2023
M-062-55	LAW Pretreatment Capability Necessary to Feed DFLAW; Hot Commissioning Complete	8/15/2023
M-045-91K	Complete Initial Baseline Visual Inspections of All SSTs	9/20/2023
M-045-92AB	Complete Construction for Barrier 4 in 241-U Farm	10/31/2023

Table 5-1. Tank Waste Cleanup Key Tri-Party Agreement and Consent Decree Milestones

<b>Milestone</b>	<b>Description</b>	<b>Compliance Date</b>
M-062-40J	Submit System Plan to Ecology	10/31/2023
M-062-56	Submit Permit Application for Design and Construction of LAW Pretreatment Capability	12/31/2023
M-090-13	Submit to Ecology, a Conceptual Design Report package (Critical Decision-1) for the Interim Hanford Storage Project (storage of the first two years of Hanford Site Immobilized High Level Waste from WTP Operations) and a TPA Change Request to submit a Preliminary Design Report package (Critical Decision-2)	9/30/2025
M-062-60	Submit Disposition Pathways Evaluation for Spent IX Columns	6/30/2026
M-045-103	Submit Tier 2 RCRA Closure Plan for WMA A/AX and Schedule for Tier 3 Schedule	9/30/2026
M-045-104	Submit Post-Closure Plan for WMA A/AX	9/30/2028
M-062-61	Submit Updated TSCR Closure Plan as a Permit Modification to Ecology	4/30/2029
M-42-00A	Complete the Closure of all DST Farms	9/30/2052
D-00A-09 <sup>2</sup>	LAW Facility Hot Commissioning Complete	TBD
D-16B-03 <sup>2</sup>	Of the 12 SSTs referred to in B-1 and B-2, complete retrieval of tank wastes in at least 5.	TBD <sup>3</sup>
D-16B-02 <sup>2</sup>	Complete retrieval of tank wastes from the following SSTs in Tank Farms A and AX: A-101, A-102, A-104, A-105, A-106, AX-101, AX-102, AX-103, and AX-104. Subject to the requirements of Section IV-B-3, DOE may substitute any of the identified 9 SSTs and advise Ecology accordingly.	TBD <sup>3</sup>
M-045-83	Complete the Closure of WMA C by Completing Closure Activities Specified in the Tier 2 Closure Plan	TBD
M-045-62	Submit the Draft Tier 3 Closure Plan with Corrective Measures in Phase 2 Corrective Measure Implementation Work Plan for WMA C	TBD
<b><i>Milestones At Risk</i></b>		
M-045-15	Completion of Tank A-103 SST Waste Retrieval	9/30/2022
D-00A-02 <sup>2</sup>	HLW Facility Construction Substantially Complete	12/31/2030
D-00A-14 <sup>2</sup>	Pretreatment Facility Construction Substantially Complete	12/31/2031
D-00A-17 <sup>2</sup>	Hot Start of WTP	12/31/2033
D-00A-01 <sup>2</sup>	Achieve Initial Plant Operations for the WTP	12/31/2036
M-045-70	Complete waste retrieval from all remaining SSTs. Retrieval standards and completion definitions are provided in 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 HLW & LAW Tank Wastes	12/31/2047



Table 5-1. Tank Waste Cleanup Key Tri-Party Agreement and Consent Decree Milestones

Milestone	Description	Compliance Date
M-047-00	Completion of Work for Management of Secondary Waste from the WTP	TBD <sup>4</sup>
<p><sup>1</sup><u>Ecology, EPA and DOE, 1989, Hanford Federal Facility Agreement and Consent Order</u>, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, as amended.</p> <p><sup>2</sup>Milestones from Amended Consent Decree (DOE and Ecology, 2016).</p> <p><sup>3</sup>Milestone due dates TBD following issuance of Order Modifying the Amended Consent Decree (<u>DOE and Ecology, 2020</u>).</p> <p><sup>4</sup>Milestone is in Dispute Resolution.</p>		
DOE	= U.S. Department of Energy.	RCRA = <i>Resource Conservation and Recovery Act</i> .
DST	= double-shell tank.	SST = single-shell tank.
Ecology	= Washington State Department of Ecology.	WMA = waste management area.
HFFACO	= <i>Hanford Federal Facility Agreement and Consent Order</i> .	WTP = Waste Treatment and Immobilization Plant.

The RPP scope is conducted under PBS ORP-0014, Radioactive Liquid Tank Waste Stabilization and Disposition, PBS ORP-0060, Major Construction – Waste Treatment Plant, and PBS ORP-0070, Waste Treatment Plant Operations. Scope, schedule, and cost information for the baseline case scenario for these work activities are summarized in sections 5.1, 5.2, and 5.3, respectively. 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 (see section 4.4).

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

This project includes activities required to manage and stabilize approximately 56,000,000 gallons of radioactive and chemical waste stored underground in 177 tanks, including retrieval, treatment, and disposal.

The PBS ORP-0014 scope includes planning, design, construction, and operation of new facilities and equipment necessary for waste feed delivery from tank farms to the WTP to meet the Low-Activity Waste Facility startup milestone from the 2016 Amended Consent Decree as adjusted in the 2020 Order Modifying Amended Consent Decree. It also includes required operations, maintenance, and upgrades and retrievals of the tank farms, the 242-A Evaporator, the Effluent Treatment Facility, and the 222-S Laboratory to manage the waste and support safe nuclear and environmentally compliant operations at Hanford and enable WTP operations. The first phase of the Low-Activity Waste Pretreatment System project will consist of a tank-side cesium removal system to remove solids and cesium to produce the low-activity waste feed stream for the Low-Activity Waste Facility.

Additional scope information for these work elements is provided in Table 5-2.

Table 5-2. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014)  
Level 2 Scope Summary

Work Element	Scope Description
Base Operations	Provides for safe storage of waste, reduces the volume of waste through evaporation, provides laboratory support, and includes necessary support activities.
Retrieve and Close SSTs	Includes retrieval of waste from the SSTs, new waste receiving facilities 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.

Work Element	Scope Description
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	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. This work element also includes treatment of secondary wastes generated during handling and processing of tank wastes.
Supplemental Treatment	Includes planning and analysis for supplemental low-activity waste treatment and contact-handled TRU handling, up to and including design and construction. This work element also includes operations of supplemental low-activity waste treatment facility.
Treat Waste	Includes preparation for hot commissioning, operation of WTP, closure planning, and final closure activities.
Facility Closures	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).
ORP Project Support	Includes other support services such as Bonneville Power Administration, Laundry, Occupational Medicine, Site-Wide Services, and holdbacks
DST = double-shell tank.	SST = single-shell tank.
ORP = DOE, Office of River Protection.	TRU = transuranic.
PBS = project baseline summary.	WTP = Waste Treatment and Immobilization Plant.

ORP-0014 Total = \$199.6 billion

Fiscal Year	Costs (Billion \$)
2022	1.5
2023	1.8
2024	2.2
2025	2.5
2026	2.8
2027	3.2
2028	3.5
2029	3.8
2030	4.2
2031	4.5
2032	4.8
2033	4.5
2034	4.2
2035	4.0
2036	3.8
2037	3.5
2038	3.8
2039	4.0
2040	4.2
2041	4.5
2042	4.8
2043	5.0
2044	5.2
2045	5.5
2046	5.8
2047	6.0
2048	6.2
2049	6.0
2050	5.8
2051	5.5
2052	5.8
2053	6.0
2054	6.2
2055	6.5
2056	6.8
2057	7.0
2058	6.8
2059	6.5
2060	6.2
2061	5.8
2062	5.5
2063	5.2
2064	5.0
2065	4.5
2066	3.8
2067	3.2
2068	2.5
2069	1.5
2070	0.8
2071	0.5
2072	0.5
2073	0.2

2022 Hanford Lifecycle Scope, Schedule and Cost Report  
5-7

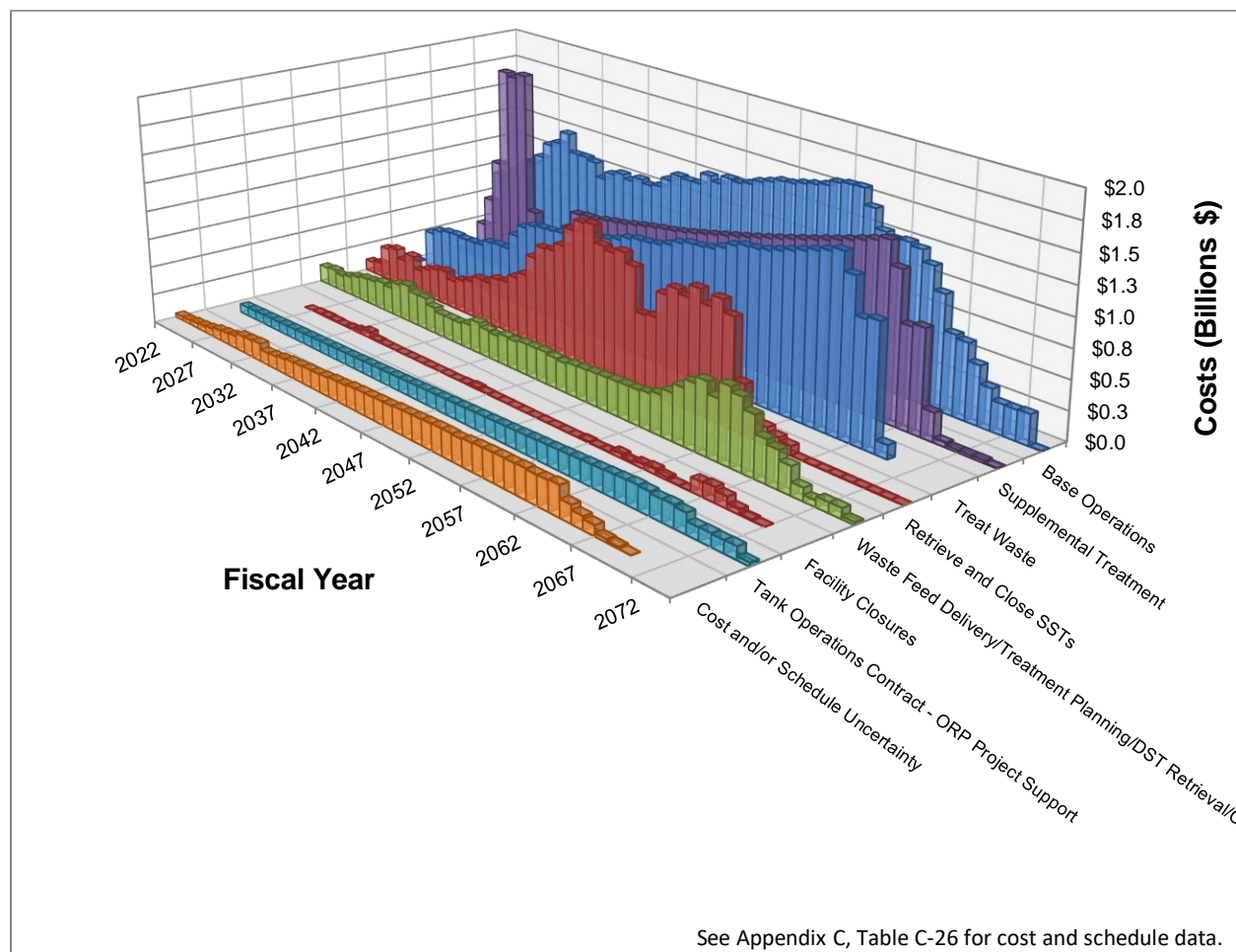


Figure 5-3. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS ORP-0014)  
Low-Range Remaining Estimated Cleanup Costs by Work Element.

## 5.2 MAJOR CONSTRUCTION – WASTE TREATMENT AND IMMOBILIZATION PLANT (PBS ORP-0060)

The scope of Major Construction – Waste Treatment and Immobilization Plant (PBS ORP-0060) is critical to the completion of the Hanford tank waste program; it will provide the primary treatment capability to immobilize the radioactive and chemical tank waste at the Hanford Site. The Waste Treatment and Immobilization Plant (WTP) includes construction of five major facility complexes:

- Pretreatment (PT)
- Low-Activity Waste (LAW)
- High-Level Waste (HLW)
- Balance of Facilities (BOF)
- Analytical Laboratory (Lab).

The WTP is being designed to operate under two scenarios. In the baseline configuration, DST waste will be processed first through the WTP PT Facility then sent on for vitrification at the LAW or HLW Facilities. Alternatively, under the DFLAW operating scenario, waste will be pretreated at a TSCR and/or TFPT, then sent to the LAW Facility for immobilization.

The WTP will commence initial operations by processing waste under a direct feed option (i.e., DFLAW). In this configuration, the LAW Facility, BOF and Lab (e.g., LBL/DFLAW) will be

commissioned to operate while the PT Facility and HLW Facility construction is completed. The DFLAW operations will support processing of some Hanford low-activity tank waste into glass by 2023.

Upon the completion of construction and successful commissioning of the PT and HLW Facilities, the WTP will switch to the baseline configuration. The portion of DST waste not subject to direct feed processing (i.e., not pretreated or conditioned before transfer to WTP) will be treated in the baseline configuration with PT, LAW, and HLW Facilities. These configurations are independent of one another and will not occur in parallel. However, the TFPT portion of DFLAW is planned to restart to provide additional feed in support of Supplemental LAW operations. Additional scope information on these work elements is provided in Table 5-3.

Table 5-3. Major Construction–Waste Treatment and Immobilization Plant (PBS ORP-0060)  
Level 2 Scope Summary

Work Element	Scope Description
LBL/DFLAW	<p>Includes design, construction, and commissioning of the LAW Facility, as well as modifications to support DFLAW. When finished, the LAW will go into a melter preparation vessel where silica and other glass-forming materials 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 containers that are then welded shut.</p> <p>Includes design, construction, and commissioning of the balance of facilities. When finished, the dedicated facilities and utilities will support the WTP.</p> <p>Includes design, construction, and commissioning of the Analytical Laboratory. When finished, samples will be analyzed to ensure the glass product meets requirements.</p> <p>Includes design, construction, and commissioning of the Effluent Management Facility to support handling of liquid effluents from DFLAW operations. The effluents will be transferred via pipeline to LERF/ETF for treatment.</p>
High-Level Waste (HLW) and Pretreatment (PT)	<p>Includes design, construction, and commissioning of the HLW Facility. Similar to the LAW Facility, when finished the HLW will be mixed with glass-forming materials, heated to molten, and poured into stainless steel canisters.</p> <p>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.</p>
<p>DFLAW = Direct Feed Low-Activity Waste.      PBS = project baseline summary.            LBL = Low-Activity Waste Facility, Balance of Facilities      WTP = Waste Treatment and Immobilization Plant.            and WTP Analytical Laboratory.</p>	

Figure 5-4 presents the low-range remaining estimated costs for Major Construction – Waste Treatment and Immobilization Plant (PBS ORP-0060) by FY; Figure 5-5 presents the low-range remaining estimated costs by work element.

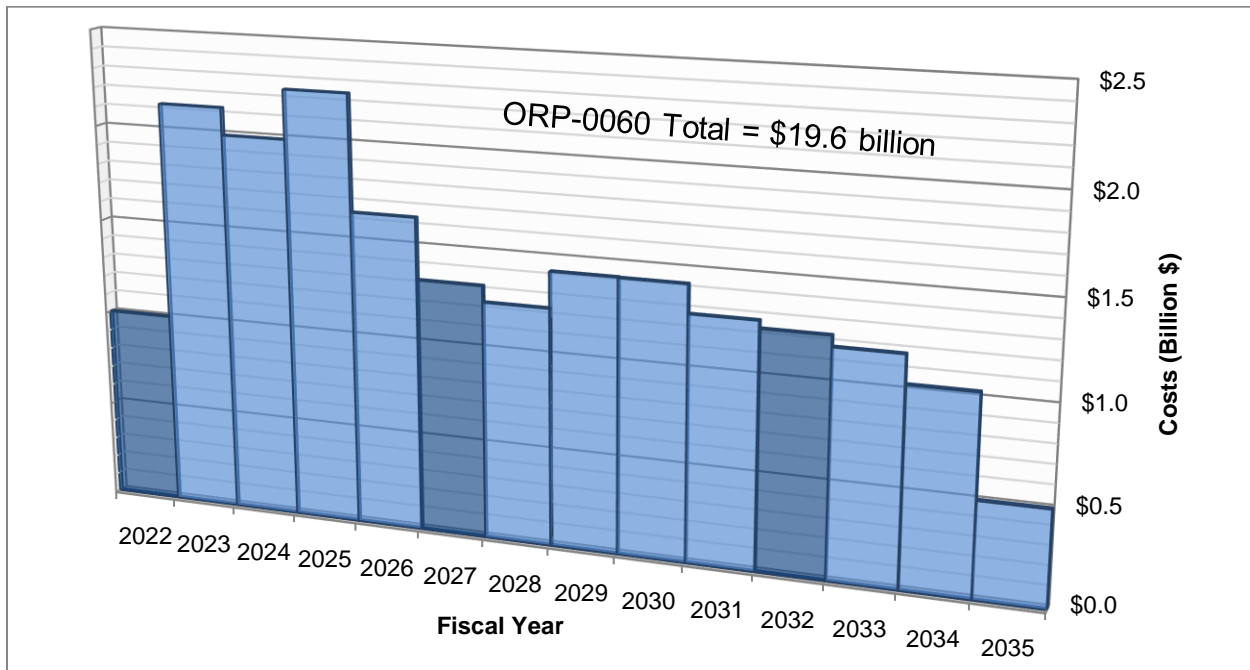


Figure 5-4. Major Construction – Waste Treatment and Immobilization Plant (PBS ORP-0060)  
Low-Range Remaining Estimated Costs by Fiscal Year.

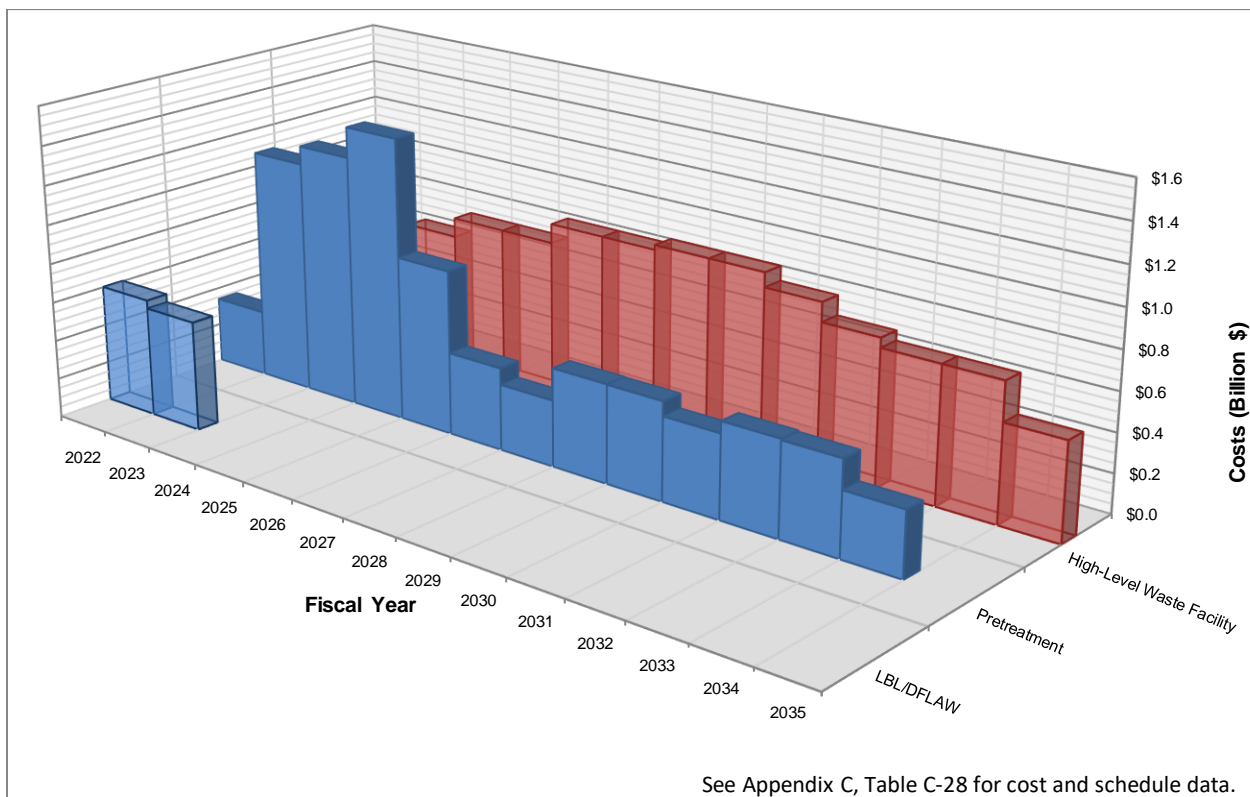


Figure 5-5. Major Construction – Waste Treatment and Immobilization Plant (PBS ORP-0060)  
Low-Range Remaining Estimated Costs by Work Element.

### 5.3 WASTE TREATMENT PLANT OPERATIONS (PBS ORP-0070)

Waste Treatment Plant Operations (PBS ORP-0070) will support the treatment of tank wastes in the WTP including the implementation of the strategy of the DFLAW approach. This includes the operational scope for the Low-Activity Waste Facility, the Analytical Laboratory, and the Balance of Facilities starting with hot commissioning but after project completion (Critical Decision 4) for those facilities. The WTP operational costs for this project are currently included within PBS ORP-0014 and will be shown in ORP-0070 in future reports. The FY 2022 budget for this project is \$50 million.

### 5.4 TANK WASTE CLEANUP ASSUMPTIONS AND UNCERTAINTIES

The scope of the baseline case (low-range estimate) is underpinned by a hierarchy of assumptions, which are detailed in [ORP-11242](#), Appendix A. These assumptions include the following:

- Treatment facility start dates and processing rates align with the Amended Consent Decree ([DOE and Ecology 2016](#)).
- DFLAW operates before the PT Facility and HLW Facility startup.
- Timely approval is assumed to be received to support full closure of each SST tank farm after all tanks in that farm are closed.
- The DSTs will remain fully operational for the duration of the waste treatment mission, except for DST AY-102, which will remain out of service.
- The retrieval of the SSTs will be sequenced using a staggered, overlapping farm-by-farm approach with the goal to minimize the waste treatment mission duration.
- The 242-A Evaporator will be available, as needed, to support the SST retrievals by creating DST space.
- The TFPT will be the only long-term source of LAW feed to the LAW Facility until the PT Facility begins operation (DFLAW will be achieved during the first five years using the temporary TSCR system, which will subsequently be replaced by TFPT for long-term operations); then it will serve as an auxiliary source of LAW feed for the LAW supplemental treatment facility for the remainder of the mission.
- The TWCS capability consists of six 500,000-gallon tanks used to stage HLW feed for delivery to the PT Facility.
- The WTP is assumed to be operable for as long as required. Upgrades are assumed to be performed as necessary to maintain operability, potentially beyond the 40-year design life.
- One HLW melter and one LAW meter are assumed to be replaced every 2.5 years on average. The LAW spent melters<sup>9</sup> will be managed and disposed of at the IDF as mixed low-level waste (MLLW).
- The WTP EMF will operate only during DFLAW. When the PT Facility begins operations, the WTP EMF will be shut down.
- LAW supplemental treatment capacity is assumed to be provided by a LAW supplemental treatment facility, located adjacent to the WTP, although no particular treatment technology is assumed.

<sup>9</sup>No final disposal location has been selected for the spent and failed HLW melters. The alternatives discussed in the TC & WM EIS assume that these spent HLW melters will be packaged in an overpack and stored at IHS until the melters can be removed for disposition and final disposal. For planning purposes, the final disposition of HLW melters is assumed to be at the IDF. Plans will be updated, as needed, after a ROD that addresses HLW melter disposal is published. Appendix E of the TC & WM EIS provides additional information ([DOE/EIS-0391](#)).

- The supplemental waste treatment and packaging system for tanks containing non-high-level radioactive waste consistent with TRU waste will first be located near B tank farm then moved to T tank farm. The drummed waste will be stored onsite at the CWC until final disposition of the waste has been determined.
- The capacities and capability of the ETF, LERF, SALDS, and 200 Area Treated Effluent Disposal Facility (TEDF) will be driven by the needs of the waste treatment mission and are assumed to be available when needed.
- The IHS Facility will receive and temporarily store canisters of immobilized HLW, pending the availability of a final disposal alternative. It will provide interim storage for a minimum of 4,000 IHLW canisters and will be expandable in increments of 2,000 canisters up to a maximum of 16,000 canisters, if needed, to mitigate the risk associated with the availability of offsite geologic repository.
- Before the third IHS module is needed, a decision is assumed to be made either to continue to build additional canister storage modules or to construct the HSF, which will provide the capability for shipping HLW canisters to a potential national repository.
- The final disposal alternative for HLW glass canisters will be at an unidentified offsite national repository. The final disposal alternative is assumed to have the same waste acceptance criteria as the Yucca Mountain national repository waste acceptance criteria, so that the HLW canisters will meet the waste acceptance criteria of the final disposal alternative.
- The IDF is assumed to be operational when needed and will provide permanent disposal for the immobilized LAW, other MLLW, and low-level waste, and can be expanded as needed.
- IDF will dispose of waste in accordance with its Waste Acceptance Criteria (WAC) and will not accept HLW or bulk waste for disposal.
- The cesium and strontium capsules are assumed to be dispositioned outside of the WTP and tank farm facilities by DOE-RL.
- Permitting and operational requirements to accept the Hanford non-high-level radioactive waste consistent with TRU waste that is planned to be disposed of at the WIPP will not affect the schedule's critical path.
- The activities described for the RPP are assumed to be consistent with, and encompassed by, the outcome of the NEPA process.

There are substantial uncertainties associated with the high-range estimate for Radioactive Liquid Tank Waste Stabilization and Disposition including, but not limited to, the following:

- Mission Extension Results in Need for Facility Replacements and Major Upgrades – Partial or full replacement of TWCS and the WTP HLW Facility are considered very likely. WTP LAW, HLW, and PT facilities have 40-year design lives. Each facility is planned to operate between 35 and 40 years. Life extension programs can effectively extend their safe operation for an additional 20 years, potentially. However, if the mission extends beyond this timeframe owing to issues such as funding constraints, lower operating efficiency, increased maintenance requirements, and/or lower waste oxide loading, these facilities may have to be completely replaced at significant cost.
- WTP LAW Facility Throughput Rate Does Not Meet Plan – There is a high likelihood that the throughput rate in the WTP LAW Facility will not meet the planned 70% operating efficiency, thereby extending the mission duration.
- WTP PT Facility Throughput Rate Does Not Meet Plan – There is also a high likelihood that the WTP PT process will not operate at the 70% operating efficiency, thereby extending the mission duration.

- WTP PT Facility is Rendered Inoperable due to Major Black Cell System Failures – If the WTP PT Facility cannot sustain operations due to irreparable system failure, then a replacement facility may be needed. The WTP PT Facility includes technically complex systems (e.g., Pulse Jet Mixer [PJM] tanks) in black cells and supporting ancillary systems that cannot be replaced. If solids build up or major component failure occurs, the facility may have to be completely replaced to complete the mission.
- WTP HLW Facility Throughput Rate Does Not Meet Plan – It is considered highly likely that the WTP HLW Facility will not operate at the 70% operating efficiency.
- SST Retrieval Systems Performance Does Not Meet Requirements Due to Unexpected Conditions – It is considered highly likely that the waste retrieval rates needed to meet the baseline case cannot be met owing to resource limitations, equipment downtime, and administrative hold points related to safety basis re-analysis.
- DST Availability to Perform Mission Functions – Additional DSTs could leak, which could have impacts on the retrieval mission.
- 242-A Evaporator Availability – It is highly likely that the 242-A Evaporator Facility will fail and will have to be replaced at some point over the RPP mission.
- Facilities and Equipment Become Obsolete – The RPP mission may last for several decades beyond the design life of RPP mission facilities and equipment.
- WTP PT Facility Radioactive Secondary Solid Waste Not Able to be Treated or Disposed as Planned – It is considered highly likely that the PT Facility will generate remote-handled or TRU waste that currently has no path to disposal. Costs will include the storage, treatment and disposal of such secondary wastes.
- WTP PT Hot Commissioning is Delayed – There is a high likelihood that PT will be delayed. The uncertainty is how long it will be delayed, as well as the actual PT configuration and capabilities required. Direct feed HLW could delay the start of PT even further.

Other risks identified with less potential impacts to the Radioactive Liquid Tank Waste Stabilization and Disposition mission costs and schedule include: TFPT hot commissioning is delayed; 222-S laboratory availability is less than adequate; cross-site transfer system startup is delayed; the waste feed delivery (WFD) system does not meet the WTP PT Facility waste acceptance criteria; availability of Hanford Site infrastructure, utilities and services (inside the waste management areas) is less than adequate; and WTP LAW radioactive solid secondary waste is not able to be treated or disposed as planned.

In addition to an assessment of the potential risk impacts, the high-range estimate also reflects an assessment of inherent cost estimate uncertainty. An allowance for cost estimate uncertainty is included by assigning an expected cost estimate accuracy range, based on accepted industry guidelines, to the various cost elements that comprise the Radioactive Liquid Tank Waste Stabilization and Disposition mission. Those ranges were then used as inputs to a Monte Carlo analysis and the resultant additional allowance is based on an 80% probability that actual costs will be less than the total estimated cost including that allowance.

These risks and their associated cost and schedule impacts, in addition to estimate uncertainty, comprise the high-range estimate.

For the WTP planning case (low-range estimate), the assumptions include the following:

- The Amended Consent Decree milestone dates are theoretically achievable at the cost profile presented in this report, assuming the project can support the aggressive schedule.
- Percent complete for HLW and PT facilities was reduced because of strategic change and project revision.



- The HLW and PT engineering percent complete performance will not gain at a rate higher than the rate sustained by the LAW Facility for the remaining engineering effort.
- Resources are available or easily accessible for deployment to the WTP project.
- The costs for the BOF and Lab modifications to support HLW and PT work are included.

The risks associated with completion and commissioning of the full LBL/DFLAW portions of the WTP are well understood and are actively being mitigated. There are still some remaining technical uncertainties, but these are generally addressed. However, both the HLW and PT facilities still represent significant technical risk. These projects have been in standby since 2012 while the technical issues were being addressed. Although significant modeling, analysis, and testing have been conducted, recognized technical risk still exists with these facilities. The combined effects of funding, technical, and programmatic challenges could significantly delay full completion and startup of the WTP complex. The uncertainty with HLW and PT facilities comprise the high-range cost estimate associated with WTP construction.

## 6.0 MISSION SUPPORT

The mission support function is service oriented and provides key infrastructure, utility, resource, and other Hanford Sitewide 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 support Hanford cleanup through Richland Community and Regulatory Support (PBS RL-0100).

A number of infrastructure-related mission support activities are in place to support cleanup of the Hanford Site. These mission support activities are managed under Hanford Sitewide Services (PBS RL-0201). 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 LTS and is covered by PBS RL-LTS.

### 6.1 SAFEGUARDS AND SECURITY (PBS RL-0020)

The scope of this PBS includes one primary work element: Safeguards and Security. Table 6-1 describes the work scope. Safeguards and Security will be required until cleanup is complete, then protection of human health and the environment transfers to PBS RL-LTS.

Table 6-1. 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 imposition protection, Hanford Site access, and badging; information and cyber security; personnel security; material control and accountability; and security program management.
PBS = project baseline summary. RL = DOE, Richland Operations Office.	

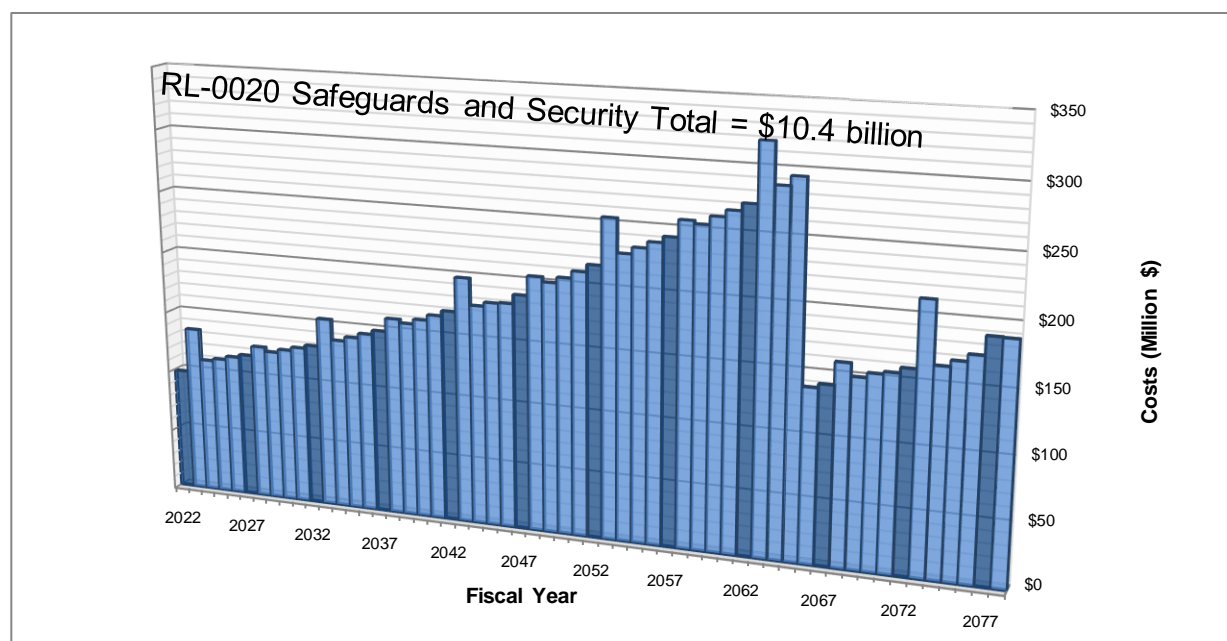


Figure 6-1 presents the low-range remaining estimated costs for Safeguards and Security (PBS RL-0020) by FY.

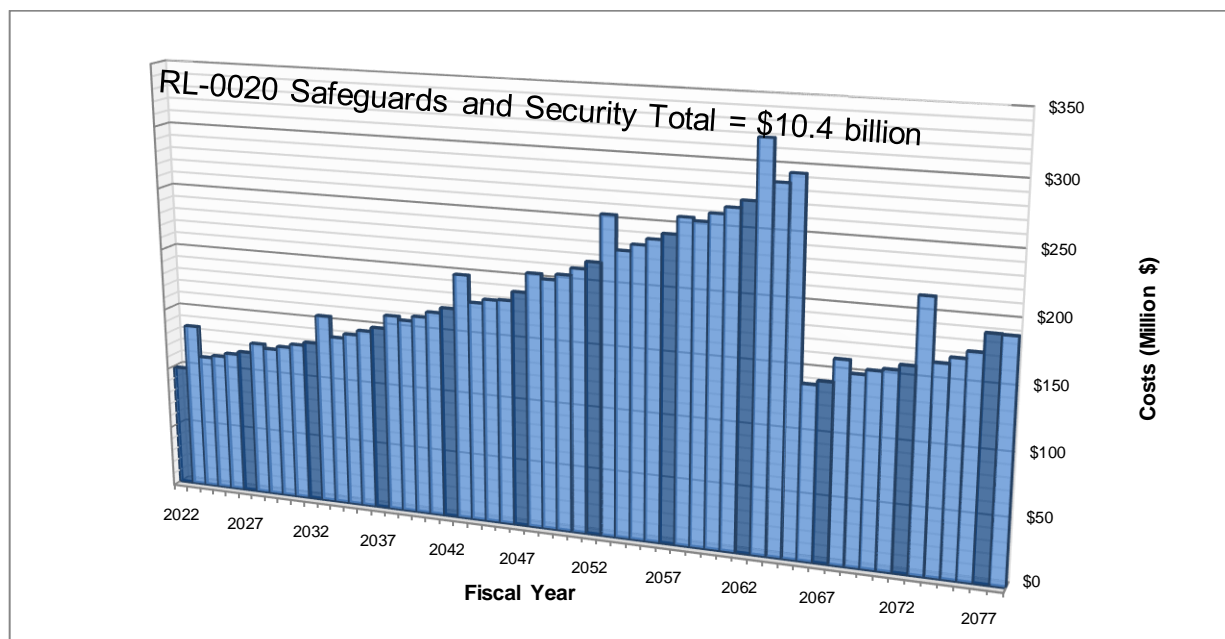


Figure 6-1. Safeguards and Security (PBS RL-0020)  
Low-Range Remaining Estimated Costs by Fiscal Year.

The operational tempo and associated costs represented in the low-range estimate (baseline/planning case) for PBS RL-0020 are to a certain extent dependent upon the success in advancing the cleanup mission. For instance, removal of material at risk may result in a lowering of the site security posture with a corresponding reduction in yearly operational costs. An example of this is illustrated in Figure 6-1, which depicts a step change decrease in annual safeguards and security expenditures beginning in 2066. This reduction is predicated on the enabling assumption that the national repository is available to accept spent nuclear fuel shipments from Hanford.

Another area of uncertainty relates to a potential extension to the tank waste cleanup mission. Under this scenario, the site would be required to sustain the requisite level of safeguards and security beyond that assumed in the baseline planning case. Similar to the availability of the national repository, this uncertainty is also reflected in the high-range estimate.

## 6.2 RICHLAND COMMUNITY AND REGULATORY SUPPORT (PBS RL-0100)

This PBS covers support to community activities and various agencies and boards. The scope of work is summarized in Table 6-2.

Table 6-2. Richland Community and Regulatory Support (PBS RL-0100) Level 2 Scope Summary

Work Element	Scope Description
Richland Community and Regulatory Support	Includes RL support to community activities and various boards, such as the Hanford Advisory Board, the Oregon Department of Energy and other entities through grants and fees. Includes studies for Natural Resource Damage Assessment but does not include significant restoration of natural resources to resolve any liability of the United States for Natural Resource Damage Assessment and Restoration.
PBS = project baseline summary. RL = DOE, Richland Operations Office.	

Figure 6-2 presents the low-range remaining estimated costs for Richland Community and Regulatory Support (PBS RL-0100) by FY.

The scope of work for Richland Community and Regulatory Support does not include any additional measurable costs for estimate uncertainty nor are there any discrete event risks. The Richland Community and Regulatory Support estimates are estimated with a high degree of certainty. The area of greatest uncertainty is the impact of extended WTP operations. The longer WTP operates, the longer support to community activities and various boards will be required. The high-range estimate accounts for the potential of WTP operations being extended.

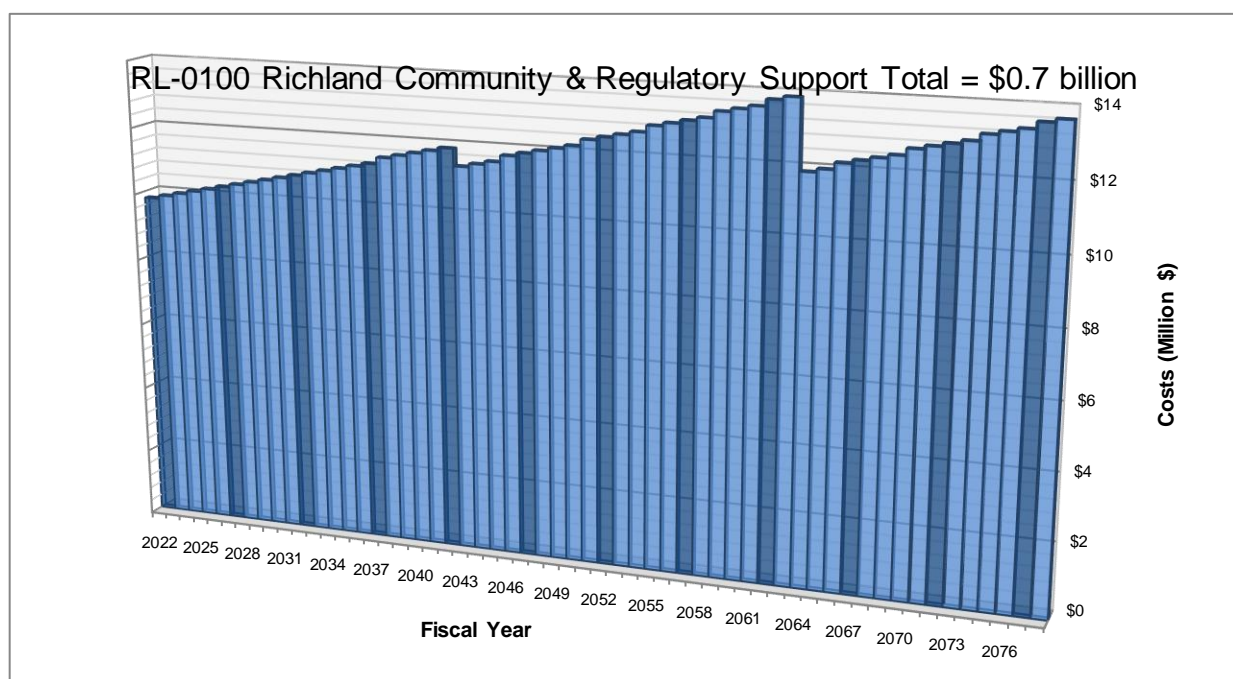


Figure 6-2. Richland Community and Regulatory Support (PBS RL-0100)  
Low-Range Remaining Estimated Costs by Fiscal Year.

### 6.3 HANFORD SITEWIDE SERVICES (PBS RL-0201)

Hanford Sitewide Services plays a key role in completing the cleanup mission. In previous LCRs these costs were allocated to several RL PBSs, but in this report these costs are consolidated and presented as PBS RL-0201, Hanford Sitewide Services.

Hanford Sitewide Services (PBS RL-0201) provides essential services ranging from the basic to highly specialized services that reflect the complexity and scale of the environmental cleanup mission.

This project provides direct operations support to RL, ORP, and their contractors with cost-effective infrastructure and Site services integral and necessary to accomplish the environmental cleanup mission. The scope consists of five primary functions: safety, security, and environment; Site infrastructure and services; Site business management; information resources and content management; and portfolio management.

Under the safety, security, and environment function, Safeguards and Security (PBS RL-0020) is funded as a separate project. Other PBS RL-201 work elements under this function consist of fire and emergency response services, emergency operations, Site safety standards, the Radiological Assistance Program, environmental regulatory management, public safety and resource protection, and radiological site services.

The work elements under the Site infrastructure and services function consists of biological control, facility services, transportation, roads and grounds, utilities (water, electricity), sewer systems, and sanitary waste management and disposal.

The work elements under the Site business management function consists of real property asset management; property systems/acquisition and materials management; sponsorship, management, and administration of employee pension and other benefits plans; Energy Employees Occupational Illness Compensation Program Act (Silver and Wilson 2005)/workers compensation; external affairs and other interactions; mail services; and reproduction, correspondence control, and multi-media.

As part of real property asset management, RL has established the LTS program to provide planning and interim execution of LTS for portions of the Hanford Site as they are cleaned up and before they are transferred to the DOE Office of Legacy Management (LM). The current LTS program is part of PBS RL-0201 until it is transferred to LM. This future LTS program under LM is referred to as PBS RL-LTS in this report. The scope of the current and future LTS program is described in section 6.4.

The work elements under the information resources and content management function consist of strategic planning and program management, telecommunications, information systems, and content (records) management.

The work elements under the portfolio management function consist of Hanford portfolio planning, analysis and performance assessment; project acquisition and support; and independent analysis and assessments.

Other work elements include 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, and operations and maintenance activities at the Volpentest HAMMER Federal Training Center in support of the Hanford Site and other training programs.

Infrastructure work elements consist of reliability projects to repair and replace infrastructure systems and provide capital upgrades to the infrastructure, including larger scale expense projects. Also included are construction and capital equipment expenditures associated with replacements for biological control, crane and rigging, electrical system, facilities, Hanford Fire Department, network and telecommunications, studies and estimates, transportation, water and sewer utilities, and other infrastructure reliability projects.

This PBS also consists of a variety of support contracts, grants, permits and fees including those for electrical power (Bonneville Power Administration), building services and rent, cleanup baseline, contract audit and closeout, information technology, land transfers, laundry services, janitorial services, legal, Natural Resource Trustee Council, occupational medicine, steam systems, Tribal Nation support, Ecology and Washington State Department of Health.

The scope description for these work elements is provided in Table 6-3.

Table 6-3. Hanford Sitewide Services (PBS RL-0201) Level 2 Scope Summary

Work Element	Scope Description
Hanford Sitewide Services	<p>Covers costs for Site services and infrastructure. This work element consists of emergency services (fire and emergency response, emergency management), environmental integration services (Sitewide safety standards, environmental integration, public safety and resource protection, radiological site services, and offsite laboratory sample analysis), information management (information management planning and controls, information systems, content and records management, infrastructure/cyber security, information resources/content management, and information support services), Site infrastructure and utilities/logistics and transportation (roads and grounds, biological services, electrical services, water/sewer services, facility services, transportation, mail, property systems/acquisitions, technical services, energy management, work management, land and facilities management), support functions (business operations, human resources, safety, health and quality), and portfolio management (portfolio planning, analysis and performance, project acquisition and support, and independent analysis and assessments).</p> <ul style="list-style-type: none"> <li>• Covers contracted technical services in key areas such as audit, regulatory analysis, cost and risk analysis and estimating. Also covers mission-critical support services to DOE and its contractors in key areas such as occupational medicine, information and telecommunications, janitorial, laundry services, electrical power, steam service and facilities rentals; critical independent legal counsel and litigation services in support of DOE and its contractors; and other mission-critical support services to DOE and its contractors in key areas such as land transfers, acquisition and contract closeout, energy conservation and management, natural resource trusteeship, Tribal Nation support, Washington State Departments of Ecology and Health, and other small contracts, permits, and payment of fees</li> <li>• Covers 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</li> <li>• Covers operations and maintenance activities at the HAMMER facility in support of the Hanford Site and other training programs</li> <li>• Covers reliability projects to repair and replace infrastructure systems and provides capital upgrades to the infrastructure, including larger scale expense projects. Also covers construction and capital equipment expenditures associated with replacements for biological control, crane and rigging, electrical system, facilities, Hanford Fire Department, network and telecommunications, studies and estimates, transportation, water and sewer utilities and other infrastructure reliability projects.</li> </ul>
DOE = U.S. Department of Energy. HAMMER = Volpentest HAMMER Federal Training Center.	PBS = project baseline summary. RL = DOE, Richland Operations Office.

Figure 6-3 presents the low-range remaining estimated costs for Hanford Sitewide Services (PBS RL-0201) by FY.

The Hanford Sitewide Services work scope includes the continued delivery of mission critical programs and services to ensure a safe, secure, and compliant work environment for DOE and its contractors. While not a determination of importance, the range of services represented in this PBS are primarily level of effort driven by the mission duration. Any scenario that results in an extension in the mission will increase expenses within this PBS. This uncertainty is accounted for in the high-range estimate.

Similarly, an extension in the mission duration could impact the serviceability of the utility infrastructure. Despite the fact the low-range estimate includes expenses to accommodate infrastructure reliability projects in the future, the amount estimated may be insufficient to overcome a catastrophic failure in a key utility system, particularly considering (1) the age of the infrastructure; and (2) the time-scale of the cleanup mission. This uncertainty is also reflected in the high-range estimate.



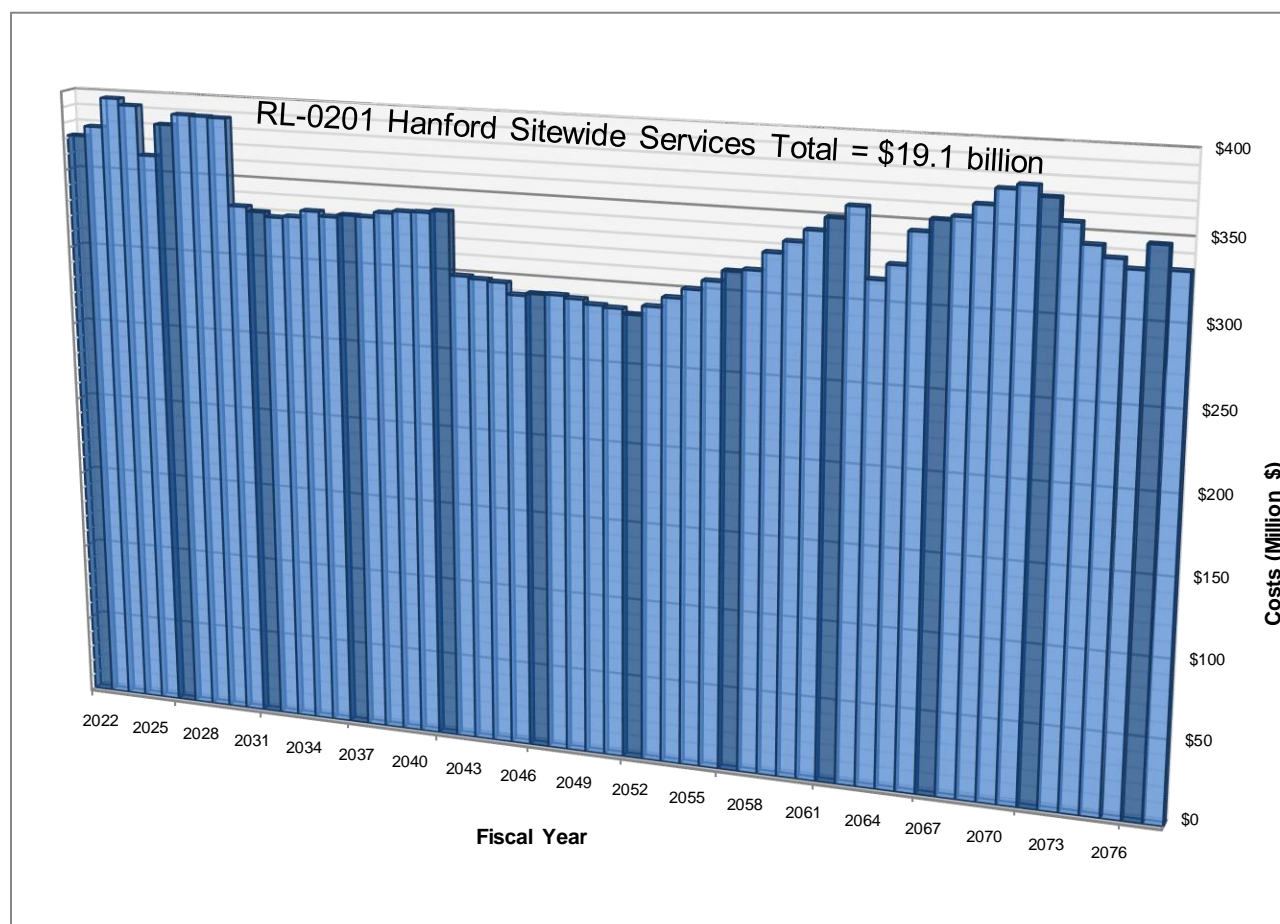


Figure 6-3. Hanford Sitewide Services (PBS RL-0201)  
Low-Range Remaining Estimated Costs by Fiscal Year.

#### 6.4 LONG-TERM STEWARDSHIP (PBS RL-LTS)

Following the completion of Hanford cleanup actions, the disposal facilities and their areas will require long-term management. Administration of the institutional controls activities will be required for portions of the Hanford Site to ensure protection of human health and the environment. As portions of the Site are cleaned up, they are managed in accordance with the Hanford Site Long-Term Stewardship Program, as described in [DOE/RL-2010-35, Hanford Long-Term Stewardship Program Plan](#), under PBS RL-0201 Hanford Sitewide Services. When all the cleanup actions defined by decision documents are completed, the Hanford Site will be turned over to DOE LM. This PBS element pertains to the LM activities at 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, recordkeeping 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 current Hanford Site LTS Program manages 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 LTS Program manages Hanford's 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 Nation treaties, DOE directives, and Hanford Site procedures. The planning basis for the Hanford Site LTS Program scope integrates stewardship and institutional controls elements into the program from present day to 2078.

The scope, schedule and costs of PB RL-LTS and institutional controls, to the extent predictable, have been included in this LCR for the period from 2079 to 2095. The Federal Government will have a presence at Hanford well beyond 2095 – especially in the Inner Area of the Central Plateau – to ensure that the cleanup remedies remain protective of people and the environment. As cleanup decisions are made and LTS requirements and institutional controls are refined, more specific information will be included in the LCR.

Table 6-4 provides a summary of the scope. Figure 6-4 shows low-range remaining estimated costs for PBS RL-LTS by FY.

Table 6-4. Long-Term Stewardship (PBS RL-LTS) Level 2 Scope Summary

Work Element	Scope Description
Long-Term Stewardship	Covers operation and maintenance of Hanford Site infrastructure following cleanup activities, environmental monitoring of groundwater, soil, vadose zone, and monitoring for public safety and resource protection, planning, land management, and surveillance and maintenance activities to ensure environmental compliance and protection, payment in lieu of taxes, and management and administration.

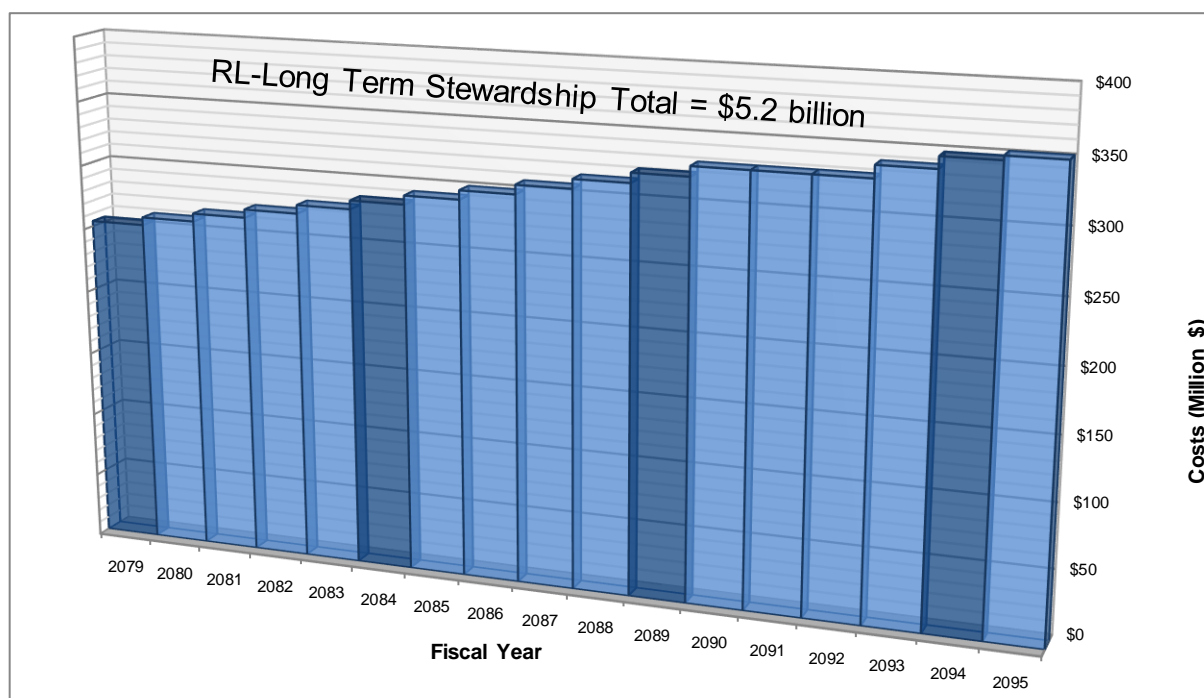


Figure 6-4. Long-Term Stewardship (PBS RL-LTS)  
Low-Range Remaining Estimated Costs by Fiscal Year.



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## **7.0 REPORT LIMITATIONS**

### **7.1 SCHEDULE AND COST LIMITATIONS**

The LCR is based on a compilation of estimated scope, schedule, and cost information. To finish preparing the LCR, it is necessary to select a deadline when the scope, schedule, and cost information used to prepare the report will be “locked down.”

For the 2022 LCR, August 31, 2021, serves as the cutoff date. Unless noted otherwise, changes in the TPA and other applicable requirements, budget requests, appropriations, program funding allocations, and other scope, schedule, and cost changes after the cutoff date are not reflected in this LCR.

### **7.2 OTHER LIMITATIONS**

Some of the activities described in the LCR are subject to the analysis and decision-making requirements of CERCLA, RCRA, or other applicable statutes and regulations. The information included in the LCR is for planning purposes only, not for regulatory decision making, which will be conducted following the applicable statutory and regulatory programs.

The LCR does not include resources that may be required to accomplish significant restoration of natural resources related to any liability of the United States for NRDAR.

Several non-DOE entities operate and manage property on the Hanford Site, typically under lease agreements with DOE, for example:

- Energy Northwest, a consortium of public utility companies that oversees the Columbia Generating Station nuclear power reactor.
- Laser Interferometer Gravitational Wave Observatory, operated by a consortium of the California Institute of Technology and the Massachusetts Institute of Technology.
- Washington State, which in turn leases land to US Ecology, Inc., a private firm that operates burial grounds for commercial low-level radioactive 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 LCR.

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## **APPENDIX A**

### **HANFORD SITE EXISTING CLEANUP DECISIONS**

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**TERMS**

AM	Action Memorandum
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CFR	<i>Code of Federal Regulations</i>
CCN	correspondence control number
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
D&D	decontamination and decommissioning
D4	deactivation, decontamination, decommissioning, and demolition
DOE	U.S. Department of Energy
DST	double-shell tank
Ecology	Washington State Department of Ecology
EE/CA	engineering evaluation/cost analysis
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERA	expedited response action
ERDF	Environmental Restoration Disposal Facility
ESD	explanation of significant differences
HCP IES	Hanford Comprehensive Land-Use Plan Environmental Impact Statement
HLW	high-level waste
IC	institutional controls
INL	Idaho National Laboratory
ISRM	in situ redox manipulation
ISS	interim safe storage
LCR	Lifecycle Report
MCL	maximum contaminant level
NPL	National Priorities List
NTCRA	non-time-critical removal action
OU	operable unit
P&T	pump-and-treat
PCB	polychlorinated biphenyl
PFP	Plutonium Finishing Plant
PRG	preliminary remediation goal
PRZ	prewetted zone
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RDR/RAWP	remedial design report/remedial action work plan
ROD	record of decision
RTD	remove, treat, and dispose of
SNF	Spent Nuclear Fuel
SST	single-shell tank
TCRA	time critical removal action
TPA	Tri-Party Agreement
Tri-Party agencies	U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington State Department of Ecology,
TRU	transuranic
TSD	treatment, storage, and disposal
USDOE	U.S. Department of Energy
WIDS	Waste Information Data System
WIPP	Waste Isolation Pilot Plant
WTP	Waste Treatment and Immobilization Plant

## APPENDIX A

### HANFORD SITE EXISTING 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 a *Hanford Lifecycle Scope, Schedule and Cost Report* (Lifecycle Report [LCR])<sup>1</sup>. The LCR is expected to reflect all actions necessary for DOE to meet all applicable environmental obligations as it completes the Hanford 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) (Tri-Party agencies), and other agencies conduct under Federal and State regulatory programs.

Many decisions regarding the Hanford cleanup have been made since the TPA was signed in 1989, and actions implementing these decisions have been completed, are underway, or will soon be initiated. Many other decisions, however, cannot be made yet, are in preliminary planning stages, or are under development. The absence of final decisions is addressed in TPA 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.*

This appendix provides current information about decisions that affect cleanup and when these decisions might become final for LCR purposes.

- **Section A.1** provides a general overview of the principal processes employed at the Hanford Site to reach decisions about future cleanup actions.
- **Section A.2** describes in more detail the Federal and State decisions that can affect Hanford 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 A.3** summarizes current decisions that, for purposes of this LCR, are considered to be cleanup decisions and which cleanup decisions can be identified as final cleanup decisions.

This appendix will be updated to reflect new and changed final cleanup decisions.

#### A.1 PRINCIPAL HANFORD CLEANUP DECISION-MAKING PROCESSES

To implement the cleanup mission, the Tri-Party agencies reach decisions about what actions need to be performed to protect the public, workers, and the environment. Cleanup decisions are based on a variety of statutory, regulatory, and other authorities such as the *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA) (42 USC 9601) and the *Resource Conservation and Recovery Act of 1976* (RCRA) (42 USC 6901) that require the consideration of various alternatives before decisions are made. In some cases, the Tri-Party agencies develop interim or partial decisions that enable cleanup work to proceed pending final decisions.

The TPA is the primary document that the Tri-Party agencies use to achieve Hanford cleanup. Cleanup decisions made under the TPA are intended to integrate several regulatory processes including but not limited to CERCLA and RCRA:

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<sup>1</sup> Specific language for milestone M-036-01 is reflected in Table 1-1 of the LCR.

- CERCLA processes support remedial decision making for most past-practice waste sites, canyon facilities, and structures that contain radioactive contamination or other hazardous substances. The TPA 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.
- RCRA closure processes are generally used to reach final decisions for the closure of 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 Washington State. Ecology implements the program via RCRA-equivalent Washington Administrative Code regulations and through facility-specific permits. RCRA closure and post-closure requirements are contained in the Hanford Site RCRA Permit ([WA7890008967](#), *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*)<sup>2</sup>.

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

In addition to DOE's responsibilities under RCRA and CERCLA, DOE has authority to regulate the radioactive materials that it manages, including setting standards that affect cleanup decisions for radionuclides. DOE Order 435.1, *Radioactive Waste Management*, governs the management of radioactive waste within DOE facilities establishing additional requirements and processes for cleaning up radioactive facilities and media. DOE develops and implements cleanup decisions under this order.

Land use also is an important factor in making cleanup decisions because remedial action objectives must support reasonably anticipated future land uses. These future land-use assumptions allow risk assessments and feasibility studies to focus on developing practical and cost-effective remedial alternatives. 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 an 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 established a comprehensive land-use plan for the Hanford Site. As DOE stated in the first ROD:

*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](#))*

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<sup>2</sup> Ecology issued a Draft Hanford Facility Dangerous Waste Permit, Rev. 9, for public review and comment from May 1, 2012, through October 22, 2012. A significant number of comments were received during this review period, Ecology and DOE are actively working to resolve comments. Until permit language and provisions are agreed to in finalizing the draft permit, Rev. 8C Permit remains in effect.

To clean up an area as large and complex as the Hanford Site requires an extraordinary number of regulatory decisions. While many cleanup decisions have been made, only some of these decisions are final; some are either interim decisions or decisions that laid the groundwork for future final decisions. The rest of this Appendix A provides a more detailed discussion of the decisions that have been made (final decisions, interim decisions, and so forth). It also includes several tables that summarize how of these decisions.

## A.2 CLEANUP DECISIONS

### A.2.1 COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 DECISIONS

CERCLA, as modified by the *Superfund Amendments and Reauthorization Act 1986* (42 USC 103), 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. Under Title 40 *Code of Federal Regulations* (CFR) Part 300, 40 CFR 300, “National Oil and Hazardous Substances Pollution Contingency Plan,” DOE is the lead agency with lead responsibilities by the National Contingency Plan and *Executive Order 12580, Superfund Implementation*. EPA is the lead regulatory agency under the TPA and oversees the cleanup activities as stated in 40 CFR 300. EPA also has certain oversight authorities granted through CERCLA and the TPA. The primary documentation used to implement cleanup decisions under CERCLA includes:

- **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. A ROD contains information about the site’s history, description, and 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. RODs can be final or interim; interim RODs 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.

Several CERCLA documents have been completed that have resulted in cleanup decisions applicable to Hanford. These CERCLA documents and summaries of the relevant cleanup decisions are listed in Section A.3 herein.

### A.2.2 PERMITS, LICENSES, AND OTHER REGULATORY PROGRAM APPROVALS

RCRA, as modified by the *Hazardous and Solid Waste Amendments of 1984*, gave EPA authority to control the generation, transportation, storage, and disposal of hazardous waste. The amendments expanded the scope of RCRA to require corrective actions for certain releases of hazardous constituents to the environment from RCRA facilities (similar to CERCLA remedial actions). Unlike CERCLA, EPA may delegate authority for implementing RCRA to the states, and in Washington State, Ecology has lead authority for most elements of RCRA through regulations contained in the Washington Administrative Code. Principal documents used to implement Hanford 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 that manages hazardous waste (or “dangerous waste” in Washington State). A TSD facility may receive a final status permit even though it is closed and not operating, if ongoing caretaking activities must be maintained after closure (i.e., during the post-closure care period). At Hanford, a single final status permit covers the entire Site, but is being issued in phases because of the number of TSD facilities. The final status permit includes decisions about how Federal and State statutes, regulations, and guidance have been interpreted and applied to specific activities conducted at each TSD facility.
- **Closure/Post-Closure Plan.** Some 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 required to address residual contamination. Ecology must approve closure/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 degree/methods for cleanup will be made and implemented through a corrective action plan approved by Ecology.

In addition to RCRA, several other programs authorized under existing Federal and State statutes require permits, licenses, and other approvals that can affect cleanup at Hanford. These other decision documents establish, among other conditions, limits on emissions of radionuclides and other hazardous constituents to the air, water, and ground. Section A.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 cleanup.

### **A.2.3 TRI-PARTY AGREEMENT DECISIONS**

The TPA, Section 5.0, helps define how CERCLA and RCRA programs will be implemented when they have overlapping authorities. The TPA is used to guide which decision-making process (e.g., CERCLA ROD, RCRA permit) will be used to establish cleanup decisions for the waste sites and facilities at Hanford. These may include TPA provisions such as Appendix H and I that set specific waste retrieval objectives and technology performance standards for certain types of cleanup actions. These TPA-based decisions are listed in Section A.3.

### **A.2.4 OTHER FEDERAL AND STATE DECISIONS**

A variety of other decisions are embodied in executive, legislative, and judicial documents that can affect cleanup at Hanford. Section A.3 lists executive orders, presidential proclamations, federal statutes, and judicial decisions that may affect cleanup.

## **A.3 SUMMARY OF HANFORD CLEANUP DECISIONS – FINAL AND NOT YET FINAL**

The statutory and regulatory authorities discussed in Section A.2 result in a multitude of decisions across numerous projects and programs. These decisions establish environmental obligations that affect the cleanup mission and are summarized in this section.

While some decisions directly affect Hanford cleanup, care has been taken to also include decisions that have indirect effects on Hanford. Examples include definition of 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, the LCR, pursuant to M-036-01, is required to consider cleanup alternatives “where final cleanup decisions have not yet been made” (Table 1-1 documents specific M-036-01 language).

Even where final decisions have been made, legal mandates require periodic reviews to ensure that selected remedies continue to be effective (i.e., CERCLA 5-Year Reviews); new decisions may be needed depending on how well cleanup actions are working. For purposes of this LCR, a cleanup decision is deemed to be final if either of the following is true.

- The decision is embodied in a statutory or regulatory document that is titled final (e.g., final permit, final ROD).
- The decision is explicitly represented as final in a document, and such representation is consistent with the statutory or regulatory authority on which it is based.

Hanford cleanup decisions summarized in the following tables indicate whether the decision is final by placing the word **FINAL** after the decision title. In addition to decisions that have been made, whether final or not, many cleanup decisions are yet to be made. However, as these decisions are reached, they will be incorporated into this section of subsequent LCRs in accordance with the TPA M-036-01 series.

Table A-1. CERCLA Records of Decision and Associated Changes.

Record of Decision – 1100 Area			
<b>Title:</b> <i>Record of Decision, USDOE Hanford 1100 Area (EPA/ROD/R10-93/063)</i> <b>FINAL</b> <b>ROD Type:</b> CERCLA Final ROD <b>Area:</b> 1100 <b>Date Approved:</b> Sep-93 <b>Initial Decision:</b> 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. The 1100 Area was deleted from the National Priorities List on September 30, 1996 (61 FR 51019).			
Revision Title	Type	Date	Revised Decision
<i>Explanation of Significant Differences for the Record of Decision for the USDOE Hanford 1100 Area Benton County, Washington (EPA 2010a)</i>	ESD	Sep-10	Documents significant differences to the selected remedies in the ROD. This ESD clarifies the IC requirements for the Horn Rapids Landfill.
Record of Decision – Environmental Restoration Disposal Facility			
<b>Title:</b> <i>Declaration of the Record of Decision for the Environmental Restoration Disposal Facility (EPA/ROD/R10-95/100)</i> <b>FINAL</b> <b>ROD Type:</b> CERCLA Final ROD <b>Area:</b> 200 West <b>Date Approved:</b> Jan-95 <b>Initial Decision:</b> Initial construction of two cells; maximum size of 1.6 mi <sup>2</sup> ; landfill construction in accordance with RCRA; capped at completion.			
Revision Title	Type	Date	Revised Decision
<i>USDOE Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington, Explanation of Significant Difference (ESD) (EPA/ESD/R10-96/145)</i>	ESD	Jul-96	Allow disposal of investigation-derived waste and RCRA past-practice waste to ERDF; allow disposal of nonprocess inactive TSD waste to ERDF; allow use of ERDF leachate for dust suppression/compaction activities at ERDF.
<i>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/AMD/R10-97/101)</i>	Amended ROD	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.

Table A-1. CERCLA Records of Decision and Associated Changes.

<i>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/AMD/R10-99/038)</i>	Amended ROD	Mar-99	Establishes conditional approval for delisting of the ERDF leachate.
<i>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/AMD/R10-02/030)</i>	Amended ROD	Jan-02	Authorizes four additional disposal cells and the option of staging waste at ERDF pending treatment and/or disposal.
<i>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)</i>	Amended ROD	May-07	Allows specific waste (e.g., waste associated with surveillance and maintenance of Hanford facilities, environmental research/development activities, sample analyses, liquid effluent waste treatment, infrastructure support, and environmental monitoring programs) to be disposed at ERDF; identifies a plug-in approach for ERDF disposal of additional similar Hanford cleanup waste generated in support of RCRA/CERCLA cleanup actions.
<i>Declaration: U.S. Department of Energy, Environmental Restoration Disposal Facility, Hanford Site - 200 Area, Benton County, Washington (09-AMRC-0179)</i>	Amended ROD and ESD	Aug-09	Allows for ERDF expansion of an area equal to 4 cells or 2 super cells; updates cell design to allow super cell concept and allows for ERDF expansion via EPA approval and fact sheets rather than ROD amendments.
<i>Explanation of Significant Differences For the U.S. Department of Energy Environmental Restoration Disposal Facility Hanford Site - 200 Area Benton County, Washington (EPA 2015)</i>	ESD	Oct-15	Allows the onsite 200 West Area Pump-and-Treat Facility to be used as an option for the treatment of ERDF leachate. This change would allow either the ETF or the 200 West Area Pump-and-Treat Facility to be used for treatment of ERDF leachate, depending upon availability.
<i>Declaration of the Amendment to Record of Decision for the USDOE Hanford Environmental Restoration Disposal Facility (Ecology 2015)</i>	Amended ROD	Dec-15	Waives the 40 CFR 268.45(a) and WAC 173-303-140(2)(a) prohibition on placing hazardous waste in a land disposal unit before completing required land disposal restriction treatment for certain long, large and/or heavy hazardous waste items.
<i>Plug-In Approach for Disposal of 6608 Sewage Lagoon Biosolids (EPA 2019a)</i>	-	Jan-19	Allows biosolids from 6608 Sewage Lagoon to be disposed at ERDF.
<i>Approval of Two Plug-In Approaches for Waste to ERDF (EPA 2020)</i>	-	Jan-20	Allows miscellaneous waste from Capsule Storage Area and WESF to be disposed at ERDF.
<i>Request for Approval to Use Plug-in Approach for Disposal of Miscellaneous Wastes from Liquid Effluent Retention Facility in the Environmental Restoration Disposal Facility (EPA 2021a)</i>	-	Jun-21	Allows miscellaneous wastes from LERF to be disposed at ERDF.

Table A-1. CERCLA Records of Decision and Associated Changes.

<i>Request for Approval to Use Plug-in Approach for Disposal of Miscellaneous Wastes from 2709-S Office Building Site Preparation in the Environmental Restoration Disposal Facility (EPA 2021b)</i>	-	Jun- 21	Allows miscellaneous wastes from 2709-S Office Building site preparation to be disposed at ERDF.
<i>Approval of Plug-In for ETF Load-In Expansion Waste to ERDF (EPA 2021c)</i>	-	Aug- 21	Allows miscellaneous asphalt, soils, and debris from the ETF load-in expansion project to be disposed in ERDF.
<b>Record of Decision – 100 Areas</b>			
<b>Title:</b> 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) <b>ROD Type:</b> CERCLA Interim Action ROD <b>Area:</b> 100; 100-BC-1, 100-DR-1, and 100-HR-1 OUs <b>Date Approved:</b> Sep-95 Initial Decision: Remove contaminated soil, structures and debris using 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 excavated areas followed by revegetation.			
<b>Revision Title</b>	<b>Type</b>	<b>Date</b>	<b>Revised Decision</b>
<i>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 (EPA/AMD/R10-97/044)</i>	Amended ROD	Apr-97	Incorporates 34 additional waste sites into the ROD; refines remedial cost estimate for original 37 sites and additional 34 sites based on actual data, streamlining, and lessons learned; eliminates the soil washing treatment option before disposal.
<b>Record of Decision</b>			
<b>Title:</b> 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) <b>FINAL</b> <b>ROD Type:</b> CERCLA Final ROD <b>Area:</b> 100; 100-IU-1, 100-IU-3, 100-IU-4, and 100-IU-5 OUs <b>Date Approved:</b> Feb-96 <b>Initial Decision:</b> No action. Partial deletion of the 100 Area (specifically the 100-IU-1 and 100-IU-3 OU waste areas) from the National Priorities List was published on July 8, 1998 (63 FR 36861).			
<b>Record of Decision</b>			
<b>Title:</b> 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) <b>ROD Type:</b> CERCLA Interim Action ROD <b>Area:</b> 100; 100-H, 100-K <b>Date Approved:</b> Mar-96 <b>Initial Decision:</b> Interim action to remove hexavalent chromium from groundwater; 30 extraction wells; ion exchange treatment; reinject treated effluent; monitor; institute ICs.			
<b>Revision Title</b>	<b>Type</b>	<b>Date</b>	<b>Revised Decision</b>
<i>U.S. Department of Energy Hanford Site – 100 Area, Benton County, Washington, Amended Record of Decision, Decision Summary and Responsiveness Summary (EPA/AMD/R10-00/122)</i>	Amended ROD	Oct-99	Implements In Situ Redox Manipulation (ISRM) barrier for second chromium plume in 100-HR-3 OU; existing P&Ts remain in operation.
<i>Explanation of Significant Difference for the 100-HR-3 Operable Unit Record of Decision (EPA/ESD/R10-03/606)</i>	ESD	Apr-03	Provides justification for increased schedule/cost from the 1999 Amendment associated with a greater number of wells and aquifer thickness that affected implementation of the ISRM barrier.



Table A-1. CERCLA Records of Decision and Associated Changes.

<i>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 2009a)</i>	ESD	Aug-09	Provides justification for increased cost and location of reinjection wells from the 1999 Amendment associated with operation beyond initial 5-year estimate and need to control plume migration.
<i>Non-Significant Change for the 100-HR-3 and 100-KR-4 Operable Units Interim Action Record of Decision (11-AMCP-0002)</i>	Non-significant change	Oct-10	Indicates that the ISRM barrier would no longer be actively maintained; this shifted the groundwater remedy at the ISRM barrier to the P&T system.
<i>Explanation of Significant Differences for the 100-KR-4 Operable Unit Interim Action Record of Decision, Hanford Site Benton County, Washington (EPA 2019b)</i>	ESD	Jul-19	Allows for miscellaneous solid waste collected from 100-KR-4 groundwater OU to be transported and stored at a central location in the Central Plateau.
<b>Record of Decision</b>			
<b>Title:</b> <i>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)</i> <b>ROD Type:</b> CERCLA Interim Action ROD <b>Area:</b> 100, 200 North <b>Date Approved:</b> Jul-99 <b>Initial Decision:</b> Requires RTD for 46 sites; adds the plug-in approach for the RTD remedy for remaining 100 Area and 200 North sites and for newly identified 100 Area sites added by ESD; 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.			
<b>Revision Title</b>	<b>Type</b>	<b>Date</b>	<b>Revised Decision</b>
<i>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)</i>	ESD	Jun-00	Plugs in 600-23 and JA Jones #1 waste sites to the Remaining Sites ROD.
<i>Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision (EPA 2004b)</i>	ESD	Feb-04	Adds 28 sites to ROD; adds <u>10 CFR 1022</u> and <u>40 CFR 6</u> , Appendix A as ARARs to ROD; revises annual ICs report date to be coincident with the due date for the Sitewide ICs Plan for Hanford CERCLA Response Actions.
<i>Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington (EPA 2009c)</i>	ESD	Aug-09	Authorizes adding 200-CW-3 OU wastes sites, 99 newly discovered waste sites, and 87 candidate sites using the plug-in approach in the ROD and any newly discovered waste sites that will be documented in the Administrative Record and in an annual fact sheet.
TPA Fact Sheet: 100 Area “Plug-In” and Candidate Waste Sites For Fiscal Year 2010 (DOE, EPA and Ecology 2011)	-	Mar-11	The annual listing of candidate waste sites for confirmatory sampling and waste sites plugged into the RTD remedy in the 1999 interim action ROD for the 100 Area Remaining Sites.
TPA Fact Sheet: 100 Area “Plug-In” and Candidate Waste Sites for Calendar Year 2011 (DOE, EPA and Ecology 2012)	-	Feb-12	The annual listing of candidate waste sites plugged into the RTD remedy in the 1999 interim action ROD for the 100 Area Remaining Sites.

Table A-1. CERCLA Records of Decision and Associated Changes.

TPA Fact Sheet: 100 Area “Plug-In” and Candidate Waste Sites For Calendar Year 2012 (DOE, EPA and Ecology 2013)	-	Jan-13	The annual listing of candidate waste sites for confirmatory sampling and waste sites plugged into the RTD remedy in the 1999 interim action ROD for the 100 Area Remaining Sites.
TPA Fact Sheet: 100 Area “Plug-In” and Candidate Waste Sites for Calendar Year 2014 (DOE, EPA and Ecology 2015)	-	May-15	The annual listing of candidate waste sites plugged into the RTD remedy in the 1999 interim action ROD for the 100 Area Remaining Sites.
TPA Fact Sheet: 100 Area “Plug-In” and Candidate Waste Sites for Calendar Year 2016 (DOE, EPA and Ecology 2016)	-	Jul-16	The annual listing of candidate waste sites plugged into the RTD remedy in the 1999 interim action ROD for the 100 Area Remaining Sites.
TPA Fact Sheet: 100 Area “Plug-In” Waste Sites For Calendar Year 2017 (DOE, EPA and Ecology 2018)	-	Mar-18	The annual listing of waste sites plugged into the RTD remedy in the 1999 interim action ROD for the 100 Area Remaining Sites.
<b>Record of Decision</b>			
<b>Title:</b> Declaration of the Record of Decision for the 100-KR-2 Operable Unit, Hanford Site, Benton County, Washington (EPA/ROD/R10-99/059) <b>ROD Type:</b> CERCLA Interim Action ROD <b>Area:</b> 100-K <b>Date Approved:</b> Sep-99 <b>Initial Decision:</b> 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 ICs.			
<b>Revision Title</b>	<b>Type</b>	<b>Date</b>	<b>Revised Decision</b>
<i>Interim Remedial Action Record of Decision Amendment, U.S. Department of Energy; 100 K Area K Basins, Hanford Site - 100 Area, Benton County, Washington (EPA 2005a)</i>	Amended ROD	Jun-05	Modifies remedy for sludge by including sludge treatment prior to interim storage and shipment to a national repository; modifies remedy for debris by including grouting in place some of the basin debris followed by removal along with the removal of the basins.
<i>Explanation of Significant Differences for the Hanford Site 100 K Area K Basins Interim Remedial Action Record of Decision (16-AMRP-0173)</i>	ESD	May-16	Modifies the amended ROD by removing the requirement that sludge be treated prior to interim storage, provided the sludge is stored at T Plant in Cells 3L, 8R, 9L, 10L, 13L 14R, and 15L. The sludge remains subject to the requirement that it be treated and packaged for disposal, and shipped off-Hanford to a national repository.

Table A-1. CERCLA Records of Decision and Associated Changes.

<b>Record of Decision</b>			
<b>Title:</b> <i>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)</i> <b>ROD Type:</b> CERCLA Interim Action ROD <b>Area:</b> 100-N <b>Date Approved:</b> Sep-99 <b>Initial Decision:</b> ICs 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.			
<b>Revision Title</b>	<b>Type</b>	<b>Date</b>	<b>Revised Decision</b>
<i>Explanation of Significant Difference 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)</i>	ESD	May-03	Removes July 31 annual ICs reporting requirements, consolidates reporting with the site-wide IC annual report; eliminates requirement to evaluate applying 30 in. of irrigation water to determine if remaining contaminants will impact groundwater; identifies need for additional ICs to preclude access to contaminated groundwater for 116-N-1 which will be incorporated into site-wide IC document.
<i>U.S. Department of Energy, 100-NR-1 and NR-2 Operable Units, Hanford Site - 100 Area, Benton County, Washington, Amended Record of Decision, Decision Summary and Responsiveness Summary (EPA 2010b)</i>	Amended ROD	Sep-10	Deploys the apatite sequestration technology for remediating Sr-90 in the 100-NR-2 OU by extending existing apatite permeable reactive barrier to ~2,500 ft, allows for deployment of the apatite sequestration technology elsewhere in the 100-NR-2 OU in accordance with an Ecology approved work plan, and includes decommissioning the treatment components of the existing P&T system.
<i>Explanation of Significant Differences for the 100-NR-1 and 100-NR-2 Operable Units Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington (EPA 2011a)</i>	ESD	Mar-11	Adds 45 additional waste sites in the 100-NR-1 OU for remediation by RTD (characterized per the 100-N Area sampling and analysis plan) and increases the total cost 38% to \$67,510,386.
<i>Explanation of Significant Difference for the 100-NR-1 and 100-NR-2 Operable Units Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington (EPA 2013)</i>	ESD	Aug-13	Adds 2 additional waste sites in the 100-NR-1 OU for remediation by RTD and increases the total cost by \$401,500.
<i>Explanation of Significant Differences for the 100-NR-2 Operable Unit Interim Action Record of Decision, Hanford Site, Benton County, Washington (EPA 2019c)</i>	ESD	Jul-19	Allows for miscellaneous solid waste collected from 100-NR-2 groundwater OU to be transported and stored at a central location in the Central Plateau.
<b>Record of Decision</b>			
<b>Title:</b> <i>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)</i> <b>ROD Type:</b> CERCLA Interim Action ROD for 2 RCRA TSDs and an associated site <b>Area:</b> 100-N <b>Date Approved:</b> Jan-00 <b>Initial Decision:</b> RTD of 116-N-1 and 116-N-3 Cribs with ERDF disposal; backfill and revegetate; any pipelines will be removed or sampled and left in place based on sample results.			

Table A-1. CERCLA Records of Decision and Associated Changes.

Revision Title	Type	Date	Revised Decision
<i>Explanation of Significant Difference 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)</i>	ESD	May-03	Removes July 31 annual ICs requirement and consolidates reporting with the site-wide IC annual report; eliminates requirement to evaluate applying 30 in. of irrigation water to determine if remaining contaminants will impact groundwater; identifies need for additional ICs to preclude access to contaminated groundwater for 116-N-1 which will be incorporated into site-wide IC document.
<b>Record of Decision</b>			
<b>Title:</b> 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) <b>ROD Type:</b> CERCLA Interim Action ROD <b>Area:</b> 100 Area Burial Grounds <b>Date Approved:</b> Sep-00 <b>Initial Decision:</b> Remove contaminated soil, structures, and debris; treat as needed; dispose at ERDF; backfill and revegetate. Applies to 45 burial grounds in 100 Area.			
Revision Title	Type	Date	Revised Decision
<i>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) (08-AMRC-0033)</i>	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 ICs for protection of groundwater and the Columbia River.
<b>Record of Decision</b>			
<b>Title:</b> Record of Decision Hanford 100 Area Superfund Site 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units (EPA 2014) <b>FINAL</b> <b>ROD Type:</b> CERCLA Final ROD <b>Area:</b> 100 Area <b>Date Approved:</b> Sep-14 <b>Initial Decision:</b> RTD at 91 waste sites, ICs at 15 waste sites, no additional action due to interim remedial actions completed at 198 waste sites, monitored natural attenuation to address nitrate, hexavalent chromium, trichloroethene, and strontium-90 in 100-FR-3 groundwater and ICs.			
Revision Title	Type	Date	Revised Decision
<i>Explanation of Significant Differences for the 100-FR-3 Operable Unit Record of Decision, Hanford Site, Benton County, Washington (EPA 2019d)</i>	ESD	Jul-19	Allows for miscellaneous solid waste collected from 100-NR-2 groundwater OU to be transported and stored at a central location in the Central Plateau.
<i>Non-Significant Change for the 100-FR-1, 100-FR-2, 100-FR-3 and 100-IU-2 and 100-IU-6 Operable Units Record of Decision, Hanford Site, September 2014 (DOE, EPA and Ecology 2021)</i>	Non-Significant Change	Mar-21	Allows for purgewater to be managed at the modular storage tanks located immediately northeast of 200 East Area of the Hanford Site as considered on-site.

Table A-1. CERCLA Records of Decision and Associated Changes.

Record of Decision			
<b>Title:</b> <i>Record of Decision Hanford 100 Area Superfund Site 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and 100-HR-3 Operable Units, Benton County, Washington (EPA and DOE, 2018) <b>FINAL</b></i> <b>ROD Type:</b> CERCLA Final ROD <b>Area:</b> 100; 100-D, 100-H <b>Date Approved:</b> Jul-18 <b>Initial Decision:</b> Supersedes the cleanup levels selected in <i>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 (100 Area Remaining Sites) (EPA/ROD/R10-99/039) and Record of Decision for the 100-HR-3 and 100-KR-4 Operable Units Interim Remedial Actions, Hanford Site, Benton County, Washington (EPA/ROD/R10-96/134)</i> . Selected remedies for waste sites are no action, removal, treatment (as needed) and disposal, pipeline end-capping, backfill, contouring, revegetation and institutional controls. Selected remedies for groundwater are expansion and optimization of the interim pump and treat remedy, ion exchange to remove hexavalent chromium, reinject treated effluent, monitored natural attenuation for nitrate and strontium-90, and institutional controls until cleanup levels are achieved.			
Revision Title	Type	Date	Revised Decision
<i>Non-Significant Change for the 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, 100-HR-3 Operable Units Record of Decision, Hanford Site, July 2018 (DOE, EPA and Ecology 2021b)</i>	Non-Significant Change	Mar-21	Allows for purgewater to be managed at the modular storage tanks located immediately northeast of 200 East Area of the Hanford Site as considered on-site.
Record of Decision – 300 Area			
<b>Title:</b> <i>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)</i> <b>Note:</b> The ROD is only <b>FINAL</b> for the 300-FF-1 OU; it is an interim action for 300-FF-5 OU. <b>ROD Type:</b> CERCLA Final/Interim ROD <b>Area:</b> 300; 300-FF-1 and 300-FF-5 OUs <b>Date Approved:</b> Jul-96 <b>Initial Decision:</b> 300-FF-1: Remove contaminated soil and debris; dispose at ERDF; backfill and recontouring; ICs. 300-FF-5: Monitoring and ICs for groundwater.			
Revision Title	Type	Date	Revised Decision
<i>USDOE Hanford 300 Area, 300-FF-1 Operable Unit, Hanford Site, Benton County, Washington Explanation of Significant Difference (ESD) (EPA/ESD/R10-00/505)</i>	ESD	Jan-00	Provides a site-specific land disposal restriction treatability variance for lead contamination found in the 628-4 waste site (Landfill 1D).
<i>Explanation of Significant Difference for the 300-FF-5 Record of Decision (EPA/ESD/R10-00/524)</i>	ESD	Jun-00	Expanded scope of 300-FF-5 ROD to include groundwater in 300 Area, including 300-FF-2 sites and any sites plugged into 300-FF-1 ROD.
Record of Decision			
<b>Title:</b> <i>Declaration of the Interim Record of Decision for the 300-FF-2 Operable Unit (EPA/ROD/R10-01/119)</i> <b>ROD Type:</b> CERCLA Interim Action ROD <b>Area:</b> 300; 300-FF-2 OU <b>Date Approved:</b> Apr-01 <b>Initial Decision:</b> Remove contaminated soil, structures, and debris; treat as needed; dispose at ERDF, WIPP, or other; backfill and revegetate; establish ICs; continued groundwater monitoring; and define plug-in approach.			
Revision Title	Type	Date	Revised Decision
<i>Explanation of Significant Differences for the 300-FF-2 Operable Unit Record of Decision (EPA 2004b)</i>	ESD	May-04	Modified uranium soil cleanup level from 350 to 267 pCi/g based on engineering study to ensure protectiveness of the groundwater and river; modified land-use assumption for 8 outlying waste sites from industrial to unrestricted, changed cleanup levels for these sites to those consistent with 100 Area cleanup.

Table A-1. CERCLA Records of Decision and Associated Changes.

<i>Explanation of Significant Differences for the 300-FF-2 Operable Unit Interim Action Record of Decision, Hanford Site, Benton County, Washington (EPA 2009d)</i>	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.
<i>TPA Fact Sheet: “300-FF-2 “Plug-In” Waste Sites for Fiscal 2010.” (DOE, EPA and Ecology 2010)</i>	-	Oct-10	The 2010 list of waste sites plugged into the RTD remedy in the 2001 interim action ROD for the 300-FF-2 OU.
<i>Explanation of Significant Differences, Hanford 300 Area, 300-FF-2 Operable Unit, 618-10 Burial Ground (EPA 2011b)</i>	ESD	Aug-11	Modified remedy to allow necessary treatment of liquid waste in bottles, up to 1 gal/bottle, to occur in trays within the excavation area in accordance with an approved work plan.
<b>Record of Decision</b>			
<p><b>Title:</b> <i>Record of Decision for 300-FF-2 and 300-FF-5, and Record of Decision Amendment for 300-FF-1 Hanford Site, Benton County, Washington (EPA and DOE 2013) <u>FINAL</u></i></p> <p><b>ROD Type:</b> CERCLA Final ROD and ROD Amendment</p> <p><b>Area:</b> 300; 300-FF-1, 300-FF-2 and 300-FF-5</p> <p><b>Date Approved:</b> Nov-13</p> <p><b>Initial Decision:</b> This ROD selects a remedy for the waste sites in 300-FF-2, a remedy for the groundwater in 300-FF-5 and amends the remedy for three 300-FF-1 waste sites. The interim action remedy for 300-FF-5, selected in 1996 and the interim action remedy for 300-FF-2 selected in 2001 are replaced with this final action remedy. The remedy for 300-FF-1 selected in 1996 is amended for additional remedial action of uranium from three sites. Contaminated buildings are being removed in accordance with CERCLA action memoranda and are not part of the OUs addressed by this ROD.</p> <p>The major components of the selected remedy for the 300-FF-2 OU are the following:</p> <ul style="list-style-type: none"> <li>• Remove, treat and dispose of (RTD) at waste sites</li> <li>• Erect temporary surface barriers and fill pipeline voids</li> <li>• Enhanced attenuation of uranium using sequestration in the vadose zone, periodically rewetted zone (PRZ) and top of the aquifer</li> <li>• ICs, including the requirement that DOE prevent the development and use of property that does not meet residential cleanup levels at the 300 Area Industrial Complex and 618-11 for other than industrial uses, including use of property for residential housing, elementary and secondary schools, childcare facilities, and playgrounds.</li> </ul> <p>The major components of the selected remedy for the 300-FF-5 OU are the following:</p> <ul style="list-style-type: none"> <li>• Monitored natural attenuation</li> <li>• Groundwater monitoring</li> <li>• Enhanced attenuation of uranium at the top of the aquifer</li> <li>• ICs.</li> </ul> <p>The major component of the amended remedy for 300-FF-1 is enhanced attenuation of uranium using sequestration in the vadose zone, PRZ and top of the aquifer.</p>			
<b>Revision Title</b>	<b>Type</b>	<b>Date</b>	<b>Revised Decision</b>
<i>Explanation of Significant Differences for the Hanford Site 300 Area Record of Decision for the 300-FF-2 and 300-FF-5 Operable Units, and Record of Decision Amendment for the 300-FF-1 Operable Unit (15-AMRP-0259)</i>	ESD and Amended ROD	Sep-15	Adds two 300-FF-2 OU wastes sites. The remedy for waste site 600-393 is RTD and no additional action is needed for waste site 600-386.
<i>Explanation of Significant Differences #2 for the Hanford Site 300 Area Record of Decision for the 300-FF-2 and 300-FF-5 Operable Units, and Record of Decision Amendment for the 300-FF-1 Operable Unit (16-AMRP-0097)</i>	ESD	Apr-16	Adds one waste site to the 300-FF-2 OU and modifies the remedy for another waste site. The remedy for waste site 600-403 is RTD and the remedy for waste site 300-288:2 is RTD without backfill, to allow its use as a borrow pit.

Table A-1. CERCLA Records of Decision and Associated Changes.

<i>Explanation of Significant Differences for the 300-FF-5 Operable Unit Record of Decision, Hanford Site, Benton County, Washington (EPA 2019e)</i>	ESD	Jul-19	Allows for miscellaneous solid waste collected from 300-FF-5 groundwater OU to be transported and stored at a central location in the Central Plateau.
<i>Non-Significant Change for the 300-FF-2 and 300-FF-5 Record of Decision, and Record of Decision Amendment for 300-FF-1, Hanford Site, November 2013 (DOE, EPA and Ecology 2021)</i>	Non-Significant Change	Mar-21	Allows for purgewater to be managed at the modular storage tanks located immediately northeast of 200 East Area of the Hanford Site as considered on-site.
<b>Record of Decision – 200-Area</b>			
<b>Title:</b> Declaration of the Interim Record of Decision for the 200-ZP-1 Operable Unit (EPA/ROD/R10-95/114) <b>ROD Type:</b> CERCLA Interim Action ROD <b>Area:</b> 200 West; 200-ZP-1 OU <b>Date Approved:</b> May-95 <b>Initial Decision:</b> P&T 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.			
<b>Record of Decision</b>			
<b>Title:</b> Declaration of the Record of Decision, USDOE Hanford 200 Area, Hanford Site, Benton County, Washington (EPA/ROD/R10-97/048) <b>ROD Type:</b> CERCLA Interim Action ROD <b>Area:</b> 200 West; 200-UP-1 OU <b>Date Approved:</b> Feb-97 <b>Initial Decision:</b> Extract groundwater from high concentration zone of uranium and Tc-99 plumes and treat at Effluent Treatment Facility.			
<b>Revision Title</b>	<b>Type</b>	<b>Date</b>	<b>Revised Decision</b>
<i>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 2009b)</i>	ESD	Feb-09	Adds National MCL of 30 µg/L for uranium as ARAR for treating extracted water; replaces 190 gal/min pumping with a pumping requirement from existing and new wells consistent with approved RDR/RAWP until uranium and Tc-99 concentrations are less than 10 times the MCL for 4 consecutive quarters; adds sampling requirements and updates cost estimates and IC requirements.
<i>Record of Decision for Interim Remedial Action Hanford 200 Area Superfund Site 200-UP-1 Operable Unit (EPA 2012)</i>	Interim Action ROD	Sep-12	Supersedes previous interim action ROD (Feb-97) and ESD (Feb-09). Includes groundwater extraction/treatment (with flow path control through injection of treated water) in combination with monitored natural attenuation for Tc-99, uranium, chromium (total and hexavalent), nitrate, carbon tetrachloride, and tritium; hydraulic containment and further treatment technology evaluation for I-129; remedy performance monitoring and ICs.

Table A-1. CERCLA Records of Decision and Associated Changes.

<b>Record of Decision</b>	
<b>Title:</b> <i>Record of Decision 221-U Facility (Canyon Disposition Initiative), Hanford Site, Washington (EPA 2005b)</i> <b>FINAL</b> <b>ROD Type:</b> CERCLA Final ROD <b>Area:</b> 200 West <b>Date Approved:</b> Oct-05 <b>Initial Decision:</b> Remove waste from vessels and equipment in the facility with levels of transuranic isotopes greater than 100 nCi/g and eventual disposal 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 dispose at ERDF; demolition and subsequent stabilization of the railroad tunnel, 271-U, 276-U, 291-U, and 292-U structures and 291-U-1 and 296-U-10 stacks and dispose at ERDF; construct an engineered barrier; planting semiarid-adapted vegetation on the barrier; ICs; post-closure care; and ongoing barrier performance and groundwater monitoring.	
<b>Record of Decision</b>	
<b>Title:</b> <i>Record of Decision, Hanford 200 Area, 200-ZP-1 Operable Unit Superfund Site, Benton County, Washington (EPA 2008)</i> <b>FINAL</b> <b>ROD Type:</b> CERCLA Final ROD <b>Area:</b> 200 West; 200-ZP-1 OU <b>Date Approved:</b> Sep-08 <b>Initial Decision:</b> P&T to address carbon tetrachloride, nitrate, chromium, trichloroethylene, I-129, Tc-99, and tritium; monitored natural attenuation; flow-path control through injection of treated water; and ICs.	
<b>Record of Decision</b>	
<b>Title:</b> <i>Record of Decision, Hanford 200 Area, Superfund Site 200-CW-5 and 200-PW-1, 200-PW-3 and 200-PW-6 Operable Units Hanford Site, Benton County, Washington (EPA 2011c)</i> <b>FINAL</b> <b>ROD Type:</b> CERCLA Final ROD <b>Area:</b> 200 East and 200 West <b>Date Approved:</b> Sep-11 <b>Initial Decision:</b> RTD of soil and debris to specified depths or cleanup levels for plutonium-contaminated soils and subsurface structures/debris. Soil vapor extraction at three 200-PW-1 waste sites will continue until vadose zone cleanup levels are met. Soil covers will be used to a depth of at least 15 ft over cesium-contaminated soils. Removal of sludge followed by tank stabilization for two tanks. No action for two waste sites. ICs and long-term monitoring for waste sites where contamination is left in place and an unrestricted land use is precluded.	
ARAR = applicable or relevant and appropriate requirement.	OU = operable unit.
CERCLA = <i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980.</i>	P&T = pump-and-treat.
EPA = U.S. Environmental Protection Agency.	PCB = polychlorinated biphenyl.
ERA = expedited response action.	PRZ = Periodically Rewetted Zone.
ERDF = Environmental Restoration Disposal Facility.	RCRA = <i>Resource Conservation and Recovery Act of 1976.</i>
ESD = explanation of significant difference.	RD/RAWP = remedial design/remedial action work plan.
IC = institutional controls.	ROD = record of decision.
ISRM = in situ redox manipulation.	RTD = remove, treat, and dispose.
MCL = maximum contaminant limit.	TSD = treatment, storage, and disposal.
	WIPP = Waste Isolation Pilot Plant.

Unless otherwise noted in Table A-2, decisions made through action memoranda (AM) are considered final and are available in the TPA Administrative Record (<http://pdw.hanford.gov/arpir/>). These decisions focus mainly on the deactivation, decontamination, decommissioning, and demolition (D4) of buildings and generally are considered final actions because buildings are demolished and the waste disposed of at approved facilities; or remove, treat, and dispose of (RTD) contaminated soil from waste sites, which are generally considered final actions for individual waste sites. Slabs and contaminated soils underlying the buildings may require 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 A-2. CERCLA Action Memoranda

Title	Date	Action	Removal Action/Decision
“618-9 Burial Ground Project Plan” (91-ERB-039)	Feb-91	TCRA	Provides for trench excavation and removal of drummed liquid wastes from 618-9 Burial Ground. Treatment and/or disposal of liquids and contaminated soils (if present) is considered part of the Phase 2 activities and is not considered time critical.
“Action Memorandum Approval: 316-5 Process Trenches, USDOE Hanford Site, Richland, WA” (CCN 9103432)	Jul-91	ERA	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 initially was 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	Identifies installing a soil vapor extraction system with granular activated carbon recovery and offsite granular activated carbon regeneration at 216-Z-1A 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 the 200-PW-1 OU.
“Action Memorandum Approval: Sodium Dichromate Barrel Landfill, USDOE Hanford Site, Richland, WA” (CCN 9307470)	Mar-93	ERA	Identifies excavation and disposal of drums and homestead debris from the landfill and sampling any other wastes encountered during excavation; the expedited response would result in cleanup of the landfill to unrestricted levels.
“Action Memorandum: Expedited Response Action Proposal; Riverland Site, USDOE Hanford Site, Richland, WA” (CCN 9305567)	Jun-93	ERA	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, USDOE Hanford Site, Richland, WA” (Ecology and EPA 1994a)	Mar-94	ERA	Provides for mitigation of physical hazards, excavation of the worst-case landfill, characterization of 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 is to provide for the final removal action taken at the 100-IU-3 OU (the Wahluke Slope).
“Action Memorandum; N Springs Expedited Response Action Cleanup USDOE Hanford Site, Richland, WA” (Ecology and EPA 1994b)	Sep-94	ERA	Identifies a P&T system combined with a vertical barrier for implementation at N Springs. These systems are a component of 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; USDOE Hanford Site; Richland, Washington” (EPA and Ecology 1995)	Jun-95	ERA	Allows contaminated soil from 116-B-4, 116-B-5, and 116-C-1 to be excavated and temporarily stored pending start of ERDF operations; actions under this AM would provide additional information to support remedial design, including cost information, for 100-BC-1 OU. The ERA was not intended as a final decision; 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	Identifies ERDF as the disposal location for 183-H solar evaporation basin waste generated through cleanup activities.

Table A-2. CERCLA Action Memoranda

Title	Date	Action	Removal Action/Decision
“Action Memorandum, N Area Waste Expedited Response Action Cleanup Plan” (CCN 038546)	Nov-96	ERA	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.
“Action Memorandum; 100-B/C Area Ancillary Facilities and the 108-F Building Removal Action, USDOE Hanford Site, Richland, WA” (EPA 1997)	Jan-97	NTCRA	Identifies D4 with ERDF disposal for facilities in 100-B and 100-F Areas: 111-B, 115-B, 118-C-4, 119-B, 105-C reactor waste, and 108-F building. The B Reactor and ISS of 105-C Reactor are not included in the AM. This action is considered final for ancillary facilities and demolished portions of the reactor. Additional decisions are expected on the reactor core that is in ISS.
“Action Memorandum: Removal Action at the 233-S Plutonium Concentration Facility, USDOE Hanford Site, Benton County, WA” (DOE and EPA 1997)	Mar-97	NTCRA	Identifies D&D as the preferred alternative for 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 of at ERDF; other waste would be disposed of as appropriate.
“Action Memorandum, USDOE Hanford 100 Area NPL, 100-IU-3 Operable Unit (Wahluke Slope), Hanford Site, Adams, Grant, and Franklin Counties, WA” (Ecology and DOE, 1997)	Jul-97	TCRA	Addresses contaminated soils/drums at the 2,4-D burial ground in 100-IU-3 OU. Removal action includes excavating dioxin-contaminated soil for offsite disposal; bioremediation of 2,4-D contaminated soil; and excavating, cleaning, and disposing of drums at ERDF. In the 1994 AM for Wahluke Slope, only 2,4-D burial ground was identified for sampling. Subsequently, additional contamination was found, prompting another AM. Completing this AM action allows continuation of the process of deleting the OU from the NPL.
“Action Memorandum: USDOE Hanford 100 Area National Priorities List, 105-F and 105-DR Reactor Buildings and Ancillary Facilities, Hanford Site, Benton County, WA” (CCN 059689)	Jul-98	NTCRA	Identifies ISS for 105-F and 105-DR reactor cores and D&D for reactor components up to the cores and for 116-D, 116-DR, 117-DR, and 119-DR ancillary facilities. Demolition will extend generally to 3 ft bgs; 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 reactors. Additional decisions are expected on the reactor cores in ISS.
“Action Memorandum: USDOE Hanford 100 Area National Priorities List, 100-N Area Ancillary Facilities; Hanford Site, Benton County, WA” (DOE et al. 1998)	Dec-98	NTCRA	Provides for D&D of the inactive contaminated ancillary facilities in 100-N Area, facilities in the buffer zone, Hanford Generating Plant, and solid waste management units inside 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 100-N Area decision documents for waste sites.
“Action Memorandum: USDOE, Hanford 300 Area National Priorities List (NPL), 331-A Virology Laboratory Building, Hanford Site, Benton County, WA” (DOE and EPA 2000)	Feb-00	NTCRA	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 of at ERDF. The concrete slab and underlying soils would remain in place.

Table A-2. CERCLA Action Memoranda

Title	Date	Action	Removal Action/Decision
“Action Memorandum: USDOE Hanford 100 Area National Priorities List (NPL); 105-D and 105-H Reactor Facilities and Ancillary Facilities; Hanford Site; Benton County, WA” (DOE and Ecology 2000)	Dec-00	NTCRA	Identifies D&D for a portion of the 105-D and 105-H Reactor facilities and D&D for the 103-D unirradiated fuel element storage building, the 190-DR process water pump house, the 1713-H warehouse, and the 1720-HA arsenal. Subsurface structures and contaminated soil would be characterized and evaluated at the time of D&D. Soils and subsurface structures that exceed cleanup levels would be excavated with waste disposal primarily at ERDF and those meeting cleanup levels would be left in place and covered with 1 m of clean fill. The reactor cores would be placed in ISS for up to 75 years. This action is considered final for the ancillary facilities and demolished portions of the reactors. Additional decisions are expected on the reactor cores in ISS.
“Action Memorandum; USDOE, Hanford 100 Area National Priorities List, 105-B Reactor Facility, Hanford Site, Benton County, WA” (DOE and EPA 2001)	Dec-01	NTCRA	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 at ERDF.
“Action Memorandum; 200 West Area, Central Waste Complex, 183-H Solar Evaporation Basin Waste, Hanford Site, Benton County, WA” (DOE et al. 2003)	Jun-03	NTCRA	Allows for the treatment and disposal to ERDF of wastes generated during the RCRA closure of 183-H basin.
“Action Memorandum; USDOE, 200 Area, Burial Ground 218-W-4C Waste Retrieval, Hanford Site, Benton County, WA” (DOE et al. 2004)	Apr-04	TCRA	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	Requires 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	NTCRA	Provides for removing nonradiological and radiological hazardous substances from the 224-B facility, removing equipment and associated piping, decontaminating structure and stabilizing contamination, demolishing structure to slab, disposing of waste generated, and stabilizing area. Samples will be used to determine the need for additional cleanup of the remaining slab and any subsurface soils. These cleanup actions are not included in the AM, but deferred to future activities.

Table A-2. CERCLA Action Memoranda

Title	Date	Action	Removal Action/Decision
“Comprehensive Environmental Response, Compensation and Liability Act Non-Time-Critical Removal Action Memorandum for Removal of the 232-Z Contaminated Waste Recovery Process Facility from the Plutonium Finishing Plant” (CCN 0093881)	Nov-04	NTCRA	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	NTCRA	Provides for removing nonradiological and radiological hazardous substances from U Plant ancillary facilities, removing equipment/associated piping, decontaminating structures and stabilizing contamination, demolishing structures to slab, disposing the waste generated, and stabilizing the area around U Plant. The AM includes the specific facilities. Slabs and underlying soils will be addressed as needed through future CERCLA actions.
“Action Memorandum #1 for the 300 Area Facilities” (DOE and EPA 2005a)	Jan-05	NTCRA	Provides for D4 of 72 buildings/structures in the northern part of the 300 Area, disposing D4 waste at ERDF. An additional 10 buildings/structures were included in the EE/CA that supports the AM; however, those buildings/structures were demolished and had no hazardous materials prior to the AM.
“Action Memorandum; USDOE, 100 Area, 105-N Reactor Facility and 109-N Heat Exchanger Building, Hanford Site, Benton County, WA” (DOE and Ecology 2005)	Mar-05	NTCRA	Provides for D&D of portions of 105-N and 109-N facilities and constructing a protective cover over the 105-N Reactor block, 109-N steam generator cells and pipe gallery, placing them into ISS, and waste generally disposed of at ERDF. Final D&D of these facilities would be done in the future to allow decay of radionuclides in the reactor block. Identifies ISS as 64 years. This action is considered final for demolished portions of the reactor and heat exchange building. Additional decisions are expected on the reactor core and buildings in ISS.
“Action Memorandum for the Plutonium Finishing Plant, Above-Grade Structures Non-Time-Critical Removal Action” (DOE/RL-2005-13)	May-05	NTCRA	Provides for removing nonradiological and radiological hazardous substances from PFP above-grade structures, removing equipment/associated piping, decontaminating structures and stabilizing contamination, demolishing structures to slab, disposing the waste generated, and stabilizing and covering the area around PFP. Lists the specific structures. 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	NTCRA	Provides for D4 of 27 buildings/structures in northern part of 100-K Area with D4 waste going to ERDF. In general, slabs and subsurface structures would be removed with about 1 m of surrounding soil; however, on a case-by-case basis, the slabs, below-grade structures and soils can be deferred to CERCLA actions associated with 100-KR-1 and 100-KR-2 source OUs.

Table A-2. CERCLA Action Memoranda

Title	Date	Action	Removal Action/Decision
“Action Memorandum for the Non-Time-Critical Removal Action for the 224-T Plutonium Concentration Facility” (DOE/RL-2004-68)	Jun-05	NTCRA	Provides for removing nonradiological and radiological hazardous substances from the 224-T Facility, removing equipment/associated piping, decontaminating structure and stabilizing contamination, demolishing structure to slab, disposing of the waste generated, and stabilizing the area. Samples will determine the need for additional cleanup of the remaining slab and any subsurface soils. These cleanup actions are not included in the AM, but deferred to future activities.
“Action Memorandum for the Time-Critical Removal Action for Support Activities to 200-UW-1 Operable Unit” (DOE/RL-2005-71)	Sep-05	TCRA	Provides activities to support U Plant canyon barrier construction, including removing part of the 200-W-42 pipeline, rerouting Treated Effluent Disposal Facility line and stabilizing/removing wastewater line; complete or partial removal of concrete slab; remove and seal three vent risers; and relocate various markers/utilities. The TCRA accelerated work consistent with weather conditions and to take advantage of available specialized resources. The action is not considered final; the decision process is ongoing for U Plant waste sites. The U Plant barrier ROD is considered final.
“Action Memorandum #2 for the 300 Area Facilities” (DOE and EPA 2006a)	May-06	NTCRA	Provides for D4 of the 324 and 327 buildings and ancillary facilities in the 300 Area with D4 waste 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	NTCRA	Provides for D4 of 110 buildings/structures in southern part of the 300 Area with D4 waste going to ERDF. An additional 30 buildings/structures were included in the EE/CA that supports the AM; however, those buildings/structures are not included in the AM because DOE identified alternative uses for them.
“Action Memorandum for the Non-Time-Critical Removal Action for the 105-KE and 105-KW Reactor Facilities and Ancillary Facilities” (DOE and EPA 2007)	Jan-07	NTCRA	Identifies ISS for 105-KE and 105-KW reactor cores, D&D of reactor components up to the cores and for remaining buildings and structures in 100-K Area. Subsurface structures will be removed 3 ft bgs; substructures and soil beneath facilities that exceed cleanup levels will be evaluated through source OU cleanup activities that are considered final for the ancillary facilities and demolished portions of the reactors. Further decisions are expected on reactor cores 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	NTCRA	Provides removal, treatment as needed, and disposal, generally to ERDF, of UPR-200-E-83 Zone A soils to a depth of 6 in., or until PRGs are met, and Zone B soils in areas of elevated radioactivity above PRGs. Excavation activities must consider old growth vegetation, avoiding 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	NTCRA	Provides for removing nonradiological and radiological hazardous substances from 212-N, -P, and -R facilities equipment and associated piping; decontaminating structures, stabilizing contamination, demolishing basins and underlying soils to 1 m depth, disposing of waste generated, and stabilizing surrounding area. Samples will be collected from underlying soils to evaluate the need for additional cleanup activities.

Table A-2. CERCLA Action Memoranda

Title	Date	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	NTCRA	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 RTD alternative (3 sites). Cleanup levels will be consistent with existing 100 Area cleanup levels. If confirmatory sites do not meet cleanup levels, they will be addressed by the RTD alternative.
“Investigation-Derived Waste Purgewater Management Action Memorandum” (DOE/RL-2009-39)	Aug-09	NTCRA	Provides for additional purge water management capacity by relining an existing unit and installing up to 3 new units, each with leak-detection systems. The purge water management units will be operated according to 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	NTCRA	Provides for cleanup of 34 waste sites in the 200-MG-2 OU using a confirmatory sampling/no further action alternative (16 sites) or an RTD alternative (18 sites). If the confirmatory sites do not meet cleanup levels, they will be addressed by the RTD alternative. The remaining 200-MG-2 OU sites are not included because contamination may extend beyond 15 ft bgs; they will be addressed through the CERCLA remedial process.
“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	NTCRA	Provides for cleanup of 37 waste sites in 100-MG-1 OU using a confirmatory sampling/no further action alternative (21 sites) or RTD alternative (16 sites). Cleanup levels will be consistent with existing 100 Area cleanup levels. If confirmatory sites do not meet cleanup levels, they will be addressed by the RTD alternative. Remaining 200-MG-1 OU sites are not included because contamination may extend beyond 15 ft bgs; they will be addressed through the CERCLA remedial process.
“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	NTCRA	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.
“Action Memorandum for Decontamination, Deactivation, Decommissioning, and Demolition (D4) Activities for 200 East Tier 2 Buildings/Structures” (DOE/RL-2010-102)	Feb-11	NTCRA	Established D4 to slab-on-grade for 57 Tier 2 buildings/structures in 200 East Area; plug or grout below-grade piping and drains; remove equipment; remove and fill below-grade voids; send waste to ERDF or other approved facility for treatment and disposal; characterize nature and extent of remaining hazardous substances for future decisions; initiate waste site evaluation through WIDS for sites that may require further work; stabilize area as needed. Additions and removal of buildings have occurred through the TPA change process.
“Action Memorandum for General Hanford Site Decommissioning Activities” (DOE/RL-2010-22)	Jul-13	NTCRA	Establishes D4 for excess industrial buildings/structures and cleanup of various debris; provides for removing contaminated soil or evaluating contaminated soils for inclusion as a waste site through WIDS; identifies ERDF as the preferred location for wastes meeting ERDF disposal criteria; allows the possibility of using certain wastes in other remedial actions, such as fill material under barriers; and for incorporating additional, similar buildings and structures in the AM, as amended through the TPA change process.

Table A-2. CERCLA Action Memoranda

Title	Date	Action	Removal Action/Decision
“Action Memorandum for 200-DV-1 Operable Unit Perched Water Pumping / Pore Water Extraction” (DOE/RL-2014-34)	Dec-14	NTCRA	Provides for extraction of perched water from the 200-DV-1 OU (B tank farm complex in the 200 East Area) and transfer of the water by tanker truck or pipeline to the 200 West P&T, where it is treated and injected into the aquifer below the 200 West Area.
“Action Memorandum for 200-BP-5 Operable Unit Groundwater Extraction” (DOE/RL-2016-41)	Nov-16	NTCRA	Provides for extraction of groundwater with elevated uranium and technetium-99 concentrations from the B Complex area of the 200-BP-5 OU, conveyance of the water by pipeline to the 200 West P&T, where it is treated and injected into the aquifer below the 200 West Area.
“Action Memorandum for the REDOX Complex” (DOE/RL-2016-52)	Apr-19	NTCRA	Provides for continued surveillance and maintenance with hazard abatement of 202S Galleries, demo prep of 202S Silo Service Area, demolition of 276S, demolition and grouting of 293S, demo prep of 202S Annex and Canyon abovegrade, and demolition of 202S Annex.
“Action Memorandum for the Interim Stabilization of 216-Z-2 Crib, 216Z9 Trench, and 241Z361 Settling Tank” (DOE/RL-2020-11)	May-20	TCRA	Provides for stabilization of the 216-Z-2 Crib, 216-Z-9 Trench, and 241-Z-361 Settling Tank using engineered grout.
“Action Memorandum for the PUREX Complex” (DOE/RL-2016-53)	Mar-21	NTCRA	Provides for continued surveillance and maintenance with hazard abatement of 202A Building [Canyon, East Annex and West Annex], demo prep and demolition of 202A East and West Annexes, and demo prep of 202A Canyon abovegrade areas.
<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq.</i> <i>Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq.</i>			
AM	= Action Memorandum.	NTCRA	= non-time-critical removal action.
bgs	= below ground surface.	OU	= operable unit.
CCN	= correspondence control number.	P&T	= pump-and-treat.
CERCLA	= <i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980.</i>	PFP	= Plutonium Finishing Plant.
D4	= deactivation, decontamination, decommissioning, and demolition.	PRG	= preliminary remediation goal.
D&D	= decontamination and decommissioning.	RCRA	= <i>Resource Conservation and Recovery Act of 1976.</i>
EE/CA	= engineering evaluation/cost analysis.	ROD	= record of decision.
ERA	= expedited response action.	RTD	= remove, treat, and dispose.
ERDF	= Environmental Restoration Disposal Facility.	TCRA	= time critical removal action.
ISS	= interim safe storage.	TRU	= transuranic.
		WIDS	= Waste Information Data System.
		WIPP	= Waste Isolation Pilot Plant.

Table A-3. Permits, Licenses, and Other Statutory/Regulatory Program Decisions Affecting Hanford Site Cleanup

Document	Summary
<p><i>Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste (WA7890008967)).</i>  <b>FINAL</b>            Ecology issued a Draft Hanford Facility Dangerous Waste Permit, Rev. 9, for public review and comment from May 1, 2012, through October 22, 2012. Until Ecology reaches a final decision, Rev. 8C Permit remains in effect.</p>	<p>This dangerous waste permit for the TSD of dangerous waste at the Hanford Site is the RCRA Permit for the Hanford Facility. The permit allows a step-wise permitting process to ensure the proper implementation of the TPA. To accomplish this, the permit has six parts:</p> <ul style="list-style-type: none"> <li>• Part I, Standard Conditions</li> <li>• Part II, General Facility Conditions</li> <li>• Part III, Unit-Specific Conditions for Final Status Operations</li> <li>• Part IV, Unit-Specific Conditions for Corrective Action</li> <li>• Part V, Unit-Specific Conditions for Units Undergoing Closure</li> <li>• Part VI, Unit-Specific Conditions for Units in Post-Closure.</li> </ul>
<p><i>Hanford Site Prevention of Significant Deterioration Permit (Permit PSD-X80-14), issued to RL by the EPA, Region 10.</i>  <b>FINAL</b></p>	<p>Covers emission of NO<sub>x</sub> to the atmosphere from the Plutonium Uranium Extraction Plant and the Uranium-Trioxide Plant. No expiration date.</p>
<p>“Record of Decision: Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington” (58 FR 48509)  <b>FINAL</b></p>	<p>In December 1992, DOE issued the <i>Final Environmental Impact Statement on Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, WA (DOE/EIS-0119F)</i>. The final EIS analyzed alternatives for decommissioning 8 water-cooled, graphite-moderated plutonium-production reactors located along the Columbia River. The 8 reactors (B, C, D, DR, F, H, KE and KW) operated between 1944 and 1971 and are retired from service. The alternatives analyzed in the EIS included no action, immediate one-piece removal, safe storage followed by deferred one-piece removal, safe storage followed by deferred dismantlement, and in situ decommissioning alternatives. The ROD was signed September 10, 1993 (58 FR 48509). The ROD documented the DOE decision for safe storage followed by deferred one-piece removal of the 8 surplus reactors. DOE prepared a supplemental analysis to the EIS in July 2010 (<i>Supplement Analysis, Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington (DOE/EIS-0119F-SA-01)</i>) to broaden the possible decommissioning approach, retaining the one-piece removal option and including the option for immediate dismantlement. DOE determined that the proposed action is not a substantial change to the alternatives previously analyzed in the EIS so a supplement to DOE/EIS-0119F or new EIS is not needed.</p>
<p>“Record of Decision: Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington” (78 FR 75913)  <b>FINAL</b></p>	<p>In December 2013, DOE issued the first in a series of RODs pursuant to the <i>Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (TC&amp;WM EIS, DOE/EIS-0391, December 2012)</i>. In this ROD DOE announced several decisions, including: to implement Tank Closure Alternative 2B, “Expanded WTP Vitrification and Landfill Closure,” without supplemental treatment at WTP and without technetium-99 removal in the WTP Pretreatment facility; to implement FFTF Alternative 2 Entombment; and to implement Waste Management Alternative 2.</p>
<p>“Amended Record of Decision for the Management of Cesium and Strontium Capsules at the Hanford Site, Richland, Washington” (83 FR 23270)  <b>FINAL</b></p>	<p>This amendment to DOE’s ROD for the TC&amp;WM EIS issued in December 2013 announced DOE’s decision to move the cesium and strontium capsules from wet storage at the Waste Encapsulation and Storage Facility (WESF) to a new dry storage facility. It does not include any decisions on treatment or final disposition of the capsules.</p>



Table A-3. Permits, Licenses, and Other Statutory/Regulatory Program Decisions Affecting Hanford Site Cleanup

Document	Summary
“Amended Record of Decision for the Direct-Feed Low-Activity Waste Approach at the Hanford Site, Washington” (84 FR 424) <b><u>FINAL</u></b>	This amendment to DOE’s ROD for the TC&WM EIS issued in December 2013 announced DOE’s decision to construct and operate IX storage pad in support of implementation of DFLAW.
Hanford Site Air Operating Permit 00-05-006, Renewal 3 <b><u>FINAL</u></b>	Covers operations on the Hanford Site having a potential to emit airborne emissions. The permit provides a compilation of applicable <i>Clean Air Act of 1977</i> (42 USC 7401) requirements for radioactive and nonradioactive emissions at Hanford. It will be implemented through Federal and State programs. Effective August 1, 2019, through August 1, 2024. <ul style="list-style-type: none"> <li>• Attachment 1 contains Ecology’s permit terms and conditions.</li> <li>• Attachment 2 contains the State of Washington Department of Health Radioactive Air Emissions License (FF-01) as permit terms and conditions.</li> <li>• Attachment 3 contains the Benton Clean Air Agency permit terms and conditions applicable to the regulations of open burning and asbestos.</li> </ul>
Permit CR-IU010, <i>City of Richland 300 Area Wastewater Discharge Permit</i> <b><u>FINAL</u></b>	Allows industrial wastewater from the 300 Area combined sewer to be discharged to the city of Richland’s sanitary sewer system. Effective March 6, 2018 through March 6, 2023.
Permit ST-0004500, Washington State Department of Ecology – State Wastewater Permit <b><u>FINAL</u></b>	Allows treated wastewater from the Effluent Treatment Facility to be discharged to the State-Approved Land Disposal Site. Effective January 1, 2015 through December 31, 2019.
Permit ST-0004502, Washington State Department of Ecology – State Wastewater Permit <b><u>FINAL</u></b>	Allows treated effluent from the 200 East and 200 West Areas to be discharged to the 200 Area Treated Effluent Disposal Facility. This permit revised and replaced Permit ST-4502 and will remain in effect from July 1, 2012 to June 30, 2017.
Permit ST-0004511, Washington State Department of Ecology – State Wastewater Permit <b><u>FINAL</u></b>	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. Effective January 1, 2014 through December 31, 2019.
Permit ST0045514, Washington State Department of Ecology – State Wastewater Permit <b><u>FINAL</u></b>	Allows domestic wastewater to be treated in a non-discharging, lined evaporative lagoon located northeast of the 200 West Area. Effective January 1, 2020 through December 31, 2024.
Large Onsite Sewage Systems (LOSS) “Permit to Operate” HAN099 <b><u>FINAL</u></b>	Lists permitted onsite sewer systems in the various Hanford Site 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 A-4. Tri-Party Agreement Decisions Affecting Hanford Cleanup

TPA Documentation	Summary of Decision
<ul style="list-style-type: none"> <li>M-045-00</li> <li>Appendix I</li> </ul>	Closure will follow retrieval of as much tank waste as technically possible, with tank waste residues not to exceed 360 ft <sup>3</sup> in each of the 100-series tanks, 30 ft <sup>3</sup> in each of the 200-series tanks, or the limit of waste retrieval technology capability, whichever is less.

Table A-5. Executive Orders, Statutes and Judicial Decisions Affecting Hanford Site Cleanup

Executive Orders, Statutes and Judicial Decisions	Summary of Decision
<u>Executive Order 11514, Protection and Enhancement of Environmental Quality</u>	This order requires Federal agencies to continually monitor and control their activities to protect and enhance the quality of the environment and develop procedures to ensure the fullest practicable provision of timely public information and understanding of Federal plans and programs that may have potential environmental impacts so that interested parties can submit their views. DOE issued regulations <u>10 CFR 1021</u> , “National Environmental Policy Act Implementing Procedures” and <u>DOE O 451.1B, National Environmental Policy Act Compliance Program</u> , for compliance with this order.
<u>Executive Order 12088, Federal Compliance with Pollution Control Standards</u>	This order directs Federal agencies to comply with applicable administrative and procedural pollution control standards established by, but not limited to <i>Clean Air Act of 1977 (42 USC 7401)</i> ; <i>Noise Control Act of 1972 (42 USC 4901)</i> ; <i>Clean Water Act of 1977 (33 USC 1251)</i> ; <i>Safe Drinking Water Act of 1974 (42 USC 300f)</i> ; <i>Toxic Substances Control Act of 1976 (15 USC 2601)</i> ; and <i>RCRA (42 USC 6901)</i> .
<u>Executive Order 12580, Superfund Implementation</u>	This order delegates a number of Federal departments and agencies, including the Department of Energy, the authority and responsibility to implement certain provisions of CERCLA as lead agency under the National Contingency Plan. Policies and procedures for implementing these responsibilities (e.g., response actions and fulfilling natural resource trusteeship responsibilities) are provided in the National Contingency Plan.
<u>Federal Facilities Compliance Act of 1992.</u> <b><u>FINAL</u></b>	This act 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. Washington State, EPA, and DOE had the TPA, which addressed compliance with the storage prohibition for mixed waste at the time this law was enacted and was not required to develop a new plan.

Table A-5. Executive Orders, Statutes and Judicial Decisions Affecting Hanford Site Cleanup

Executive Orders, Statutes and Judicial Decisions	Summary of Decision
<p><i>Nuclear Waste Policy Act of 1982 (42 USC 10101).</i>  <b><u>FINAL</u></b></p>	<p>This act directed DOE to characterize and evaluate the Yucca Mountain site for suitability as a potential repository for disposal of commercial SNF and HLW. The act 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 was that HLW from atomic energy defense activities may be disposed of in the proposed repository along with SNF. 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 developing a repository for disposal of HLW and SNF, pursuant to the <i>Nuclear Waste Policy Act of 1982</i>.</p> <p>As indicated in the Obama administration's FY2010 budget request, the administration intended 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 dispose of HLW and SNF. The Obama administration directed establishing the Blue Ribbon Commission on America's Nuclear Future (Commission) to evaluate alternative approaches for meeting these obligations. The Commission submitted its final report to the Secretary of Energy in January 2012. The Commission did not evaluate Yucca Mountain or any other location and recommended an 8-element waste management approach to resolve the current impasse:</p> <ul style="list-style-type: none"> <li>• A new consent-based approach to siting future nuclear waste management facilities.</li> <li>• A new organization dedicated solely to implementing the waste management program and empowered with the authority and resources to succeed.</li> <li>• Access to the funds nuclear utility ratepayers are providing for the purpose of nuclear waste management.</li> <li>• Prompt efforts to develop one or more geologic disposal facilities.</li> <li>• Prompt efforts to develop one or more consolidated storage facilities.</li> <li>• Prompt efforts to prepare for eventual large-scale transport of SNF and HLW to consolidated storage/disposal facilities when such facilities become available.</li> <li>• Support continued U.S. innovation in nuclear energy technology and workforce development.</li> <li>• Active U.S. leadership in international efforts to address safety, waste management, non-proliferation, and security concerns.</li> </ul> <p>In January 2013, DOE responded to the Blue Ribbon Commission's final report in the <i>Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste (DOE 2013)</i>. This policy document proposes a framework for moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of SNF and HLW from civilian nuclear power generation, defense, national security, and other activities. The Strategy endorses a waste management system containing a pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shut-down reactor sites; a larger, full-scale interim storage facility by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough used nuclear fuel to reduce expected government liabilities; and the siting and characterization of repository sites to facilitate the availability of a geologic repository by 2048.</p>

Table A-5. Executive Orders, Statutes and Judicial Decisions Affecting Hanford Site Cleanup

Executive Orders, Statutes and Judicial Decisions	Summary of Decision
U.S. Department of Interior Announcement, National Historic Landmark, August 19, 2008.	Hanford's B Reactor was designated a National Historic Landmark by the U.S. Department of Interior. Since then, efforts have continued to include B Reactor in a new National Historical Park.
<u>Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year 2015</u> , Public Law 113-291.	President Obama signed the 2015 National Defense Authorization Act into law on December 19, 2014, authorizing the Manhattan Project National Historical Park. B Reactor as the world's first production reactor is a signature facility of the Manhattan Project National Historical Park.
<u>Waste Isolation Pilot Plant Land Withdrawal Act</u> (Public Law 102-579). <b><u>FINAL</u></b>	The act withdrew land from the public domain for purposes of creating and operating WIPP, the geologic repository in New Mexico designated as the national disposal site for defense TRU waste. In addition to establishing the location for the facility, the WIPP Land Withdrawal Act defines the characteristics and amount of waste that will be disposed of at the facility. Amendments to the WIPP 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 TRU waste from other RCRA requirements. WIPP does have a RCRA permit and can accept mixed TRU waste. On May 15, 2003, EPA Region 6 approved DOE's request to dispose of TRU and mixed TRU 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 SNF and mixed waste from offsite and establishes schedules for the treatment of existing HLW, TRU waste, mixed waste, and removal of SNF 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. <b><u>FINAL</u></b>	This consent decree established a court-enforceable, technically sound schedule for pumping liquid nuclear waste from the remaining 29 unstabilized SSTs. The following were the key elements of the consent decree: <ul style="list-style-type: none"> <li>• Pumping the tanks that pose the greatest environmental risk first, thus providing additional protection for the Columbia River and public health.</li> <li>• Accelerating the schedule for pumping so that 98% of approximately 6.2 million gallons of remaining pumpable liquid is removed by September 30, 2003, with the final 2% scheduled to be removed by September 30, 2004 (this was completed).</li> <li>• Increasing DOE funding to a level that supports successful execution of the new schedule for tank stabilization.</li> <li>• Work under the consent decree has been completed and the court has terminated the consent decree.</li> </ul>
<u>Presidential Proclamation 7319, Establishment of the Hanford Reach National Monument</u> (June 9, 2000). <b><u>FINAL</u></b>	This proclamation set apart and reserved the Hanford Reach National Monument to protect all lands and interests in lands owned or controlled by the U.S. Government 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.

Table A-5. Executive Orders, Statutes and Judicial Decisions Affecting Hanford Site Cleanup

Executive Orders, Statutes and Judicial Decisions	Summary of Decision
<u>Executive Order 13175, Consultation and Coordination with Indian Tribal Governments</u> (November 6, 2000). <b><u>FINAL</u></b>	This 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.
<i>Memorandum of Agreement Between the U.S. Department of the Interior and the U.S. Department of Energy for the Manhattan Project National Historical Park</i> (November 10, 2015) (DOI and DOE 2015)	The Memorandum of Agreement defines the roles and responsibilities of the two agencies in managing the Manhattan Project National Historical Park which includes facilities at all three of the original Manhattan Project locations – Oak Ridge, Tennessee; Los Alamos, New Mexico; and the Hanford Site. At the Hanford Site, the B Reactor National Historic Landmark, the Bruggemann Warehouse, the 1908 Hanford Irrigation District Pump House, the White Bluffs Bank, and the Hanford High School from the Town of Hanford and Hanford Construction Camp historic district are included in the Park.
Consent Decree in <i>State of Washington v. Department of Energy</i> , Case No. CV-08-5085-FVS (E.D. Wa. October 25, 2010)	The Consent Decree imposes milestones for the construction and initial operation of the WTP, as well as retrieval of waste from certain SSTs. The Consent Decree also covers reporting requirements for waste retrievals from SSTs, regulatory coordination, and a process to resolve disputes between the agencies.
<i>Amended Consent Decree Between Department of Energy and State of Washington</i> , Case No. 2:08-CV-5085-RMP (E.D. Wa. March 11, 2016)	The Amended Consent Decree generally continued the existing milestones from the 2010 Consent Decree but extended the milestone dates and added additional reporting requirements. One new milestone of note is B-3, which requires DOE retrieve at least 5 of the Consent Decree SSTs by December 31, 2020.
<i>Second Amended Consent Decree Between Department of Energy and State of Washington</i> , Case No. 2:08-CV-5085-RMP (E.D. Wa. April 12, 2016)	Parties agreed-to modifications of the Amended Consent Decree concerning the purchase and availability of a spare reboiler for the 242-A Evaporator, and associated reporting requirements.
<i>Third Amended Consent Decree Between Department of Energy and State of Washington</i> , Case No. 2:08-CV-5085-RMP (E.D. Wa. Oct. 12, 2018)	The court extended the B-2 and B-3 tank retrieval milestones. The B-2 milestone was extended by two-and-a-half years (i.e., from March 31, 2024, to September 30, 2026), and the B-3 milestone was extended by six months (i.e., from December 31, 2020, to June 30, 2021).
<i>Order Modifying Amended Consent Decree Between U.S. Department of Energy and State of Washington</i> , Case No. 2:08-cv-5085-RMP (E.D. Wa. December 10, 2020)	Parties agreed that the novel coronavirus (COVID-19) pandemic constitutes a <i>force majeure</i> event justifying amendment to the previously established milestone dates.

Table A-5. Executive Orders, Statutes and Judicial Decisions Affecting Hanford Site Cleanup

Executive Orders, Statutes and Judicial Decisions	Summary of Decision
<p><i>Settlement Agreement between the State of Washington and the U.S. Department of Energy</i> (No. 2:03-CV-05018-AAM January 6, 2006). <b>FINAL</b></p>	<p>Prior to the issuance of the <i>Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement, Richland, Washington</i> (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”), the State initiated litigation on issues related to the importation, treatment, and disposal of radioactive and hazardous waste generated off the Hanford Site as a result of nuclear defense and research activities. The court enjoined shipment of offsite TRU waste to Hanford for processing and storage pending shipment to WIPP located near Carlsbad, New Mexico. DOE, Washington State, and the U.S. Department of Justice signed a Settlement Agreement ending the litigation on January 6, 2006. The agreement is intended to resolve the State’s concerns about HSW EIS (DOE/EIS-0286F) groundwater and other analyses. The agreement specifies that when the <i>Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington</i> (DOE/EIS-0391) is complete, it will supersede the HSW EIS. Until that time, DOE will not rely on HSW EIS groundwater analyses for decision-making and will not import offsite waste to Hanford with certain limited exemptions as specified in the agreement. The Tank Closure –Waste Management Environmental Impact Statement is now complete. DOE continues to prohibit the importation of waste from off the Hanford Site at least until the Waste Treatment Plant is operating.</p>
<p>CERCLA = <i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980.</i> DOE = U.S. Department of Energy. DST = double-shell tank. EPA = U.S. Environmental Protection Agency. HLW = high-level waste. HSW EIS = <i>Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement, Richland, Washington.</i></p>	<p>INL = Idaho National Laboratory. PCB = polychlorinated biphenyl. RCRA = <i>Resource Conservation and Recovery Act of 1976.</i> SNF = spent nuclear fuel. SST = single-shell tank. TPA = Tri-Party Agreement. TRU = transuranic. WIPP = Waste Isolation Pilot Plant. WTP = Waste Treatment Plant.</p>

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## **APPENDIX B**

### **FUTURE CLEANUP ACTIONS AND ALTERNATIVE ANALYSES**

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## TERMS

2013 LCR	DOE/RL-2012-13, <i>2013 Hanford Lifecycle Scope, Schedule and Cost Report</i>
ABAR	aggregate barrier
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
CSNA	confirmatory sampling to support no further cleanup action
CSS	cask storage system
D&D	decontamination and decommissioning
D4	deactivation, decontamination, decommissioning, and demolition
DOE	U.S. Department of Energy
DST	double-shell tank
DWMU	dangerous waste management unit
Ecology	Washington State Department of Ecology
EE/CA	engineering evaluation/cost analysis
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESD	explanation of significant differences
ETF	Effluent Treatment Facility
FBSR	fluidized bed steam reforming
FFTF	Fast Flux Test Facility
FY	fiscal year
HLW	high-level waste
IBAR	individual barrier
IC	institutional controls
IDF	Integrated Disposal Facility
IHLW	immobilized high-level waste
ILAW	immobilized low-activity waste
INL	Idaho National Laboratory
ISS	interim safe storage
LAW	low-activity waste
LCR	Lifecycle Report
LERF	Liquid Effluent Retention Facility
LTS	long-term stewardship
MESC	maintain existing soil cover
MNA	monitored natural attenuation
N/A	not applicable
NEPA	<i>National Environmental Policy Act of 1969</i>
NRDWL	Nonradioactive Dangerous Waste Landfill
OU	operable unit
P&T	pump-and-treat
PFP	Plutonium Finishing Plant
PNNL	Pacific Northwest National Laboratory
PUREX	Plutonium Uranium Extraction (Plant)
PRB	permeable reactive barrier
RAO	remedial action objective
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
REDOX	Reduction-Oxidation Facility (S Plant)
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RTD	remove, treat, and dispose of

SALDS	State-Approved Land Disposal Site
S&M	surveillance and maintenance
SSE	safe storage enclosure
SST	single-shell tank
SWL	solid waste landfill
TBD	to be determined
TC&WM EIS	<i>Tank Closure and Waste Management Environmental Impact Statement</i>
TI	technical impracticability
TPA	Tri-Party Agreement
TPH-D	total petroleum hydrocarbon-diesel
Tri-Party Agencies	U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington State Department of Ecology
Tri-Party Agreement	<i>Hanford Federal Facility Agreement and Consent Order</i>
TRU	transuranic
TSD	treatment, storage, and disposal
WAC	<i>Washington Administrative Code</i>
WESF	Waste Encapsulation and Storage Facility
WRAP	Waste Receiving and Processing Plant
WTP	Hanford Tank Waste Treatment and Immobilization Plant



## APPENDIX B

### FUTURE CLEANUP ACTIONS AND ALTERNATIVE ANALYSES

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 [LCR]) may 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 implement cleanup actions at the Hanford Site. As discussed in Section B.1, the LCR has grouped remaining Hanford Site cleanup work into the cleanup actions listed in Table B-1.

DOE has decided that information about the range of plausible alternatives, rather than just a range of alternative costs, would be most useful for the LCR. 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 B.2 includes information about the range of plausible alternatives for each future cleanup action.

Because many final decisions remain to be made, a reasonable upper bound was defined, along with schedule and costs, for a number of remaining 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 B.3 proposes a rationale and schedule for when different cleanup actions may undergo in-depth alternatives analyses in the LCR.

Information provided in this Appendix B has been developed for the sole purpose of preparing the LCR and fulfilling the requirements of TPA M-036-01; the LCR is not a decision-making document. Cleanup actions and decisions discussed in this Appendix B are still undergoing formal development, review, and eventual approval pursuant to procedures established in the TPA and applicable Federal and State requirements. Information in this appendix does not presume nor is it intended to prejudice the outcome of the requirements that must be followed by the Tri-Party 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.

#### **B.1 IDENTIFYING FUTURE CLEANUP ACTIONS FOR THE HANFORD SITE**

The term “cleanup action” is used to conceptually describe work that enables cleanup to proceed for common or related contaminants that occur in a relatively well-defined environmental medium (or waste management system) within a generally contiguous geographic area.

This cleanup action concept is consistent with the operable unit (OU) cleanup approach taken in the TPA and enables future cleanup actions and alternatives to be addressed in a manner consistent with the way cleanup decisions are being made for Hanford. This approach also provides a reasonable middle ground for looking at cleanup work performed on Site.

The Tri-Party agencies developed a set of cleanup actions for the LCR. Table B-1 lists the future cleanup actions for which final cleanup decisions do not yet exist.

Table B-1. Future Cleanup Actions for which Final Decisions Have Not Been Made

<b>River Corridor Cleanup Actions</b>	
<ul style="list-style-type: none"> <li>• Disposition N Reactor</li> <li>• Disposition 100 Area K West Basin</li> <li>• Remediate 100 Area Contaminated Soil Sites</li> <li>• Restore 100-BC-5 Groundwater OU to Beneficial Use</li> <li>• Restore 100-KR-4 Groundwater OU to Beneficial Use</li> <li>• Restore 100-NR-2 Groundwater OU to Beneficial Use</li> <li>• Disposition 300 Area Facilities Retained by PNNL</li> <li>• Disposition 100 Area former Orchard Contaminated Soil Sites (100-OL-1 OU)</li> </ul>	
<b>Central Plateau Cleanup Actions<sup>1</sup></b>	
<ul style="list-style-type: none"> <li>• Disposition Remaining Outer Area Buildings and Facilities (200-OA-1 OU)</li> <li>• Remediate Remaining Outer Area Contaminated Soil Sites (200-OA-1, 200-CW-1, and 200-CW-3 OUs)</li> <li>• Disposition Below-Grade Portions of Plutonium Finishing Plant</li> <li>• Disposition B Plant Canyon Building/Associated Waste Sites (200-CB-1 OU)</li> <li>• Disposition PUREX Canyon Building/Associated Waste Sites (200-CP-1 OU)</li> <li>• Disposition PUREX Storage Tunnels (200-CP-1 OU)</li> <li>• Disposition REDOX Canyon Building/Associated Waste Sites (200-CR-1 OU)</li> <li>• Disposition T Plant Canyon Building/Associated Waste Sites</li> <li>• Disposition Cesium/Strontium Capsules</li> <li>• Remediate Solid Waste Landfill and Non-Radioactive Dangerous Waste Landfill (200-SW-1 OU)</li> <li>• Disposition Remaining Liquid Waste Disposal Facilities</li> <li>• Disposition Remaining Waste Treatment, Storage, and Disposal Facilities</li> <li>• Remediate Pipelines, Pits, Diversion Boxes and Associated Tanks (200-IS-1 OU)</li> <li>• Remediate Land Disposal Units (200-SW-2 OU)</li> <li>• Remediate Remaining 200 West Inner Area Contaminated Soil Sites (200-WA-1 OU) including the BC Control Area (200-BC-1)</li> <li>• Remediate Remaining 200 East Inner Area Contaminated Soil Sites (200-EA-1 OU)</li> <li>• Disposition Remaining Inner Area Buildings and Facilities</li> <li>• Remediate Contaminated Deep Vadose Zone (200-DV-1 OU)</li> <li>• Restore 200 West Groundwater to Beneficial Use (200-UP-1 OU)</li> <li>• Restore 200 East Groundwater to Beneficial Use (200-PO-1 and 200-BP-5 OUs)</li> </ul>	
<b>Tank Waste Cleanup Actions</b>	
<ul style="list-style-type: none"> <li>• Tank Retrieval and Single-Shell Tank Farm Closure</li> <li>• Tank Waste Treatment</li> <li>• Secondary Waste Treatment</li> <li>• Double-Shell Tank Closure</li> <li>• Waste Treatment and Immobilization Plant Closure</li> </ul>	
<p><sup>1</sup>While the 200-IA-1 OU has been administratively created and waste sites reassigned to it from other OU (primarily 200-WA-1 and 200-EA-1), the remediation scope for these waste sites had not be separated from their previous OU assignments. The decision documentation and cost will be reflected in future LCR.</p> <p>OU = operable unit. REDOX = Reduction-Oxidation Facility (S Plant).  PUREX = Plutonium Uranium Extraction (Plant).</p>	

Cleanup work at Hanford 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 LCR will evolve over time and may have a different scope in future reports as progress is made in completing Hanford cleanup.

## **B.2 IDENTIFYING RANGES OF PLAUSIBLE ALTERNATIVES AND ANALYZING ALTERNATIVES FOR FUTURE CLEANUP ACTIONS**

The LCR provides information about ranges of plausible alternatives for future cleanup actions. Alternatives are included based on current understandings among the Tri-Party agencies, the status of existing and forthcoming cleanup decisions, and whether current planning adequately encompasses the range of plausible alternatives. The Tri-Party agencies developed and maintain the range of plausible alternatives presented in Section B.2.1.

As discussed further in Section B.2.2, a more in-depth analyses of the alternatives for individual future cleanup actions will be performed to describe a reasonable upper bound for the scope and costs of a specific cleanup action. The Tri-Party agencies have agreed to take a graded approach and to consider analyzing alternatives and develop a reasonable upper bound scope and cost estimate as a sensitivity analysis for a limited set of future cleanup actions in the LCR. The main reasons for this approach include the following:

- Developing and analyzing alternatives for every separate cleanup action in every LCR 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 are under way, the results of which will improve the ability to analyze alternatives in future LCRs.

In lieu of analyzing alternatives for all cleanup actions, the LCR proposes a schedule and rationale for when different cleanup actions may be considered to undergo in-depth analyses. Section B.3 provides this information.

### **B.2.1 Range of Plausible Alternatives**

The range of plausible alternatives for each future cleanup action was originally developed through a series of working sessions involving the Tri-Party agencies' subject matter experts applying their knowledge of Hanford Site cleanup work and best professional judgment. Each range of plausible alternatives, in the opinion of the agency experts, has alternatives that include a maximum cleanup effort (e.g., a likely upper bound) for that cleanup action. In addition, the range of plausible alternatives exclude alternatives that could not be part of a reasonable upper bound (e.g., no action). Determining 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 was intended to encompass the most current planning assumptions with respect to that cleanup action. The Tri-Party agencies update this list in each LCR.

Tables B-2, B-3, and B-4 list and are organized by the identified future cleanup actions for the River Corridor, Central Plateau, and tank waste. 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 with a list of relevant cleanup decision documents
- A list that encompasses the likely range of plausible alternatives.

Table B-2. Summary of Future Cleanup Actions and Plausible Alternatives – River Corridor

CLEANUP ACTION:	RC-1a <sup>1</sup> River Corridor – Disposition N Reactor
<p><b>Cleanup Decision Summary and Relevant Decision Documents</b></p> <p>In September 1993, DOE issued 58 FR 48509, “Record of Decision: Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, WA,” which implements the recommendation for safe storage followed by deferred one-piece removal of the surplus reactors. N Reactor was not included in the EIS because the reactor was not available for decommissioning at the time of the NEPA EIS and ISS was approved through the CERCLA removal action process (DOE and Ecology 2005). Final disposition of N Reactor will be determined by a subsequent NEPA or CERCLA decision process.</p> <ul style="list-style-type: none"> <li>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.</li> </ul>	
<p><b>Range of Plausible Alternatives</b></p> <ul style="list-style-type: none"> <li>Demolish the reactor block in ISS and transport the reactor block intact on a tractor transporter from the present 100 Area location to the 200 West Area for disposal.</li> <li>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 block and transport of the reactor block intact on a tractor transporter from the present 100 Area location to the 200 West Area for disposal.</li> <li>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 core and transport of radioactive waste to the 200 West Area for burial. Demolition of the reactor buildings and SSE and filling voids beneath and around the reactor block; covering the reactor block, adjacent shield walls, and the spent fuel storage basin together with the contained radioactivity, gravel, and grout to a depth of at least 5 meters with a mound containing earth and gravel.</li> </ul>	
CLEANUP ACTION:	RC-2 River Corridor – Disposition 100 Area K West Basin
<p><b>Cleanup Decision Summary and Relevant Decision Documents</b></p> <p>An interim ROD, ROD amendment, and action memorandum are in place for the removal, treatment, and interim onsite storage of spent nuclear fuel and sludge from the K Basins.</p> <ul style="list-style-type: none"> <li>EPA/ROD/R10-99/059, 1999, <i>Declaration of the Record of Decision for the 100-KR-2 Operable Unit, Hanford Site, Benton County, Washington</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>DOE and EPA, 2004, <i>Action Memorandum: Request for Time Critical Response for Treatment and Disposal of Sludge from the 105-K East North Loadout Pit, USDOE Hanford Site</i>, U.S. Department of Energy, Richland Operations Office and U.S. Environmental Protection Agency, Richland, Washington, June 4.</li> <li>EPA, 2005, <i>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</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> </ul>	
<p><b>Range of Plausible Alternatives</b></p> <ul style="list-style-type: none"> <li>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.*</li> </ul> <p>*May require removing K Reactors to access below-grade contaminated soils. K East Basin was demolished in 2009.</p>	

Table B-2. Summary of Future Cleanup Actions and Plausible Alternatives – River Corridor

CLEANUP ACTION:	RC-3 River Corridor – Remediate 100 Area Contaminated Soil Sites
<p><b>Cleanup Decision Summary and Relevant Decision Documents</b></p> <p>Interim RODs, ROD amendments, ESDs, and annual fact sheets (100 Area “Plug-In” and Candidate Waste Sites for fiscal year [FY] 2010, 2011, 2012, 2014, 2016 and 2017) are in place to remove contaminated soil, structures, debris, and burial grounds using the observational and plug-in approaches with onsite disposal at ERDF.</p> <ul style="list-style-type: none"> <li>• <u>EPA, 2004</u>, <i>Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• <u>08-AMRC-0033</u>, 2007, <i>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)</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• <u>EPA, 2009a</u>, <i>Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• <u>EPA, 2011</u>, <i>Explanation of Significant Differences for the 100-NR-1 and 100-NR-2 Operable Units Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• <u>EPA, 2013</u>, <i>Explanation of Significant Difference for the 100-NR-1 and 100-NR-2 Operable Units Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• <u>EPA/ROD/R10-95/126</u>, 1995, <i>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</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• <u>EPA/AMD/R10-97/044</u>, 1997, <i>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</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• <u>EPA/ROD/R10-99/039</u>, 1999, <i>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</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• <u>EPA/ROD/R10-99/112</u>, 1999, <i>Interim Remedial Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units, Hanford Site, Benton County, Washington</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• <u>EPA/ESD/R10-00/045</u>, 2000, <i>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</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• <u>EPA/ROD/R10-00/120</u>, 2000, <i>Interim Remedial Action Record of Decision for the 100-NR-1 Operable Unit, Hanford Site, Benton County, Washington</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• <u>EPA/ESD/R10-03/605</u>, 2003, <i>Explanation of Significant Difference 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</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• <u>EPA/ROD/R10-00/121</u>, 2000, <i>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, 100-KR-2 Operable Units</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• <i>Resource Conservation and Recovery Act of 1976, (42 USC 6901), et seq.</i></li> </ul>	

Table B-2. Summary of Future Cleanup Actions and Plausible Alternatives – River Corridor

<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>• RTD contaminated soil sites to achieve RAOs* and applicable closure performance standards**; backfill, contour, and revegetate excavations.</li> </ul> <p><b>Note:</b> The 100 Area interim RODs for waste sites will be covered by the final RODs for the River Corridor currently being worked through the RI/FS process (see Appendix A, Table A-1).</p> <p>If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.</p> <p>* In accordance with applicable interim action RODs.</p> <p>** Closure of several 100-N facilities will be according to approved RCRA closure plans.</p>	
<b>CLEANUP ACTION:</b>	<b>RC-4.1 River Corridor – Restore 100-BC-5 Groundwater OU to Beneficial Use</b>
<b>Cleanup Decision Summary and Relevant Decision Documents</b> <p>The Proposed Plan was approved in September 2019. The public comment period was initiated on October 7, 2019 through December 9, 2019. Responsiveness Summaries are being incorporated into the final Record of Decision. Groundwater monitoring and annual reporting continue to track groundwater contamination in this OU.</p> <ul style="list-style-type: none"> <li>• DOE/RL-2016-43, 2019, <i>Proposed Plan for Remediation of the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• WAC 173-340, “Model Toxics Control Act -- Cleanup,” <i>Washington Administrative Code</i>, Olympia, Washington. <ul style="list-style-type: none"> <li>– WAC 173-340-720, “Groundwater Cleanup Standards.”</li> </ul> </li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>• Natural attenuation with institutional controls (IC), RTD, and no action for waste sites; and monitored natural attenuation (MNA) with ICs for groundwater.</li> <li>• Natural attenuation with ICs, RTD, and no action for waste sites; and P&amp;T and MNA with ICs for groundwater.</li> <li>• Natural attenuation with ICs, aggressive RTD, and no action for waste sites; and P&amp;T and MNA with ICs for groundwater.</li> <li>• Natural attenuation with ICs, RTD, and no action for waste sites; and hexavalent chromium (Cr[VI]) source treatment with P&amp;T, and MNA with ICs for groundwater.</li> <li>• Natural attenuation with ICs, aggressive RTD, and no action for waste sites; and Cr(VI) source treatment with P&amp;T, and MNA with ICs for groundwater.</li> </ul> <p>If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.</p>	
<b>CLEANUP ACTION:</b>	<b>RC-4.2 River Corridor – Restore 100-KR-4 Groundwater OU to Beneficial Use</b>
<b>Cleanup Decision Summary and Relevant Decision Documents</b> <p>An interim ROD and multiple ESDs are in place to clean up hexavalent chromium in the groundwater using P&amp;T.</p> <ul style="list-style-type: none"> <li>• EPA, 2019a, <i>Explanation of Significant Differences for the 100-KR-4 Operable Unit Interim Action Record of Decision, Hanford Site Benton County, Washington</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• EPA, 2009b, <i>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</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• EPA/ROD/R10-96/134, 1996, <i>Declaration of the Record of Decision for the 100-HR-3 and 100-KR-4 Operable Units, Hanford Site, Benton County, Washington</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• WAC 173-340, “Model Toxics Control Act -- Cleanup,” <i>Washington Administrative Code</i>, Olympia, Washington. <ul style="list-style-type: none"> <li>– WAC 173-340-720, “Groundwater Cleanup Standards.”</li> </ul> </li> </ul>	

Table B-2. Summary of Future Cleanup Actions and Plausible Alternatives – River Corridor

<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>Expand the P&amp;T system in 100-KR-4; transition to S&amp;M for post-treatment groundwater monitoring.</li> <li>Continue operation of P&amp;T system with incorporation of bioremediation for chromium.</li> <li>Allow monitored natural attenuation to proceed under LTS with institutional controls.</li> </ul> <p>If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.</p>	
<b>CLEANUP ACTION:</b>	<b>RC-4.3 River Corridor – Restore 100-NR-2 Groundwater OU to Beneficial Use</b>
<b>Cleanup Decision Summary and Relevant Decision Documents</b> <p>An action memorandum, interim ROD, ROD amendment and ESD are in place to clean up strontium-90 in the groundwater using P&amp;T and physical barriers. An in situ apatite permeable reactive barrier (PRB) is being evaluated for use in the cleanup of strontium-90 in groundwater. The initial draft of the Proposed Plan was submitted in June 2013. In October 2017, it was mutually agreed that a Draft B of the Proposed Plan was the best course of action and action was taken to support this decision. Ongoing dialogue surrounding Technical Impracticability waiver and its incorporation into the Proposed Plan has continued to delay its delivery.</p> <ul style="list-style-type: none"> <li>EPA, 2019b, <i>Explanation of Significant Differences for the 100-NR-2 Operable Unit Interim Action Record of Decision, Hanford Site, Benton County, Washington</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>DOE/RL-2012-68, 2013, <i>Proposed Plan for Remediation of the 100-NR-1 and 100-NR-2 Operable Units</i>, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>EPA, 2010, <i>Amended Record of Decision, Decision Summary and Responsiveness Summary U.S. Department of Energy 100-NR-1 and NR-2 Operable Units, Hanford Site – 100 Area, Benton County, Washington</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>EPA/ESD/R10-03/605, 2003, <i>Explanation of Significant Difference 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</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>EPA/ROD/R10-99/112, 1999, <i>Interim Remedial Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units, Hanford Site, Benton County, Washington</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>Ecology and EPA, 1994, “Action Memorandum; N Springs Expedited Response Action Cleanup U.S. Department of Energy Hanford Site, Richland, WA” (letter to R. Izatt, U.S. Department of Energy, Richland Operations Office from R.F. Smith, U.S. Environmental Protection Agency and D. Butler, Washington State Department of Ecology), U.S. Environmental Protection Agency, Richland, Washington, September 23.</li> <li>WAC 173-340, “Model Toxics Control Act -- Cleanup,” <i>Washington Administrative Code</i>, Olympia, Washington.</li> <li>– WAC 173-340-720, “Groundwater Cleanup Standards.”</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>RTD at waste sites, apatite PRB for near-shore strontium-90, technical impracticability (TI) waiver for upland strontium-90, bioventing for total petroleum hydrocarbon-diesel (TPH-D) in vadose zone, MNA for TPH-D in groundwater, groundwater monitoring, and ICs.</li> <li>RTD at waste sites, apatite PRB for near-shore strontium-90, TI waiver for upland strontium-90, bioventing and biosparging for TPH-D, groundwater monitoring, and ICs.</li> <li>RTD at waste sites, apatite PRB for near-shore strontium-90, TI waiver for upland strontium-90, bioventing and biosparging for TPH-D, in situ biological treatment for nitrate, groundwater monitoring, and ICs.</li> <li>RTD at waste sites, apatite PRB for near-shore strontium-90, apatite treatment and TI waiver for upland strontium-90; bioventing and biosparging for TPH-D, in situ biological treatment for nitrate, groundwater monitoring, and ICs.</li> </ul> <p>If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.</p>	

Table B-2. Summary of Future Cleanup Actions and Plausible Alternatives – River Corridor

CLEANUP ACTION:	RC-5 River Corridor – Disposition 300 Area Facilities Retained By PNNL
<b>Cleanup Decision Summary and Relevant Decision Documents</b> 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 the facility is removed in accordance with an applicable action memorandum. The removal action work plan will need to be modified to address PNNL-retained facilities once PNNL declares the facilities as surplus. 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. <ul style="list-style-type: none"> <li>• DOE and EPA, 2005, <i>Action Memorandum #1 for the 300 Area Facilities</i>, U.S. Department of Energy, Richland Operations Office and U.S. Environmental Protection Agency, Richland, Washington, January 20.</li> <li>• DOE and EPA, 2006a, <i>Action Memorandum #2 for the 300 Area Facilities</i>, U.S. Department of Energy, Richland Operations Office and U.S. Environmental Protection Agency, Richland, Washington, May 16.</li> <li>• DOE and EPA, 2006b, <i>Action Memorandum #3 for the 300 Area Facilities</i>, U.S. Department of Energy, Richland Operations Office and U.S. Environmental Protection Agency, Richland, Washington, November 30.</li> <li>• 16-PNSO-0057, 2015, <i>Need for the Pacific Northwest National Laboratory (PNNL) Occupied/Operated 300 Area Environmental Management (EM) Facilities Anticipated to Extend Through 2045</i>, Memorandum from R.E. Snyder, U.S Department of Energy Pacific Northwest Site Office to S.L. Charboneau, U.S Department of Energy Richland Operations Office, November 25.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>• Following end of PNNL facilities' operational period (no earlier than 2045), D4 all buildings and facilities; remediate consistent with 300 Area contaminated soil sites if needed.</li> </ul>	
CLEANUP ACTION:	RC-6 River Corridor – Disposition 100 Area former Orchard Contaminated Soil Sites (100-OL-1 OU)
<b>Cleanup Decision Summary and Relevant Decision Documents</b> No cleanup decisions have been made for the 100 Area former Orchard Contaminated Soil Sites (100-OL-1 OU). The Remedial Investigation, Draft B was submitted to Washington State Department of Ecology and U.S. Environmental Protection Agency in June 2021, and the Feasibility Study, Draft A was submitted in August 2021. <ul style="list-style-type: none"> <li>• TBD – No approved decision documents currently available.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>• RTD contaminated soil sites from residual lead arsenate pesticide to achieve RAOs, backfill, contour, and revegetate excavations.</li> <li>• Cover contaminated soil sites with clean soil (depth TBD) and establish institutional controls.</li> </ul> If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.	
D4 = deactivation, decontamination, decommissioning, and demolition. D&D = decontamination and decommissioning. DOE = U.S. Department of Energy. EIS = environmental impact statement. ERDF = Environmental Restoration Disposal Facility. ESD = explanation of significant differences. ISS = interim safe storage. LTS = long-term stewardship. NEPA = <i>National Environmental Policy Act of 1969</i> . OU = operable unit.	P&T = pump-and-treat. PNNL = Pacific Northwest National Laboratory. RAO = remedial action objective. RCRA = <i>Resource Conservation and Recovery Act</i> . RI/FS = remedial investigation/feasibility study. ROD = record of decision. RTD = remove, treat, and dispose. S&M = surveillance and maintenance. SSE = safe storage enclosure. WAC = <i>Washington Administrative Code</i> .
<sup>1</sup> RC-1 River Corridor – Disposition 100 Area Reactors (Except B Reactor) was removed from the LCR in response to comments that the 1993 National Environmental Policy Act ROD is considered a final action (see Appendix A, Table A-3)	



Table B-3. Summary of Future Cleanup Actions and Plausible Alternatives – Central Plateau

Cleanup Action:	CP-1 Central Plateau – Disposition Remaining Miscellaneous Buildings and Facilities
<b>Cleanup Decision Summary and Relevant Decision Documents</b> 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. <ul style="list-style-type: none"> <li>• DOE/RL-2008-80, 2009, <i>Action Memorandum for the Non-Time-Critical Removal Action for the 212-N, -P and -R Facilities</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• DOE/RL-2008-80-ADD1, 2010, <i>Action Memorandum for the Non-Time Critical Removal Action for the 212-N, 212-P, and 212-R Facilities, Addendum 1: Disposition of Railcars</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• DOE/RL-2010-22, 2013, <i>Action Memorandum for General Hanford Site Decommissioning Activities</i>, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>• 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.</li> </ul>	
Cleanup Action:	CP-2 Central Plateau – Remediate Remaining Outer Area Contaminated Soil Sites (200-OA-1, 200-CW-1, and 200-CW-3 OUs)
<b>Cleanup Decision Summary and Relevant Decision Documents</b> An interim ROD, ESD, and action memoranda are in place to remove contaminated soil, structures, and debris with disposal at ERDF. Future cleanup decisions for remaining soil sites will be included in decision documents (e.g., action memoranda, RODs). <ul style="list-style-type: none"> <li>• EPA/ROD/R10-99/039, 1999, <i>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</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• EPA, 2009a, <i>Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• DOE/RL-2009-48, 2009, <i>Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• DOE/RL-2009-37, 2009, <i>Action Memorandum for Non-Time-Critical Removal Action for 200-MG-2 Operable Unit</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• DOE/RL-2009-86, 2010, <i>Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>• RTD contaminated soil sites to achieve RAOs comparable to 100 Areas; backfill, contour, and revegetate excavations.</li> <li>• RTD all sites except ponds; allow monitored natural attenuation for large pond sites with presence of existing vegetated soil covers.</li> <li>• Allow monitored natural attenuation to proceed for all sites with appropriate institutional controls.</li> </ul> If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.	

Table B-3. Summary of Future Cleanup Actions and Plausible Alternatives – Central Plateau

Cleanup Action:	CP-3 Central Plateau – Disposition Below-Grade Portions of Plutonium Finishing Plant
<b>Cleanup Decision Summary and Relevant Decision Documents</b> A non-time critical action memorandum is in place, associated TPA milestone decision documents are approved, and D4 activities are being implemented for above-grade structures of PFP*. Final decisions and cleanup actions have not been made for below-grade structures/contaminated areas and are not identified in the action memorandum. <ul style="list-style-type: none"> <li>DOE/RL-2005-13, 2005, <i>Action Memorandum for the Plutonium Finishing Plant, Above-Grade Structures Non-Time Critical Removal Action</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> </ul> <p>*Below-grade rooms (e.g., basements, tunnels, vaults) of above-grade structures are included but sub-grade items (e.g., buried piping) are excluded.</p>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>Evaluate below-grade portions for residual contamination; leave remaining below-grade structures and contaminated areas in place and transition to LTS with appropriate institutional controls.</li> <li>RTD all PFP below-grade structures and contaminated areas; backfill and revegetate.</li> </ul> <p>If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.</p>	
Cleanup Action:	CP-4 Central Plateau – Disposition B Plant Canyon Building/Associated Waste Sites (200-CB-1 OU)
<b>Cleanup Decision Summary and Relevant Decision Documents</b> A non-time critical action memorandum is in place to perform continued surveillance and maintenance with hazard abatement and demolition preparation activities at B Plant (221B) and demolition of above-grade structures with grouting of below-grade structures for the 291B Ventilation System. Future cleanup decisions for remaining buildings and waste sites will be included in decision documents (e.g., action memoranda, RODs). <ul style="list-style-type: none"> <li>DOE/RL-2010-102, 2011, <i>Action Memorandum for Decontamination, Deactivation, Decommissioning, and Demolition (D4) Activities for 200 East Tier 2 Buildings/Structures</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>DOE/RL-2016-51, 2021, <i>Action Memorandum for the B Plant Complex</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>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 of all waste and debris at approved facility.</li> <li>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 of 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.</li> <li>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.</li> <li>Same as preceding (entombment) alternative, with addition of disposal capability to allow receipt of wastes from cleanup activities.</li> </ul> <p>If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.</p>	

Table B-3. Summary of Future Cleanup Actions and Plausible Alternatives – Central Plateau

Cleanup Action:	CP-5 Central Plateau – Disposition PUREX Canyon Building/Associated Waste Sites (200-CP-1 OU)
<p><b>Cleanup Decision Summary and Relevant Decision Documents</b></p> <p>An action memorandum includes one waste site (UPR-200-E-17) that was moved into this OU. A non-time critical action memorandum is in place to perform continued surveillance and maintenance with hazard abatement (including removal of white powder in PUREX [202A] as well as the East and West Annexes as described in DOE/RL-2019-34) and demolition preparation activities of above-grade areas at PUREX (202A) and demolition of the 202A East and West Annexes. Future cleanup decisions for remaining buildings and waste sites will be included in decision documents (e.g., action memoranda, RODs).</p> <ul style="list-style-type: none"> <li>• <u>DOE/RL-2009-37</u>, 2009, <i>Action Memorandum for Non-Time-Critical Removal Action for 200-MG-2 Operable Unit</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• <u>DOE/RL-2010-102</u>, 2011, <i>Action Memorandum for Decontamination, Deactivation, Decommissioning, and Demolition (D4) Activities for 200 East Tier 2 Buildings/Structures</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• <u>DOE/RL-2016-53</u>, 2021, <i>Action Memorandum for PUREX Complex</i>, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• <u>DOE/RL-2019-34</u>, 2020, <i>Action Memorandum for the PUREX Complex - Hazard Abatement Including White Powder within the 202A Building</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> </ul>	
<p><b>Range of Plausible Alternatives</b></p> <ul style="list-style-type: none"> <li>• Remove all contents and D4 PUREX canyon building including below-grade foundation; remove all contaminated materials, associated waste sites and contaminated soils to achieve RAOs; dispose of all waste and debris at approved facility.</li> <li>• Condition contents to place in spaces below canyon deck level; stabilize and fill voids; remove contaminated wastes and soils from associated waste sites and dispose of 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.</li> <li>• 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.</li> <li>• Same as preceding (entombment) alternative, with addition of disposal capability to allow receipt of wastes from cleanup activities.</li> </ul> <p>If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.</p> <p><b>Note:</b> Cleanup decisions affecting disposition of the PUREX canyon building/associated waste sites and disposition of PUREX storage tunnels should be aligned and cleanup actions should be coordinated and integrated as much as practical.</p>	

Table B-3. Summary of Future Cleanup Actions and Plausible Alternatives – Central Plateau

Cleanup Action:	CP-6 Central Plateau – Disposition PUREX Storage Tunnels (200-CP-1 OU)
<b>Cleanup Decision Summary and Relevant Decision Documents</b> Although no cleanup decisions have been made for the PUREX storage tunnels, following the discovery of subsidence at PUREX Tunnel #1 on May 9, 2017, DOE took actions to stabilize and void-fill this tunnel with engineered grout by November 11, 2017. Because a structural integrity evaluation identified a potential high risk of localized collapse of PUREX Tunnel #2, DOE also stabilized and void-filled this tunnel with engineered grout in 2019. <ul style="list-style-type: none"> <li>18-AMRP-0023, “Continued Response Actions at the PUREX Storage Tunnels – Completion of Tunnel 1 Stabilization and Path Forward for Tunnel 2,” letter from D. Shoop, U.S. Department of Energy to A. Smith, Washington State Department of Ecology, December 5, 2017.</li> <li>18-NWP-160, “Request for Temporary Authorization to Implement the Class 3 Permit Modification for PUREX Storage Tunnel 2, Closure Unit Group” letter from A. Smith, Washington State Department of Ecology to D. Shoop, U.S. Department of Energy, September 28, 2018.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>Maintain grout fill placed as part of the interim stabilization measures of both tunnels, install surface barrier that meets RCRA landfill cover requirements, and conduct post-closure monitoring.</li> <li>Railcars and grout in both tunnels could be remotely retrieved after excavation of the tunnel by cutting and removal using water jets, wire saws, excavation equipment, or other technologies. Waste material could be moved from the tunnels to the PUREX Plant canyon deck area or an alternate plant location for disposal within the plant. Waste such as empty railcars that could not be placed in the PUREX Plant for disposal (e.g., insufficient space) could be removed for final disposition at other approved disposal facilities.</li> <li>In addition to moving waste materials from the tunnels to the PUREX Plant, characterize, size-reduce, and package waste materials as needed. Size reduction could be performed through various technologies that include but are not limited to flame cutting, water jet cutting, and sawing. Final disposition of the processed waste material could be either on or off Site.</li> <li>Construct a new facility that is either mobile or stationary to remove and treat waste material stored in the tunnels. The facility could be constructed in a manner consistent with the retrieval and handling requirements for large, contaminated waste material. Retrieval of the waste and grout from the tunnels could involve cutting and removal using water jets, wire saws, excavation equipment, or other technologies. Final disposition of the processed waste material could be either onsite or offsite.</li> </ul>	
If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness. <b>Note:</b> Cleanup decisions affecting disposition of PUREX storage tunnels and disposition of 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 OU)
<b>Cleanup Decision Summary and Relevant Decision Documents</b> A non-time critical action memorandum is in place to perform continued surveillance and maintenance with hazard abatement activities of REDOX (202S) galleries, demolition preparation of the 202S Silo Service Areas and above-grade canyon (202S) areas, demolition of 276S and 202S Annex, and above-grade demolition with grouting of below-grade structures for 293S. Future cleanup decisions for remaining buildings and waste sites will be included in decision documents (e.g., action memoranda, RODs). <ul style="list-style-type: none"> <li>DOE/RL-2016-52, 2019, <i>Action Memorandum for the Reduction-Oxidation Facility Complex</i>, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> </ul>	

Table B-3. Summary of Future Cleanup Actions and Plausible Alternatives – Central Plateau

<b>Range of Plausible Alternatives</b>	
<ul style="list-style-type: none"> <li>Remove all contents and D4 REDOX canyon building including below-grade foundation; remove all contaminated materials, associated waste sites, and contaminated soil to achieve RAOs; dispose of all waste and debris at approved facility.</li> <li>Condition contents for placement in spaces below canyon deck level; stabilize and fill voids; remove contaminated waste and soil from associated waste sites and dispose of 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.</li> <li>Condition contents, retrieve associated waste site contaminated soil 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.</li> <li>Same as preceding (entombment) alternative, with addition of disposal capability to allow receipt of wastes from cleanup activities.</li> </ul> <p>If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.</p>	
<b>Cleanup Action:</b>	<b>CP-8 Central Plateau – Disposition T Plant Canyon Building/Associated Waste Sites</b>
<b>Cleanup Decision Summary and Relevant Decision Documents</b>	
<p>No cleanup decisions have been made for the T Plant canyon building and associated waste sites. Current expectations are that T Plant will continue to be used to support other remediation and waste management work beyond 2040.</p> <ul style="list-style-type: none"> <li>TBD – No decision documents currently available.</li> </ul>	
<b>Range of Plausible Alternatives</b>	
<ul style="list-style-type: none"> <li>Continue ongoing operations until no longer needed; transition to D4; fulfill hazardous waste facility closure obligations consistent with RCRA permit.</li> <li>Remove all contents and D4 T Plant canyon building including below-grade foundation; remove all contaminated materials, associated waste sites and contaminated soil to achieve RAOs; dispose of all waste and debris at approved facility.</li> <li>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 of 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.</li> <li>Condition contents, retrieve associated waste site contaminated soil 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.</li> <li>Same as preceding (entombment) alternative, with addition of disposal capability to allow receipt of waste from cleanup activities.</li> </ul> <p>If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.</p>	

Table B-3. Summary of Future Cleanup Actions and Plausible Alternatives – Central Plateau

<b>Cleanup Action:</b>	<b>CP-9 Central Plateau – Disposition Cesium/Strontium Capsules</b>
<b>Cleanup Decision Summary and Relevant Decision Documents</b> No cleanup decisions have been made for final disposition of the cesium/strontium capsules. DOE amended the ROD for the TC&WM EIS, the final Class 3 Permit Modification 8C.2020.1F to the <i>Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste</i> (Site-wide Permit), Part III, Operating Unit Group 19, Capsule Interim Storage (CIS), WA7890008967 became effective March 20, 2021. This permits authorizes construction of the Capsule Storage Area to provide interim dry storage of the cesium and strontium capsules until a final capsule disposal decision is made.	
<ul style="list-style-type: none"> <li>83 FR 23270, 2018, “Amended Record of Decision for the Management of Cesium and Strontium Capsules at the Hanford Site, Richland, Washington,” <i>Federal Register</i>, May 18.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>Package and transport capsules from WESF to dry storage; store capsules pending final disposition; direct dispose of capsules at a geologic repository.</li> <li>Package capsules in cask storage systems (CSSs); store at Hanford Site pending development of a national interim fuel storage facility; transport and store at an interim fuel storage facility pending transport and disposal at a geologic repository.</li> <li>Incorporate capsules into immobilized high-level waste glass at WTP.</li> <li>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.</li> </ul>	
<b>Cleanup Action:</b>	<b>CP-10 Central Plateau – Remediate Solid Waste Landfill and Non-Radioactive Dangerous Waste Landfill (200-SW-1 OU)</b>
<b>Cleanup Decision Summary and Relevant Decision Documents</b> Although a closure/postclosure plan was submitted in July 2010, no cleanup decisions have been made for the 200-SW-1 OU.	
<ul style="list-style-type: none"> <li>DOE/RL-90-17, 2010, <i>Nonradioactive Dangerous Waste Landfill/Solid Waste Landfill Closure/Postclosure Plan</i>, Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> </ul>	
<b>Range of Plausible Alternatives</b> The following alternatives are being considered as part of DOE/EA-1707D, <i>Environmental Assessment Closure of Nonradioactive Dangerous Waste Landfill (NRDWL) and Solid Waste Landfill (SWL)</i> ; these alternatives are not intended to presume the outcome of the ongoing environmental assessment process:	
<ul style="list-style-type: none"> <li>Install an evapotranspiration barrier over both landfills; upgrade monitoring and infrastructure systems; perform post-closure monitoring and caretaking.</li> <li>Partial RTD with removal of waste material from both landfills and impacted soil 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.</li> <li>Remove all waste material from both landfills; excavate and RTD all contaminated soil to groundwater, if necessary; backfill and revegetate.</li> </ul>	
If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.	
<b>Cleanup Action:</b>	<b>CP-11 Central Plateau – Disposition Remaining Liquid Waste Disposal Facilities*</b>
<b>Cleanup Decision Summary and Relevant Decision Documents</b> No cleanup decisions have been made for the remaining liquid waste disposal facilities. TBD – No decision documents currently available.	

Table B-3. Summary of Future Cleanup Actions and Plausible Alternatives – Central Plateau

<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>Closure of facilities will be according to approved operating plans and closure plans.</li> <li>If needed, may remediate contaminated soil under zone closure; may include partial RTD with various capping alternatives; monitoring and institutional controls after closure may be required.</li> <li>RTD all contaminated soil; backfill and revegetate.</li> <li>Allow monitored natural attenuation to proceed under LTS with appropriate institutional controls.</li> </ul> <p>If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.</p> <p>* Includes state-approved land disposal site; state waste discharge permit sites; 100-N Sewage Lagoon; onsite sewage systems; national pollutant discharge elimination system outfalls; and underground injection control well sites.</p>	
<b>Cleanup Action:</b>	<b>CP-12 Central Plateau – Disposition Remaining Waste Treatment, Storage and Disposal Facilities*</b>
<b>Cleanup Decision Summary and Relevant Decision Documents</b> <p>No cleanup decisions have been made for the remaining waste treatment, storage, and disposal facilities.</p> <ul style="list-style-type: none"> <li>TBD – No decision documents currently available.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>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.</li> </ul> <p>* Includes LERF/ETF, WESF, WRAP, CWC, 222-S Laboratory, and IDF.</p>	
<b>Cleanup Action:</b>	<b>CP-13 Central Plateau – Remediate Pipelines, Pits, Diversion Boxes and Associated Tanks 200-IS-1 OU</b>
<b>Cleanup Decision Summary and Relevant Decision Documents</b> <p>The 200-IS-1 OU waste sites include tanks (except those in the tank farms), pipelines, pits, diversion boxes, and associated ancillary equipment. Several pipelines are being addressed (in part) by 200-MG-1 removal actions; final remediation decisions will be addressed in RODs; TSD ancillary equipment will be addressed in future RCRA closure plans; other media may be addressed via CERCLA process.</p> <ul style="list-style-type: none"> <li>TBD – No decision documents currently available.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>RTD all contaminated equipment, materials, debris, and soil to a depth determined by the Tri-Party agencies to be protective of human health and ecological resources (depth TBD); backfill and revegetate.</li> <li>RTD all contaminated equipment, materials, debris, and soil; backfill and revegetate.</li> <li>Stabilize select equipment in place using technologies yet to be determined.</li> <li>Leave everything in place; maintain under LTS with appropriate institutional controls.</li> </ul> <p>If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.</p>	
<b>Cleanup Action:</b>	<b>CP-14 Central Plateau – Remediate Land Disposal Units (200-SW-2 OU)</b>
<b>Cleanup Decision Summary and Relevant Decision Documents</b> <p>No cleanup decisions have been made to remediate the 200-SW-2 OU. (Note that this OU is not a single contaminated site but comprises a large number of land disposal units.)</p> <ul style="list-style-type: none"> <li>TBD – No decision documents currently available.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>Excavation, treatment (as necessary), and disposal of all waste from within individual landfills.</li> <li>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.</li> <li>Capping of individual landfills; includes continued cap maintenance and monitoring.</li> <li>In situ treatment/stabilization (e.g., vitrification or grouting) of portions of individual landfills followed by capping; includes continued cap maintenance and monitoring.</li> </ul> <p>If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.</p>	

Table B-3. Summary of Future Cleanup Actions and Plausible Alternatives – Central Plateau

<b>Cleanup Action:</b>	<b>CP-15 Central Plateau – Remediate Remaining 200 West Inner Area Contaminated Soil Sites (200-WA-1 OU)</b>
<b>Cleanup Decision Summary and Relevant Decision Documents</b> 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). <ul style="list-style-type: none"> <li>• DOE/RL-2009-37, 2009, <i>Action Memorandum for Non-Time-Critical Removal Action for 200-MG-2 Operable Unit</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• DOE/RL-2009-86, 2010, <i>Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>• RTD approximately half of waste sites and cap remainder.</li> <li>• RTD all waste sites; backfill and revegetate.</li> <li>• Cap and maintain under LTS with monitoring and appropriate institutional controls.</li> </ul> If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.	
<b>Cleanup Action:</b>	<b>CP-16 Central Plateau – Remediate Remaining 200 East Inner Area Contaminated Soil Sites (200-EA-1 OU)</b>
<b>Cleanup Decision Summary and Relevant Decision Documents</b> 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). <ul style="list-style-type: none"> <li>• DOE/RL-2009-37, 2009, <i>Action Memorandum for Non-Time-Critical Removal Action for 200-MG-2 Operable Unit</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• DOE/RL-2009-86, 2010, <i>Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>• RTD approximately half of waste sites and cap remainder.</li> <li>• RTD all waste sites; backfill and revegetate.</li> <li>• Cap and maintain under LTS with monitoring and appropriate institutional controls.</li> </ul> If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.	



Table B-3. Summary of Future Cleanup Actions and Plausible Alternatives – Central Plateau

Cleanup Action:	CP-19 <sup>1</sup> Central Plateau –Disposition Remaining Inner Area Buildings and Facilities
<b>Cleanup Decision Summary and Relevant Decision Documents</b> 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.) <ul style="list-style-type: none"> <li>• <u>DOE/RL-2004-36</u>, 2004, <i>Action Memorandum for Non-Time Critical Removal Action for 224-B Plutonium Concentration Facility</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• <u>DOE/RL-2004-68</u>, 2005, <i>Action Memorandum for Non-Time Critical Removal Action for 224-T Plutonium Concentration Facility</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• <u>DOE/RL-2010-22</u>, 2013, <i>Action Memorandum for General Hanford Site Decommissioning Activities</i>, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• <u>DOE/RL-2010-102</u>, 2011, <i>Action Memorandum for Decontamination, Deactivation, Decommissioning, and Demolition (D4) Activities for 200 East Tier 2 Buildings/Structures</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• <u>DOE/RL-2020-56</u>, 2020, <i>Action Memorandum for the 200 West Area Tier 2 Buildings/Structures</i>, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>• 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.</li> <li>• Leave structures in place and transition to LTS with appropriate institutional controls.</li> </ul>	
Cleanup Action:	CP-20 Central Plateau – Remediate Contaminated Deep Vadoze Zone (200-DV-1 OU)
<b>Cleanup Decision Summary and Relevant Decision Documents</b> An action memorandum provides for extraction of perched water from the 200-DV-1 OU (B tank farm complex in the 200 East Area) and transfer of the water by tanker truck or pipeline to the 200 West pump and treat, where it is treated and injected into the aquifer below the 200 West Area. Future cleanup decisions for other deep vadose zone areas will be included in decision documents (e.g., action memoranda, RODs). <ul style="list-style-type: none"> <li>• <u>DOE/RL-2014-34</u>, 2014, <i>Action Memorandum for 200-DV-1 Operable Unit Perched Water Pumping/Pore Water Extraction</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>• Implement results of treatability testing in accordance with CERCLA and/or RCRA final decisions.</li> <li>• RTD all contaminated soils to groundwater if necessary and technically practical; backfill and revegetate.</li> <li>• In place treatment to destroy, immobilize, or capture, treat and dispose of contaminants.</li> <li>• Soil flushing with P&amp;T or pore water removal.</li> <li>• Install surface barriers.</li> <li>• Allow monitored natural attenuation to proceed under LTS with appropriate institutional controls.</li> </ul>	
Cleanup Action:	CP-21 Central Plateau – Restore 200 West Groundwater To Beneficial Use (200-UP-1 OU)
<b>Cleanup Decision Summary and Relevant Decision Documents</b> An interim ROD for 200-UP-1 OU was issued in September 2012 that superseded the previous remedy decisions for this OU and a final ROD is in place for the adjacent 200-ZP-1 OU to address all contaminants. <ul style="list-style-type: none"> <li>• <u>EPA, 2012</u>, <i>Record of Decision for Interim Remedial Action Hanford 200 Area Superfund Site, 200-UP-1 Operable Unit</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> </ul>	

Table B-3. Summary of Future Cleanup Actions and Plausible Alternatives – Central Plateau

<ul style="list-style-type: none"> <li>• EPA, 2008, <i>Record of Decision Hanford 200 Area 200-ZP-1 Superfund Site, Benton County, Washington</i>, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.</li> <li>• WAC 173-340, “Model Toxics Control Act -- Cleanup,” <i>Washington Administrative Code</i>, Olympia, Washington.</li> <li>– WAC 173-340-720, “Groundwater Cleanup Standards.”</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>• Expand 200-ZP-1 extraction, treatment and injection capacity; install extraction and transfer system for 200-UP-1; operate P&amp;T system to achieve RAOs; continue monitoring.</li> <li>• Localized P&amp;T using IX treatment and monitored natural attenuation.</li> <li>• Allow monitored natural attenuation to proceed under LTS with appropriate institutional controls.</li> <li>• Hydraulic containment of the iodine-129 groundwater plume.</li> <li>• Groundwater monitoring and institutional controls.</li> </ul>	
<b>Cleanup Action:</b>	<b>CP-22 Central Plateau – Restore 200 East Groundwater to Beneficial Use (200-PO-1 and 200-BP-5 OUs)</b>
<b>Cleanup Decision Summary and Relevant Decision Documents</b> <p>An action memorandum provides for extraction of groundwater with elevated uranium and technetium-99 concentrations from the B complex area of the 200-BP-5 OU, conveyance of the water by pipeline to the 200 West P&amp;T, where it is treated and injected into the aquifer below the 200 West Area. A non-significant change to the action memorandum eliminated the extraction pumping limit of 150 gallons per minute. A proposed plan for interim action was approved in April 2020. The public comment period was initiated on May 4, 2020 through July 8, 2020. Responsiveness Summaries are being incorporated into the interim action Record of Decision. Groundwater monitoring and annual reporting continue to track groundwater contamination in this OU.</p> <ul style="list-style-type: none"> <li>• DOE/RL-2016-41, 2016, <i>Action Memorandum for 200-BP-5 Operable Unit Groundwater Extraction</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• DOE and Ecology, 2019, <i>Non-Significant Change for the Action Memorandum for 200-BP-5 Operable Unit Groundwater Extraction (DOE/RL-2016-41)</i>, Rev. 0, U.S. Department of Energy; Washington State Department of Ecology, Richland, Washington, April 4.</li> <li>• DOE/RL-2018-58, 2020, <i>Proposed Plan for Interim Action Remediation of the 200-BP-5 and 200-PO-1 Operable Units</i>, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.</li> <li>• WAC 173-340, “Model Toxics Control Act -- Cleanup,” <i>Washington Administrative Code</i>, Olympia, Washington.</li> <li>– WAC 173-340-720, “Groundwater Cleanup Standards.”</li> </ul>	
<b>Range of Plausible Alternatives</b> <ul style="list-style-type: none"> <li>• Install P&amp;T system for 200-BP-5 OU; implement monitored natural attenuation for 200-PO-1 OU; perform well support and maintenance activities.</li> <li>• Allow monitored natural attenuation to proceed under LTS with appropriate institutional controls.</li> <li>• Install P&amp;T in B Complex plume area, C Farm and A/AX Farms plume area, with institutional controls.</li> </ul> <p><b>Note:</b> 400 Area groundwater cleanup actions are included as part of 200-PO-1 OU.</p>	
<p><i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq.</i>  <i>Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq.</i>  WAC 173-340, “Model Toxics Control Act -- Cleanup,” <i>Washington Administrative Code</i>, Olympia, Washington.  WAC 173-340-720, “Groundwater Cleanup Standards,” <i>Washington Administrative Code</i>, Olympia, Washington.</p>	

Table B-3. Summary of Future Cleanup Actions and Plausible Alternatives – Central Plateau

CERCLA = <i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980.</i>	OU = operable unit.
D&D = decontamination and decommissioning.	P&T = pump-and-treat.
D4 = deactivation, decontamination, decommissioning, and demolition.	PFP = Plutonium Finishing Plant.
DOE = U.S. Department of Energy.	PUREX = Plutonium-Uranium Extraction (Plant).
EE/CA = engineering evaluation/cost analysis.	RAO = remedial action objective.
ERDF = Environmental Restoration Disposal Facility.	RCRA = <i>Resource Conservation and Recovery Act of 1976.</i>
ESD = explanation of significant difference.	REDOX = Reduction-Oxidation Facility (S Plant).
ETF = Effluent Treatment Facility.	ROD = record of decision.
FFTF = Fast Flux Test Facility.	RTD = remove, treat, and dispose.
IDF = Integrated Disposal Facility.	SWL = solid waste landfill.
IHLW = immobilized high-level waste.	TBD = to be determined.
INL = Idaho National Laboratory.	TPA = Tri-Party Agreement.
LERF = Liquid Effluent Retention Facility.	TSD = treatment, storage, and disposal.
LTS = long-term stewardship.	WAC = <i>Washington Administrative Code.</i>
NRDWL = Nonradioactive Dangerous Waste Landfill.	WESF = Waste Encapsulation and Storage Facility.
	WRAP = Waste Receiving and Processing Plant.
	WTP = Waste Treatment and Immobilization Plant.
<sup>1</sup> CP-17 Central Plateau – Disposition Fast Flux Test Facility (FFTF) Complex and CP-18 Central Plateau – Disposition Remaining Buildings and Facilities in FFTF Complex were removed since the “Record of Decision: Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington” (78 FR 75913) is a final decision for these cleanup actions.	

Table B-4. Summary of Future Cleanup Actions and Plausible Alternatives – Tank Waste

Cleanup Action:	TW-1 Tank Waste – Tank Retrieval and Single-Shell Tank Farm Closure
<b>Cleanup Decision Summary and Relevant Decision Documents</b>	
In the February 26, 1997 <i>Federal Register</i> , DOE decided to retrieve and treat tank waste (62 FR 8693). DOE's preferred alternative of those evaluated in the TC&WM EIS (DOE/EIS-0391) was published in the December 13, 2013 <i>Federal Register</i> (78 FR 75913).	
<b>Range of Plausible Alternatives</b>	
<ul style="list-style-type: none"> <li>DOE has decided to implement Tank Closure Alternative 2B, "Expanded WTP Vitrification and Landfill Closure," without supplemental treatment at WTP and without technetium-99 removal in the WTP Pretreatment Facility, including the following major activities: retrieval of 99% of the tank waste by volume; use of liquid-based retrieval systems; leak detection monitoring and routine maintenance; new waste receiver facilities, as needed; additional storage facilities for canisters; operations and necessary maintenance, waste transfers and associated operations such as use of the "hose-in-hose" transfer lines or installation of new transfer lines, where needed; and upgrades to existing DST and SST systems, including piping and other ancillary equipment as needs are identified. Tank waste treatment includes pretreatment of all tank waste, with separation into LAW and HLW. New evaporation capacity, upgrades to the ETF, new transfer lines and processing of both vitrified LAW and secondary waste for disposal are included in this decision. Disposal activities include disposal of LAW on Site and construction of enough IHLW interim storage modules to store all the IHLW generated by WTP treatment prior to disposal. SST closure operations include filling the tanks and ancillary equipment with grout to immobilize the residual waste. Disposal of contaminated equipment and soil will occur on Site. The tanks will be grouted and contaminated soil may be removed. The SSTs will be landfill-closed, which means they will be stabilized and an engineered modified RCRA Subtitle C barrier put in place followed by postclosure care.</li> <li>As stated in the March 11, 2013 <i>Federal Register</i> (78 FR 15358), DOE prefers to retrieve, treat, package, characterize and certify the tank wastes that are properly and legally classified as mixed TRU waste for disposal at WIPP.</li> </ul>	
If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.	
Cleanup Action:	TW-2 Tank Waste – Tank Waste Treatment
<b>Cleanup Decision Summary and Relevant Decision Documents</b>	
In the February 26, 1997 <i>Federal Register</i> , DOE decided to retrieve, separate, vitrify, and dispose of the tank waste (62 FR 8693). The ILAW would be prepared for onsite disposal and the vitrified HLW would be placed in interim storage pending future disposal at a national geologic repository. DOE's preferred alternative of those evaluated in the TC&WM EIS (DOE/EIS-0391) was published in the December 13, 2013 <i>Federal Register</i> (78 FR 75913).	
<b>Range of Plausible Alternatives</b>	
<ul style="list-style-type: none"> <li>See discussion of DOE's preferred alternative under cleanup action TW-1 Tank Waste – Tank Retrieval and Single-Shell Tank Farm Closure.</li> </ul>	
Cleanup Action:	TW-3 Tank Waste – Secondary Waste Treatment
<b>Cleanup Decision Summary and Relevant Decision Documents</b>	
No cleanup decisions have been made. See Chapter 7 and Appendix M of the TC&WM EIS (DOE/EIS-0391) for discussion, sensitivity analysis, and potential mitigation strategies for the treatment and disposal of the secondary waste. Decisions have been deferred to future decision-making processes.	
<ul style="list-style-type: none"> <li>TBD – No decision documents currently available.</li> </ul>	
<b>Range of Plausible Alternatives</b>	
<ul style="list-style-type: none"> <li>Recycle liquid waste streams in WTP; manage residual liquid waste at LERF/ETF/SALDS; treat solid waste from WTP and ETF and dispose at IDF; manage and disposition other secondary waste (e.g., failed melters). Other plausible alternatives will be determined at a later date.</li> </ul>	
<b>Note:</b> Any radioactive HLW will be stored and eventually shipped to a geologic repository.	

Table B-4. Summary of Future Cleanup Actions and Plausible Alternatives – Tank Waste

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			
<ul style="list-style-type: none"><li>Retrieve DST wastes consistent with TPA and the RCRA permit; achieve designated retrieval objectives or limits of technology, remediate structures and soil and install cover/cap to meet closure performance standards, maintain post-closure care and monitoring consistent with RCRA permit.</li></ul> Other plausible alternatives will be determined at a later date.			
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 permitted DWMUs.” 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 also may 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.			
<ul style="list-style-type: none"><li><u>WA7890008967</u>, 2013, <i>Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste</i>, Washington State Department of Ecology, Nuclear Waste Program, Richland, Washington, September 30.</li></ul>			
Range of Plausible Alternatives			
<ul style="list-style-type: none"><li>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.</li><li>D4 all buildings and facilities to slab-on-grade; evaluate below-grade portions for residual contamination; if needed, remediate below-grade portions.</li><li>Perform clean closure of WTP and all ancillary facilities/structures.</li><li>Leave structures in place and transition to LTS with appropriate institutional controls.</li></ul>			
If residual contamination remains after cleanup actions are completed, cleanup work will transition to LTS, including institutional controls and 5-year reviews of remedy effectiveness.			
D4	= deactivation, decontamination, decommissioning, and demolition.	LTS	= long-term stewardship.
DOE	= U.S. Department of Energy.	RCRA	= <i>Resource Conservation and Recovery Act of 1976</i> .
DST	= double-shell tank.	RTD	= remove, treat, and dispose.
DWMU	= dangerous waste management unit	SALDS	= State-Approved Land Disposal Site.
ETF	= Effluent Treatment Facility.	SST	= single-shell tank.
HLW	= high-level waste.	TBD	= to be determined.
IDF	= Integrated Disposal Facility.	TC&WM EIS	= <i>Tank Closure and Waste Management Environmental Impact Statement</i> .
ILAW	= immobilized low-activity waste.	TPA	= Tri-Party Agreement.
LAW	= low-activity waste.	WTP	= Waste Treatment and Immobilization Plant.
LERF	= Liquid Effluent Retention Facility.		

### B.2.2 DOE’s Approach for Analyzing Alternatives and Describing the Reasonable Upper Bound

TPA 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 LCR provides information that meets the requirement and intent of the milestone, DOE has relied on a conceptual framework as described in [DOE/RL-2012-13](#), *2013 Hanford Lifecycle Scope, Schedule and Cost Report* (2013 LCR), Appendix A, section A.2.2.

### B.3 RATIONALE FOR ANNUAL SELECTION OF FUTURE CLEANUP ACTIONS TO BE ANALYZED

DOE will consider recommendations from EPA and Ecology, government-to-government consultations (e.g., Tribal Nations, State of Oregon), Hanford Advisory Board advice, input from Hanford stakeholders, and public comments received on previous LCRs when selecting the future cleanup actions to be analyzed in the LCR. The 2013 LCR, Appendix A, section A.3, contains additional details about the rationale used to select these cleanup actions.

### B.4 COMPLETED CLEANUP ACTION ALTERNATIVES

The cleanup actions that have been analyzed in-depth in LCRs are summarized in Table B-5. For details about the cost estimate alternative analysis of any of these cleanup actions, see the specific LCR cited in Table B-5.

Table B-5. Summary of Completed Cleanup Action Alternatives

Cleanup Action	Cost Estimate Alternative Analysis (Million \$)	Final Decision Reference
<b>2011 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT (DOE/RL-2010-25)</b>		
River Corridor–Disposition 100 Area Reactors	Reactors Remain in Place - \$0 Remove Reactors - \$676	Record of Decision; Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, WA (58 FR 48509)
Central Plateau–Remediate 200-SW-2 OU	Barriers - \$823 Remove, Treat, Dispose of Waste - \$16,614	TBD
<b>2012 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT (DOE/RL-2011-93)</b>		
Tank Waste Cleanup Action–Tank Retrieval and Single-Shell Tank Farm Closure	1 – Baseline Case - \$59,900 2 – TRU Waste to WTP - \$61,600 3 – FBSR for supplemental treatment - \$58,100	TBD
Tank Waste Cleanup Action–Tank Waste Treatment	4 – WTP delay with +10% vitrification capacity - \$66,000	TBD
Tank Waste Cleanup Action– Secondary Waste Treatment	5 – 2020 Vision One System - \$58,000 6 – WTP delay with new DST farm - \$68,700 7 – Enhanced tank waste strategy - \$57,300 8 – Accelerated SST retrievals - \$62,800 9 – Early U Farm closure - \$59,600 10 – Slow SST retrievals - \$60,800	TBD
<b>2013 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT (DOE/RL-2012-13)</b>		
Central Plateau–Remediate Remaining Outer Area Contaminated Soil Sites (200-OA- 1, 200-CW-1, and 200-CW-3 OUs)	The DOE planning-case cleanup remedies for the 190 waste sites evaluated includes RTD - \$98.3 CSNA - \$4.9	TBD
Central Plateau–Remediate Remaining 200 West Inner Area Contaminated Soil Sites (200-WA-1 OU)	MESC/MNA/IC - \$3.2 IBAR - \$19.2 ABAR - \$19.8 <b>Total</b> - \$145.4	TBD
<b>2014 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT (DOE/RL-2013-02)</b>		
None selected for 2014	N/A	N/A
<b>2015 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT (DOE/RL-2014-11)</b>		
None selected for 2015	N/A	N/A

Table B-5. Summary of Completed Cleanup Action Alternatives

Cleanup Action	Cost Estimate Alternative Analysis (Million \$)	Final Decision Reference
<b>2016 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT (DOE/RL-2015-10)</b>		
None selected for 2016	N/A	N/A
<b>2019 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT (DOE/RL-2018-45)<sup>1</sup></b>		
None selected for 2019	N/A	N/A
<b>2022 HANFORD LIFECYCLE SCOPE, SCHEDULE AND COST REPORT (DOE/RL-2021-47)<sup>2</sup></b>		
None selected for 2022	N/A	N/A
<sup>1</sup> There were no LCRs for 2017 and 2018 in accordance with TPA Change Control Forms M-36-16-02 and M-36-17-01. <sup>2</sup> The LCR was changed from annual to a three year rolling cycle that coincides with M-62-40 submittal of System Plan with TPA Change Control Form M-36-19-01.  ABAR = aggregate barrier. CSNA = confirmatory sampling to support no further cleanup action. DOE = U.S. Department of Energy. DST = double-shell tank. FBSR = fluidized bed steam reformer. IBAR = individual barrier. IC = institutional controls. MESOC = maintain existing soil cover. MNA = monitored natural attenuation. N/A = not applicable. OU = operable unit. RTD = remove, treat and dispose. SST = single-shell tank. TBD = to be determined. TRU = transuranic. WTP = Waste Treatment and Immobilization Plant.		

Considering the criteria described earlier and cleanup actions analyzed in previous LCRs, DOE developed an anticipated schedule for performing in-depth analyses of plausible alternatives for each remaining future cleanup action. Table B-6 presents this schedule and explains the rationale for analyzing alternatives in the recommended LCR year.

Table B-6. Anticipated Schedule for Detailed Analyses of Future Cleanup Action Alternatives

Cleanup Action	Alternative
<ul style="list-style-type: none"> <li>Central Plateau–Disposition PUREX Storage Tunnels (200-CP-1 OU)</li> <li>Central Plateau–Disposition PUREX Canyon Building/Associated Waste Sites (200-CP-1 OU)</li> </ul>	<p>DOE took actions to stabilize and void-fill PUREX Tunnel #1 with engineered grout by November 11, 2017, and stabilized PUREX Tunnel #2 with engineered grout in 2019.</p> <p>The RI/FS work plan for 200-CP-1 (DOE/RL-2020-27, Draft A) was submitted on September 22, 2020 to meet TPA milestone M-085-80. Ecology comments were received on April 23, 2021 (21-NWP-066) and comment responses continue to be generated. It may be reasonable to develop alternatives after 2025 that could benefit future planning and budget requests.</p>
<ul style="list-style-type: none"> <li>Central Plateau–Disposition REDOX Canyon Building/Associated Waste Sites (200-CR-1 OU)</li> </ul>	<p>The RI/FS work plan is due for 200-CR-1 by September 30, 2026 (TPA M-085-90). It may be reasonable to develop alternatives after 2028 that could benefit future planning and budget requests.</p>
<ul style="list-style-type: none"> <li>Central Plateau–Restore 200 East Groundwater to Beneficial Use (200-PO-1 and 200-BP-5 OUs)</li> </ul>	<p>An interim action ROD is being developed following issuance of proposed plan in April 2020 that supersedes the previous 200-BP-5 OU action memorandum. It may be reasonable to develop alternatives after 2022 that could benefit future planning and budget requests.</p>
<ul style="list-style-type: none"> <li>Central Plateau–Remediate Solid Waste Landfill and Non-Radioactive Dangerous Waste Landfill (200-SW-1 OU)</li> </ul>	<p>A closure/ postclosure plan was submitted in July 2010 for 200-SW-1. Analysis of alternatives for 200-SW-1 is not likely to contribute useful information that could benefit future planning and budget requests.</p>
<ul style="list-style-type: none"> <li>Central Plateau–Restore 200 West Groundwater to Beneficial Use (200-UP-1 OU)</li> </ul>	<p>An interim action ROD was issued in September 2012 that superseded the previous 200-UP-1 OU decisions. It may be reasonable to develop alternatives after 2025 that could benefit future planning and budget requests.</p>
<ul style="list-style-type: none"> <li>River Corridor–Disposition 100 Area Former Orchard Contaminated Soil Sites (100-OL-1 OU)</li> </ul>	<p>The FS report (Draft A) was submitted August 24, 2021 (TPA M-015-97). It may be reasonable to develop alternatives after 2022 that could benefit future planning and budget requests.</p>
<ul style="list-style-type: none"> <li>Central Plateau–Disposition Cesium/Strontium Capsules</li> </ul>	<p>TPA M-092-20 requires DOE to determine a disposition pathways evaluation for the cesium/strontium capsules by March 31, 2022, and every 4 years thereafter. The Hanford Dangerous Waste Permit was updated to reflect construction and operation of a capsule storage area that would provide interim dry storage of the cesium and strontium capsules until a final capsule disposal decision is made. Analysis of alternatives is not likely to contribute useful information for out-year budget planning.</p>
<ul style="list-style-type: none"> <li>River Corridor–Disposition 300 Area Facilities Retained by PNNL</li> </ul>	<p>Facilities in the 300 Area will be maintained operational by PNNL through 2045. Earlier analysis of alternatives would be premature and not needed for out-year budget planning.</p>
<ul style="list-style-type: none"> <li>Central Plateau (Outer Area)–Disposition Remaining Outer Area Buildings and Facilities (200-OA-1 OU)</li> </ul>	<p>Over 200 active facilities are not covered by existing decisions, including TEDF, purge water ponds, ETF/LERF, laydown yards, warehouses, mobile offices, pump-and-treat facilities, WSCF, shops and the CWC complex. These facility operations are integral to the long-term cleanup mission and will continue well after 2030. Cleanup actions can be implemented by modifying existing action memoranda. Analysis of alternatives is not likely to contribute useful information for out-year budget planning.</p>



Table B-6. Anticipated Schedule for Detailed Analyses of Future Cleanup Action Alternatives

Cleanup Action	Alternative
<ul style="list-style-type: none"> <li>• Central Plateau–Disposition B Plant Canyon Building/Associated Waste Sites (200-CB-1 OU)</li> <li>• Central Plateau–Remediate Remaining 200 East Inner Area Contaminated Soil Sites (200-EA-1 OU)</li> <li>• Central Plateau–Disposition Below-Grade Portions of PFP</li> <li>• Central Plateau–Remediate Pipelines, Pits, Diversion Boxes and Associated Tanks (200-IS-1 OU)</li> <li>• Central Plateau–Remediate Contaminated Deep Vadose Zone (200-DV-1 OU)</li> </ul>	<p>The following TPA milestones are In Abeyance as described in IAMIT Determination 2021-003, Extension for the Temporary Suspension of Tri-Party Agreement Milestones from the Agreement in Principle for the Negotiation of Hanford Federal Facility Agreement and Consent Order Revisions in Response to Federal Fiscal Year 2018-2020 Appropriation in Conjunction with the RASCAL Recommendations (Interagency Management Integration Team Determination 2020-006) for Expediting Remedial Cleanup on the Hanford Central Plateau:</p> <ul style="list-style-type: none"> <li>• M-015-93C – Initiate Characterization Field Work for 200-SW-2 Operable Unit Landfills</li> <li>• M-015-98 – Complete RI of U Plant related waste sites in 200-WA-1</li> <li>• M-085-70 – Submit RI/FS Work Plan for 200-CB-1</li> <li>• M-015-99 – Complete RI of PFP related waste sites in 200-WA-1</li> <li>• M-015-84 – Complete RI for 200-BC-1 and 200-WA-1</li> <li>• M-015-92B – Submit RFI/CMS &amp; RI/FS &amp; PCAD/PP for 200-EA-1</li> <li>• M-015-93B – Submit RFI/CMS &amp; RI/FS &amp; PCAD/PP for 200-SW-2</li> <li>• M-015-92C – Submit RFI/CMS &amp; RI/FS &amp; PCAD/PP for 200-IS-1</li> <li>• M-015-38B – Submit FS &amp; PP for 200-CW-1, 200-CW-3 and 200-OA-1</li> <li>• M-015-91B – Submit RI/FS &amp; PP for 200-BC-1 and 200-WA-1</li> <li>• M-015-110B – Submit CMS &amp; FS &amp; PCAD/PP for 200-DV-1</li> <li>• M-016-200A – Complete U Plant Canyon (221U) Demolition</li> <li>• M-016-200B – Complete U Plant Canyon (221U) Barrier Construction</li> </ul> <p>The schedules for these milestones are being negotiated and will affect the schedules for when alternatives may be available that could benefit future planning and budget requests.</p>
<ul style="list-style-type: none"> <li>• Central Plateau–Disposition T Plant Canyon Building/Associated Waste Sites</li> <li>• Central Plateau–Disposition Remaining Liquid Waste Disposal Facilities</li> <li>• Central Plateau–Disposition Remaining Waste Treatment, Storage and Disposal Facilities</li> </ul>	<p>These facility operations are integral to the long-term cleanup mission and will continue well after 2030. Any likely cleanup actions are not expected for at least 20+ years in the future so earlier analyses would be premature and not needed for out-year budget planning.</p>
<ul style="list-style-type: none"> <li>• Central Plateau–Disposition Any Remaining Inner Area Buildings and Facilities</li> </ul>	<p>Over 150 active and inactive facilities are not covered by other cleanup actions or decisions, including laydown yards, storage, mobile offices and facilities, pump-and-treat facilities, CSB, 222S lab, telecommunications, sirens and electrical facilities. The active facilities are integral to the long-term cleanup mission and will continue well after 2030. Cleanup actions can be implemented by modifying existing action memoranda. Analysis of alternatives is not likely to contribute useful information for out-year budget planning.</p>

Table B-6. Anticipated Schedule for Detailed Analyses of Future Cleanup Action Alternatives

Cleanup Action	Alternative
<ul style="list-style-type: none"> <li>• Tank Waste–Double-Shell Tank Closure</li> <li>• Tank Waste–WTP Closure</li> </ul>	DST closure is not expected to begin before 2066 and WTP closure before 2069. Earlier analyses would be premature and not needed for out-year budget planning.
<b>CLEANUP ACTIONS FOR WHICH ALTERNATIVES WOULD NOT BE ANALYZED</b>	
<b>River Corridor–B Reactor Preservation</b> - B Reactor is designated a National Historic Landmark and is a signature facility of the Manhattan Project National Historical Park so no cleanup actions are anticipated. Minor conditioning/maintenance activities will be performed consistent with National Park Service decision making under the <i>National Environmental Policy Act</i> (42 USC 4321) and/or <i>National Historic Preservation Act</i> (16 USC 470).	
<b>River Corridor–Disposition Remaining 100 Area Buildings/Facilities and Disposition Remaining 300 Area Buildings/Facilities (except facilities retained for use by PNNL)</b> - Although cleanup actions are mostly completed for these buildings/facilities, excess buildings/facilities in the 100 and 300 Areas are expected to undergo D&D according to applicable action memoranda. DOE considers D&D of buildings/structures to be final cleanup decisions if all regulated contaminants are removed in accordance with an action memorandum so alternatives do not need to be analyzed.	
<b>River Corridor–Remediate Remaining Contaminated Sites Within Hanford Reach National Monument</b> - National Monument remediation is being implemented to fulfill obligations under a presidential proclamation that establishes a <i>de facto</i> final decision. RTD and decontamination in the Monument areas were substantially completed in 2012 (some residual cleanup in the 100 Area portions of the Monument is expected to be complete within the next few years as part of the River Corridor or Central Plateau cleanup projects).	
<b>River Corridor - Disposition 100 Area K West Basin</b> <b>River Corridor - Remediate 100 Area Contaminated Soil Sites</b> <b>River Corridor - Restore 100-BC-5 Groundwater OU to Beneficial Use</b> <b>River Corridor - Restore 100-KR-4 Groundwater OU to Beneficial Use</b> <b>River Corridor - Restore 100-NR-2 Groundwater OU to Beneficial Use</b> The Tri-Party agencies agreed that for cleanup actions close to having final decisions there would be little value in presenting a cost estimate alternatives analysis in the LCR. Because K West Basin cleanup action was limited to only one alternative, the agencies agreed to remove it from the alternatives analysis in the LCR.	
<b>Central Plateau–Disposition U Plant (Canyon Building/Associated Waste Sites)</b> - U Plant remediation was approved according to 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.	
<b>Central Plateau–Manage ERDF</b> - ERDF was approved according to a CERCLA Final ROD and closure and post-closure care are part of the operating documentation. Alternatives need not be analyzed, unless future decisions are made that modify the current final ERDF decisions.	
<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq.</i> <i>National Environmental Policy Act of 1969, 42 USC 4321, et seq.</i> <i>National Historic Preservation Act of 1966, 16 USC 470, et seq.</i> <i>Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq.</i>	
CERCLA= <i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980.</i> D&D = decontamination and decommissioning. DOE = U.S. Department of Energy. DST = double-shell tank. ERDF = Environmental Restoration Disposal Facility. FFTF = Fast Flux Test Facility. FS = feasibility study. LCR = Lifecycle Report. OU = operable unit.	PFP = Plutonium Finishing Plant. PNNL = Pacific Northwest National Laboratory. PUREX = Plutonium-Uranium Extraction (Plant). RCRA = <i>Resource Conservation and Recovery Act of 1976.</i> REDOX = Reduction-Oxidation Facility. RI/FS = remedial investigation/feasibility study. ROD = record of decision. RTD = remove, treat, and dispose. TPA = Tri-Party Agreement. WTP = Waste Treatment and Immobilization Plant.

## B.5 REFERENCES

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## **APPENDIX C**

### **HANFORD ESTIMATED SCHEDULE AND COST STATUS**



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**TERMS**

ACRW	alpha caisson waste retrieval
BOF	Balance of Facilities
CCP	Central Characterization Project
CENRTC	capital equipment not related to construction
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
CH	contact-handled
CSB	Canister Storage Building
CWC	Central Waste Complex
D&D	decontamination and decommissioning
D4	deactivation, decontamination, decommissioning, and demolition
DOE	U.S. Department of Energy
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
GRP	Groundwater Remediation Project
HAMMER	Volpentest HAMMER Federal Training Center
HLW	high-level waste
IA	implementation area
IDF	Integrated Disposal Facility
IFW	Integrated Field Work
ISMS	Integrated Safety Management System
LAW	low-activity waste
LAWPS	LAW Pretreatment System
LCR	Lifecycle Report
LDR	land disposal restriction
LERF	Liquid Effluent Retention Facility
LLBG	low-level (waste) burial ground
LLW	low-level waste
LOE	level of effort
LTS	Long-Term Stewardship
MCSC	management of cesium and strontium capsules
MLLW	mixed low-level waste
O&M	operations and maintenance
ORP	U.S. Department of Energy, Office of River Protection
OU	operable unit
PBS	project baseline summary
PFP	Plutonium Finishing Plant
PRC	Plateau Remediation Contract
PT	pretreatment
PUREX	Plutonium Uranium Extraction (Plant)
RH	remote-handled
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
REDOX	Reduction-Oxidation Facility (S Plant)
RI/FS	remedial investigation/feasibility study

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RL	U.S. Department of Energy, Richland Operations Office
ROD	record of decision
RTD	remove, treat, and dispose
S&M	surveillance and maintenance
SNF	spent nuclear fuel
SST	single-shell tank
TOC	Tank Operations Contract
TPA	Tri-Party Agreement
TRU	transuranic
TSD	treatment, storage, and disposal
TWCSF	Tank Waste Characterization and Staging Facility
WIPP	Waste Isolation Pilot Plant
WESF	Waste Encapsulation and Storage Facility
WRAP	Waste Receiving and Processing (Facility)
WTP	Hanford Tank Waste Treatment and Immobilization Plant

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## APPENDIX C

### HANFORD ESTIMATED SCHEDULE AND COST STATUS

As directed in the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989), also referred to as the Tri-Party Agreement (TPA)<sup>1</sup>, M-036-01, additional schedule and cost details are provided in this Appendix C. The schedules and costs are provided by project baseline summary (PBS) and reflect the scope discussed in Chapters 3.0 through 6.0 of this *Hanford Lifecycle Scope, Schedule and Cost Report* (LCR), additional scope information at Level 3 is provided, if available.

The schedules and costs provided in this Appendix C present the low-range estimate of the baseline planning case with allowances for schedule and cost uncertainty. The schedules and costs provided in this Appendix A are reported to Level 2 for the entire PBS lifecycle and to Level 3 for the execution year (fiscal year [FY] 2022) and a period of approximately 5 more years. Because of 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 PBS 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.
- A cost and schedule table for the remaining lifecycle is presented at Level 2 by fiscal year. The costs are escalated and include cost and/or schedule uncertainty. Costs are presented from FY2022 through the final year of the lifecycle for all PBSs. PBS RL-LTS extends from FY 2079 through FY 2095.
- A near-term cost and schedule table at Level 3 by fiscal year that extends for about 5 years.

Risk management is an essential function of project management. Cost and schedule uncertainty are included in the development of the total project cost and the approved U.S. Department of Energy (DOE) planning case. Information provided in this LCR includes estimates for both cost and schedule uncertainty based on risk analysis methods that comply with DOE guidelines and orders. These estimates are identified as “cost and/or schedule uncertainty” in the tables. Additional information about uncertainty and project risk is included in Section 1.6.2.

#### C.1 RICHLAND OPERATIONS OFFICE PROJECT BASELINE SUMMARY INFORMATION

The DOE, Richland Operations Office (RL) manages their assigned cleanup mission through the following PBSs (at Level 1):

- 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
- 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
- Hanford Sitewide Services, PBS RL-0201
- Long-Term Stewardship, PBS RL-LTS
- Final Reactor Disposition.

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<sup>1</sup> 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.



### C.1.1 SOLID WASTE STABILIZATION AND DISPOSITION–200 AREA (PBS RL-0013C) SCHEDULE AND COST DETAILS

Table C-1. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Level 3 Scope Summary

Level 2 Work Element	Level 3 Work Element	Scope Summary
Project Management	Solid Waste Program Management	Provides overall management function in support of the waste management mission, including waste program support, safety documentation, radiation protection, regulatory and environmental compliance, occupational and industrial safety, and beryllium program management.
Waste Encapsulation Storage Facility (WESF)	WESF Upgrades	Includes activities to safely store cesium/strontium capsules in the WESF pool cells; operate and maintain 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, dispose of as appropriate; and maintain systems necessary for environmental compliance, radiological control, personnel safety, and capsule integrity; and transition of WESF for final D&D.
	WESF Transition Preparation	
	WESF Transition	
	WESF Min Safe	
	WESF During Transition Min Safe	
Canister Storage Building (CSB)	Canister Storage Building	Includes activities to safely store SNF (primarily from K Basins) while awaiting final disposition at a national repository. Includes operation and maintenance of CSB facilities and associated structures, operating systems and equipment, and monitoring systems. Also includes various corrective maintenance tasks, facility modifications, or capital projects necessary to continue safe, cost-effective, and compliant operations throughout the operating life of the facility.
	Canister Storage Building Min Safe	
Mixed Low-Level Waste (MLLW) Trenches	MLLW Ready-to-Serve	Provides for operation of the mixed waste disposal trenches in a safe, compliant, and cost-effective manner, including emergency preparedness, assessments and surveillances, environmental monitoring and sampling, fire protection, engineering, training, receipt and disposal of compliant MLLW packages, design, construction and other activities necessary to add operational layers and for placing temporary caps on the trenches before turnover to PBS RL-0040 for final closure.
	MLLW Upgrades	
	MLLW Leachate Management	
	MLLW Min Safe	
Transuranic (TRU) Waste Retrieval	CH Waste Retrieval	Provides for retrieval, designation, and transfer to a TSD facility of CH suspect TRU waste from LLBGs 218-W-3A, 218-W-4B, 218-W-4C, and 218-E-12B.
	Alpha Caisson Waste Retrieval	Provides for retrieval, designation, and transfer to a TSD facility of RH suspect TRU waste from LLBG 218-W-4B.

Table C-1. Solid Waste Stabilization and Disposition—200 Area (PBS RL-0013C) Level 3 Scope Summary

Level 2 Work Element	Level 3 Work Element	Scope Summary
TRU Repackaging	TRU Repackaging	Provides for WIPP production, TRU repacking operations at T Plant and WRAP (or a commercial facility), TRU program support for repack, TRUM processing, and RH/large packaging capabilities. It includes staffing, contracts, and consumables directly related to operations.
	RH/Large Package Capability	
	Commercial TRU Repackaging	
Waste Receiving and Processing Facility (WRAP)	WRAP Ready-to-Serve	Provides for operations and maintenance of the WRAP facility to support shipping and receiving activities associated with WIPP shipments.
	WRAP Upgrades	Provides for upgrades of the WRAP facility
	WRAP Transition	Following operations, WRAP will be transitioned to a condition ready for D&D.
	WRAP Min Safe	Provides for operation of the WRAP facility in a safe, compliant, and cost-effective manner, including activities such as emergency preparedness, assessments and surveillances, environmental monitoring and sampling, engineering, and training.
T Plant	T Plant Ready-to-Serve	Provides for services necessary to maintain the T Plant Complex in a ready-to-serve status for waste processing operations.
	T Plant Upgrades	Provides for upgrades to waste processing equipment, systems components, and computer interface equipment, including physical upgrades to T Plant facility.
	T Plant Transition	Following operations, T Plant will be transitioned to a condition ready for D&D.
	T Plant Min Safe	Provides for operation of the T Plant facility in a safe, compliant, and cost-effective manner, including activities such as emergency preparedness, assessments and surveillances, environmental monitoring and sampling, engineering and training.
Central Waste Complex (CWC)	CWC Ready-to-Serve	Provides for services necessary to maintain CWC in a ready-to-serve status (base operations) for interim storage of LLW, MLLW, TRU waste and waste receipts from RL approved generators.
	CWC Upgrades	Provides for upgrades to waste processing equipment, systems components, and computer interface equipment, including physical upgrades to the CWC.
	CWC CENRTC	Provides for upgrades and replacement of capital equipment not related to construction (CENTRC).
	CWC Transition	Following operations, CWC will be transitioned to a condition ready for D&D.
	CWC Min Safe	Provides for operation of the CWC in a safe, compliant, and cost-effective manner, including emergency preparedness, assessments and surveillances, environmental monitoring and sampling, engineering, and training.

Table C-1. Solid Waste Stabilization and Disposition—200 Area (PBS RL-0013C) Level 3 Scope Summary

Level 2 Work Element	Level 3 Work Element	Scope Summary
Environmental Restoration Disposal Facility (ERDF)	ERDF Cell Expansion	Provides for expansion of ERDF by one supercell (two normal cells) to support Site cleanup efforts, including relocation of groundwater monitoring wells. Also includes placement of interim covers over ERDF cells as they are filled.
	ERDF Ready-to-Serve	Includes ERDF operations-related activities such as leachate management, waste receipt and disposal, waste transport to ERDF, equipment and road maintenance, air monitoring, and groundwater well sampling and analysis.
Integrated Disposal Facility (IDF)	IDF Startup and Testing	Includes staff ramp-up, operational readiness review, and regulatory documentation.
	IDF Ready-to-Serve	Provides for operation of the IDF in a safe, compliant, and cost-effective manner, including emergency preparedness, assessments and surveillances, environmental monitoring and sampling, fire protection, engineering, training, and receipt and disposal of ILAW and other solid waste from the WTP.
	IDF Upgrades	Includes upgrades to trailers, parking, utilities, and other infrastructure needed for IDF occupancy as well as upgrades to the waste receiving interface area and leachate systems.
	IDF Min-Safe	Provides for operation of the IDF in a safe, compliant, and cost-effective manner, including emergency preparedness, assessments and surveillances, environmental monitoring and sampling, engineering, and training.
TRU Disposition	Central Characterization Project (CPP) Support	Provides for resources to develop and maintain an interface with Hanford Site generators and CCP to perform TRU certification activities. Includes support for generators of TRU waste to define CH and RH waste volumes and packaging requirements and resources to perform WIPP closeout activities to the current Hanford WIPP Program. Provides for TRU CH shipping capabilities and establishing RH shipping capabilities, including all capital funded activities.
	Establish Shipping Capability	
	Waste Handling Support	
Spent Nuclear Fuel (SNF) Disposition	Fuel Prep Facility	Includes design, construction, and turnover to operations of a fuel preparation facility to repackage fuel stored at the 200 Area interim storage area into DOE standard canisters that satisfy repository acceptance requirements. The facility will include a shielded hot cell and remote welding capabilities.
	Offsite SNF Disposition	Includes activities to facilitate final disposition of Hanford SNF inventories at a national repository, including compliance document review, technical and programmatic interface with the cognizant DOE office and/or programs that have responsibility for management and disposition of SNF, SNF data package compliance, and planning for SNF disposition.

Table C-1. Solid Waste Stabilization and Disposition—200 Area (PBS RL-0013C) Level 3 Scope Summary

Level 2 Work Element	Level 3 Work Element	Scope Summary
Low Level Waste Burial Grounds	Low Level Waste Burial Grounds Min Safe	Provides for operation of the Low-Level Waste Burial Grounds in a safe, compliant and cost-effective manner, including surveillance, maintenance, environmental monitoring and sampling, engineering, training, work control, and radiation protection.
Sludge Treatment Phase 2	Sludge Treatment Phase 2 Design and Construction	Includes documentation for project approval, development and approval of conceptual, preliminary and final designs, project management, procurement, construction and operational readiness completion needed to stabilize and package sludge from 105-KW Basin for final disposition to WIPP or another disposal facility.
	Sludge Treatment Phase 2 Operation	Includes operations needed to package and ship the treated sludge to WIPP and deactivation of process systems.
	Sludge Treatment Phase 2 Project Closeout	Includes shutdown of process systems, management, and support.
Management of Cesium and Strontium Capsules (MCSC)	WESF Mods & Capsule Storage Area	Provides for construction of WESF modifications and the capsule storage area (CSA), management and other project costs.
	MCSC Other Project Costs	Provides design and fabrication of the cask storage system, identification and development of required transportation safety documentation based on selected cask storage technology, and preparation of transportation safety documentation necessary to support capsule transfer operations.
Capsule Interim Storage Operations	Capsule Transfer Startup and Operations	Provides for retrieval of cesium/strontium capsules from the WESF pool cells and packaging, transportation, and placement of the CSS into dry storage at the CSA.
General Debris and Excess Cleanup	Disposition Decision and Disposal	Includes a disposition decision, cleanup and disposal of general debris and excess material on the Hanford Site.
<b>NOTE:</b> See Tables C-2 and C-3 for schedule and budget information.		
<div> <div> CCP = Central Characterization Project.  CENRTC = Capital Equipment Not Related To Construction.  CH = contact-handled.  CSB = Canister Storage Building.  CWC = Central Waste Complex.  D&amp;D = decontamination and decommissioning.  ERDF = Environmental Restoration Disposal Facility.  ETF = Effluent Treatment Facility.  IDF = Integrated Disposal Facility.  LDR = land disposal restriction. </div> <div> LERF = Liquid Effluent Retention Facility.  LLBG = Low-Level Burial Grounds.  LLW = low-level waste.  MLLW = mixed low-level waste.  PBS = project baseline summary.  RH = remote-handled.  SNF = spent nuclear fuel.  TRU = transuranic.  TSD = treatment, storage, and disposal.  WESF = Waste Encapsulation Storage Facility.  WIPP = Waste Isolation Pilot Plant.  WRAP = Waste Receiving and Processing (Facility).  WTP = Waste Treatment and Immobilization Plant. </div> </div>		

Table C-2. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000 Escalated)

Fiscal Year	2022	2023	2024	2025	2026	2027	2028
Project Management	19,700	20,000	20,600	21,200	21,600	22,100	21,900
Waste Encapsulation Storage Facility (WESF)	12,300	12,600	12,200	12,300	12,900	27,100	27,100
Canister Storage Building (CSB)	7,300	7,500	7,700	7,800	8,000	8,200	9,600
MLLW Trenches	1,900	2,000	2,300	2,100	2,100	2,400	2,400
TRU Waste Retrieval	0	0	0	0	0	0	2,100
TRU Repackaging	28,000	30,100	30,900	38,100	39,000	5,700	317,500
WRAP	15,300	15,500	5,200	5,300	5,500	5,600	5,700
T Plant	14,500	13,100	13,400	13,700	14,000	14,300	14,600
Central Waste Complex (CWC)	17,300	17,400	18,100	10,200	12,000	11,600	12,200
ERDF	31,100	31,600	43,500	44,300	45,600	46,400	35,300
Integrated Disposal Facility (IDF)	40,200	24,600	27,600	28,100	28,900	29,500	30,000
TRU Disposition	0	0	4,600	5,900	16,500	8,600	9,000
Spent Nuclear Fuel (SNF) Disposition	0	0	0	0	0	0	0
Low-Level Waste Burial Grounds	1,100	1,100	1,100	1,100	1,200	1,200	1,200
Sludge Treatment, Phase 2	7,000	71,400	43,900	42,200	24,600	13,100	24,300
Management of Cesium/Strontium Capsules (MCSC)	9,900	1,100	700	0	0	0	0
Capsule Interim Storage Operations	0	0	9,900	28,000	0	0	0
General Debris and Excess Cleanup	100	200	200	100	200	100	0
Cost and/or Schedule Uncertainty	4,900	3,400	8,200	10,000	10,000	13,100	8,000
<b>Level 2 Total</b>	<b>210,600</b>	<b>251,600</b>	<b>250,100</b>	<b>270,400</b>	<b>242,100</b>	<b>209,000</b>	<b>520,900</b>

Table C-2. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000 Escalated)

Fiscal Year	2029	2030	2031	2032	2033	2034	2035
Project Management	22,300	22,800	23,400	23,900	24,300	25,100	25,800
Waste Encapsulation Storage Facility (WESF)	0	0	0	0	0	0	0
Canister Storage Building (CSB)	9,900	10,100	8,900	9,100	9,300	9,600	9,900
MLLW Trenches	2,500	2,500	1,600	1,700	1,700	1,700	1,800
TRU Waste Retrieval	14,800	21,500	37,600	30,500	31,100	34,200	35,100
TRU Repackaging	80,000	71,200	33,600	34,400	35,000	36,100	37,000
WRAP	5,800	10,700	19,800	20,300	20,700	21,300	21,900
T Plant	14,900	15,200	15,700	16,000	16,200	16,800	17,200
Central Waste Complex (CWC)	12,900	13,500	10,800	10,600	10,800	11,100	11,800
ERDF	36,100	37,000	37,900	38,700	39,400	40,600	41,800
Integrated Disposal Facility (IDF)	30,800	31,500	32,200	32,800	33,500	34,600	35,600
TRU Disposition	9,200	9,400	9,600	9,800	10,000	10,400	10,700
Spent Nuclear Fuel (SNF) Disposition	0	0	0	0	0	0	0
Low-Level Waste Burial Grounds	1,200	1,300	1,300	1,300	1,300	1,400	1,400
Sludge Treatment, Phase 2	41,500	31,100	11,700	44,800	52,900	54,500	56,100
Management of Cesium/Strontium Capsules (MCSC)	0	0	0	0	0	0	0
Capsule Interim Storage Operations	0	0	0	0	0	0	0
General Debris and Excess Cleanup	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	14,800	2,000	15,800	2,800	2,300	2,200	2,000
<b>Level 2 Total</b>	<b>296,700</b>	<b>279,800</b>	<b>259,900</b>	<b>276,700</b>	<b>288,500</b>	<b>299,600</b>	<b>308,100</b>

Table C-2. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000 Escalated)

Fiscal Year	2036	2037	2038	2039	2040	2041	2042
Project Management	26,600	27,200	27,800	28,800	29,500	30,400	31,200
Waste Encapsulation Storage Facility (WESF)	0	0	0	0	0	0	0
Canister Storage Building (CSB)	45,300	10,400	10,600	11,000	11,300	11,600	11,900
MLLW Trenches	1,900	1,900	2,000	2,000	2,000	2,100	2,200
TRU Waste Retrieval	38,400	25,600	28,300	29,300	30,100	21,100	8,300
TRU Repackaging	38,100	39,200	39,900	41,300	42,400	43,700	44,900
WRAP	22,600	23,100	23,600	24,400	25,000	25,800	26,500
T Plant	16,100	16,500	16,800	17,400	17,900	18,400	18,900
Central Waste Complex (CWC)	11,700	12,000	12,300	12,700	13,000	13,500	13,900
ERDF	43,100	44,200	45,100	46,700	47,900	49,300	50,700
Integrated Disposal Facility (IDF)	36,500	37,500	38,200	39,600	40,800	41,900	43,000
TRU Disposition	11,000	11,300	11,500	11,800	13,000	13,600	13,900
Spent Nuclear Fuel (SNF) Disposition	0	0	0	0	0	0	0
Low-Level Waste Burial Grounds	1,500	1,500	1,500	1,600	1,600	0	0
Sludge Treatment, Phase 2	57,800	38,700	29,100	21,000	6,600	0	0
Management of Cesium/Strontium Capsules (MCSC)	0	0	0	0	0	0	0
Capsule Interim Storage Operations	0	0	0	0	0	0	0
General Debris and Excess Cleanup	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	1,800	2,400	16,800	34,600	45,700	33,500	17,700
<b>Level 2 Total</b>	<b>352,400</b>	<b>291,500</b>	<b>303,500</b>	<b>322,200</b>	<b>326,800</b>	<b>304,900</b>	<b>283,100</b>



Table C-2. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000 Escalated)

Fiscal Year	2043	2044	2045	2046	2047	2048	2049
Project Management	31,800	32,800	33,400	33,300	34,900	36,100	37,200
Waste Encapsulation Storage Facility (WESF)	0	0	0	0	0	0	0
Canister Storage Building (CSB)	12,200	12,500	12,700	12,700	13,300	13,800	14,200
MLLW Trenches	2,300	2,300	2,300	2,300	2,400	2,600	2,600
TRU Waste Retrieval	7,900	7,500	16,700	16,700	17,500	18,000	0
TRU Repackaging	45,800	47,000	47,900	47,900	50,100	13,200	0
WRAP	27,000	27,800	28,300	28,200	29,500	54,600	0
T Plant	19,300	19,800	20,200	20,200	21,100	30,900	31,900
Central Waste Complex (CWC)	14,100	14,500	14,800	14,800	15,000	15,500	16,000
ERDF	51,700	53,100	54,100	54,000	56,500	58,400	60,300
Integrated Disposal Facility (IDF)	43,900	45,000	46,000	46,000	48,000	49,500	51,300
TRU Disposition	14,100	14,600	14,800	14,800	15,100	15,700	16,200
Spent Nuclear Fuel (SNF) Disposition	100	30,600	47,600	53,900	8,800	9,200	9,500
Low-Level Waste Burial Grounds	0	0	0	0	0	0	0
Sludge Treatment, Phase 2	0	0	0	0	0	0	0
Management of Cesium/Strontium Capsules (MCSC)	0	0	0	0	0	0	0
Capsule Interim Storage Operations	0	0	0	0	0	0	0
General Debris and Excess Cleanup	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	23,400	20,100	13,200	7,900	4,500	10,500	25,600
<b>Level 2 Total</b>	<b>293,600</b>	<b>327,600</b>	<b>352,000</b>	<b>352,700</b>	<b>316,700</b>	<b>328,000</b>	<b>264,800</b>



Table C-2. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000 Escalated)

Fiscal Year	2050	2051	2052	2053	2054	2055	2056
Project Management	38,100	39,200	40,400	41,200	42,400	39,800	40,700
Waste Encapsulation Storage Facility (WESF)	0	0	0	0	0	0	0
Canister Storage Building (CSB)	14,500	15,000	15,400	15,800	16,200	16,600	16,900
MLLW Trenches	2,700	2,700	2,900	2,900	3,000	0	0
TRU Waste Retrieval	0	0	0	0	0	0	0
TRU Repackaging	0	0	0	0	0	0	0
WRAP	0	0	0	0	0	0	0
T Plant	32,700	33,600	34,600	35,500	36,400	0	0
Central Waste Complex (CWC)	16,400	16,900	17,400	17,800	18,200	18,700	19,100
ERDF	61,700	63,500	65,400	66,800	68,600	70,300	71,800
Integrated Disposal Facility (IDF)	52,400	54,100	55,600	56,800	58,300	59,700	61,000
TRU Disposition	16,500	0	0	0	0	0	0
Spent Nuclear Fuel (SNF) Disposition	7,100	7,400	13,200	13,500	13,800	14,200	14,500
Low-Level Waste Burial Grounds	0	0	0	0	0	0	0
Sludge Treatment, Phase 2	0	0	0	0	0	0	0
Management of Cesium/Strontium Capsules (MCSC)	0	0	0	0	0	0	0
Capsule Interim Storage Operations	0	0	0	0	0	0	0
General Debris and Excess Cleanup	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	38,900	25,800	28,300	18,100	14,300	13,000	12,000
<b>Level 2 Total</b>	<b>281,000</b>	<b>258,200</b>	<b>273,200</b>	<b>268,400</b>	<b>271,200</b>	<b>232,300</b>	<b>236,000</b>

Table C-2. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000 Escalated)

Fiscal Year	2057	2058	2059	2060	2061	2062	2063
Project Management	41,500	41,600	43,500	44,600	45,500	46,500	47,600
Waste Encapsulation Storage Facility (WESF)	0	0	0	0	0	0	0
Canister Storage Building (CSB)	17,300	17,300	18,100	18,600	18,900	19,400	19,800
MLLW Trenches	0	0	0	0	0	0	0
TRU Waste Retrieval	0	0	0	0	0	0	0
TRU Repackaging	0	0	0	0	0	0	0
WRAP	0	0	0	0	0	0	0
T Plant	0	0	0	0	0	0	0
Central Waste Complex (CWC)	19,500	19,500	20,400	20,900	21,300	21,800	22,300
ERDF	73,200	73,400	76,600	78,700	80,300	82,000	83,900
Integrated Disposal Facility (IDF)	62,500	62,400	65,200	66,700	68,300	69,900	71,600
TRU Disposition	0	0	0	0	0	0	0
Spent Nuclear Fuel (SNF) Disposition	14,800	14,800	15,500	31,600	32,300	33,000	33,700
Low-Level Waste Burial Grounds	0	0	0	0	0	0	0
Sludge Treatment, Phase 2	0	0	0	0	0	0	0
Management of Cesium/Strontium Capsules (MCSC)	0	0	0	0	0	0	0
Capsule Interim Storage Operations	0	0	0	0	0	0	0
General Debris and Excess Cleanup	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	8,200	8,600	7,300	4,900	5,000	5,000	5,500
<b>Level 2 Total</b>	<b>237,000</b>	<b>237,600</b>	<b>246,600</b>	<b>266,000</b>	<b>271,600</b>	<b>277,600</b>	<b>284,400</b>

Table C-2. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000 Escalated)

Fiscal Year	2064	2065	2066	2067	2068	2069	2070
Project Management	49,200	50,600	52,600	53,900	54,800	57,400	59,000
Waste Encapsulation Storage Facility (WESF)	0	0	0	0	0	0	0
Canister Storage Building (CSB)	20,500	21,000	0	0	0	0	0
MLLW Trenches	0	0	0	0	0	0	0
TRU Waste Retrieval	0	0	0	0	0	0	0
TRU Repackaging	0	0	0	0	0	0	0
WRAP	0	0	0	0	0	0	0
T Plant	0	0	0	0	0	0	0
Central Waste Complex (CWC)	25,500	47,900	0	0	0	0	0
ERDF	86,700	89,200	95,800	98,100	99,800	104,500	107,500
Integrated Disposal Facility (IDF)	71,800	0	0	0	0	0	0
TRU Disposition	0	0	0	0	0	0	0
Spent Nuclear Fuel (SNF) Disposition	34,900	35,800	0	0	0	0	0
Low-Level Waste Burial Grounds	0	0	0	0	0	0	0
Sludge Treatment, Phase 2	0	0	0	0	0	0	0
Management of Cesium/Strontium Capsules (MCSC)	0	0	0	0	0	0	0
Capsule Interim Storage Operations	0	0	0	0	0	0	0
General Debris and Excess Cleanup	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	2,800	3,500	27,900	37,500	44,500	62,600	38,000
<b>Level 2 Total</b>	<b>291,400</b>	<b>248,000</b>	<b>176,300</b>	<b>189,500</b>	<b>199,100</b>	<b>224,500</b>	<b>204,500</b>

Table C-2. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000 Escalated)

Fiscal Year	2071	2072	2073	2074	2075	2076	2077
Project Management	59,300	61,200	61,100	61,800	63,900	66,600	0
Waste Encapsulation Storage Facility (WESF)	0	0	0	0	0	0	0
Canister Storage Building (CSB)	0	0	0	0	0	0	0
MLLW Trenches	0	0	0	0	0	0	0
TRU Waste Retrieval	0	0	0	0	0	0	0
TRU Repackaging	0	0	0	0	0	0	0
WRAP	0	0	0	0	0	0	0
T Plant	0	0	0	0	0	0	0
Central Waste Complex (CWC)	0	0	0	0	0	0	0
ERDF	108,000	111,400	111,200	112,500	116,400	121,300	0
Integrated Disposal Facility (IDF)	0	0	0	0	0	0	0
TRU Disposition	0	0	0	0	0	0	0
Spent Nuclear Fuel (SNF) Disposition	0	0	0	0	0	0	0
Low-Level Waste Burial Grounds	0	0	0	0	0	0	0
Sludge Treatment, Phase 2	0	0	0	0	0	0	0
Management of Cesium/Strontium Capsules (MCSC)	0	0	0	0	0	0	0
Capsule Interim Storage Operations	0	0	0	0	0	0	0
General Debris and Excess Cleanup	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	20,800	9,200	4,200	2,900	3,600	3,200	141,500
<b>Level 2 Total</b>	<b>188,100</b>	<b>181,800</b>	<b>176,500</b>	<b>177,200</b>	<b>183,900</b>	<b>191,100</b>	<b>141,500</b>

Table C-2. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000 Escalated)

Fiscal Year	2078	2079	2080	2081	2082	2083	2084
Project Management	0	0	0	0	0	0	0
Waste Encapsulation Storage Facility (WESF)	0	0	0	0	0	0	0
Canister Storage Building (CSB)	0	0	0	0	0	0	0
MLLW Trenches	0	0	0	0	0	0	0
TRU Waste Retrieval	0	0	0	0	0	0	0
TRU Repackaging	0	0	0	0	0	0	0
WRAP	0	0	0	0	0	0	0
T Plant	0	0	0	0	0	0	0
Central Waste Complex (CWC)	0	0	0	0	0	0	0
ERDF	0	0	0	0	0	0	0
Integrated Disposal Facility (IDF)	0	0	0	0	0	0	0
TRU Disposition	0	0	0	0	0	0	0
Spent Nuclear Fuel (SNF) Disposition	0	0	0	0	0	0	0
Low-Level Waste Burial Grounds	0	0	0	0	0	0	0
Sludge Treatment, Phase 2	0	0	0	0	0	0	0
Management of Cesium/Strontium Capsules (MCSC)	0	0	0	0	0	0	0
Capsule Interim Storage Operations	0	0	0	0	0	0	0
General Debris and Excess Cleanup	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	143,700	140,800	126,200	78,000	42,400	35,000	33,600
<b>Level 2 Total</b>	<b>143,700</b>	<b>140,800</b>	<b>126,200</b>	<b>78,000</b>	<b>42,400</b>	<b>35,000</b>	<b>33,600</b>

Table C-2. Solid Waste Stabilization and Disposition –200 Area (PBS RL-0013C) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000 Escalated)

Fiscal Year	2085	2086	2087	2088	2089	2090	Total
Project Management	0	0	0	0	0	0	2,099,700
Waste Encapsulation Storage Facility (WESF)	0	0	0	0	0	0	116,500
Canister Storage Building (CSB)	0	0	0	0	0	0	607,700
MLLW Trenches	0	0	0	0	0	0	73,800
TRU Waste Retrieval	0	0	0	0	0	0	472,300
TRU Repackaging	0	0	0	0	0	0	1,358,000
WRAP	0	0	0	0	0	0	545,000
T Plant	0	0	0	0	0	0	667,800
Central Waste Complex (CWC)	0	0	0	0	0	0	717,700
ERDF	0	0	0	0	0	0	3,643,000
Integrated Disposal Facility (IDF)	0	0	0	0	0	0	1,983,400
TRU Disposition	0	0	0	0	0	0	321,600
Spent Nuclear Fuel (SNF) Disposition	0	0	0	0	0	0	489,800
Low-Level Waste Burial Grounds	0	0	0	0	0	0	24,900
Sludge Treatment, Phase 2	0	0	0	0	0	0	672,300
Management of Cesium/Strontium Capsules (MCSC)	0	0	0	0	0	0	11,700
Capsule Interim Storage Operations	0	0	0	0	0	0	37,900
General Debris and Excess Cleanup	0	0	0	0	0	0	900
Cost and/or Schedule Uncertainty	22,100	16,800	7,700	3,800	6,800	1,400	1,612,600
<b>Level 2 Total</b>	<b>22,100</b>	<b>16,800</b>	<b>7,700</b>	<b>3,800</b>	<b>6,800</b>	<b>1,400</b>	<b>15,456,600</b>
<div> <div>ERDF = Environmental Restoration Disposal Facility</div> <div>MLLW = mixed low-level waste. PBS = project baseline summary.</div> <div>TRU = transuranic. WRAP = Waste Receiving and Processing Facility.</div> </div>							

Table C-3. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Near-Term Schedule and Costs, Level 3, by Fiscal Year (\$1,000, Escalated)

Schedule Level	Scope	2022	2023	2024	2025	2026	2027	Total
<b>1</b>	<b>Solid Waste Stabilization and Disposition – 200 Area</b>	<b>210,600</b>	<b>251,600</b>	<b>250,100</b>	<b>270,400</b>	<b>242,100</b>	<b>209,000</b>	<b>1,433,800</b>
<b>2</b>	<b>Project Management</b>	<b>19,700</b>	<b>20,000</b>	<b>20,600</b>	<b>21,200</b>	<b>21,600</b>	<b>22,100</b>	<b>125,200</b>
3	Solid Waste Program Management	19,700	20,000	20,600	21,200	21,600	22,100	125,200
<b>2</b>	<b>Waste Encapsulation Storage Facility (WESF)</b>	<b>12,300</b>	<b>12,600</b>	<b>12,200</b>	<b>12,300</b>	<b>12,900</b>	<b>27,100</b>	<b>89,400</b>
3	Waste Encapsulation Storage Facility Upgrades	700	800	100	0	0	0	1,600
3	Waste Encapsulation Storage Facility Transition Preparation	0	0	0	0	300	0	300
3	Waste Encapsulation Storage Facility Transition	0	0	0	0	0	500	500
3	Waste Encapsulation Storage Facility During Transition Min Safe	0	0	0	0	0	26,600	26,600
3	Waste Encapsulation Storage Facility Min Safe	11,600	11,800	12,100	12,300	12,600	0	60,400
<b>2</b>	<b>Canister Storage Building (CSB)</b>	<b>7,300</b>	<b>7,500</b>	<b>7,700</b>	<b>7,800</b>	<b>8,000</b>	<b>8,200</b>	<b>46,500</b>
3	Canister Storage Building Min Safe	7,300	7,500	7,700	7,800	8,000	8,200	46,500
<b>2</b>	<b>Mixed Low Level Waste Trenches</b>	<b>1,900</b>	<b>2,000</b>	<b>2,300</b>	<b>2,100</b>	<b>2,100</b>	<b>2,400</b>	<b>12,800</b>
3	Mixed Low Level Waste Trenches Ready-to-Serve	400	400	400	400	400	500	2,500
3	Mixed Low Level Waste Upgrades	900	1,000	1,000	1,000	1,000	1,100	6,000
3	Mixed Low Level Waste Leachate Management	600	600	600	700	700	800	4,000
3	Mixed Low Level Waste Trenches Min Safe	0	0	300	0	0	0	300
<b>2</b>	<b>TRU Repackaging</b>	<b>28,000</b>	<b>30,100</b>	<b>30,900</b>	<b>38,100</b>	<b>39,000</b>	<b>5,700</b>	<b>171,800</b>
3	Commercial TRU Repackaging	26,900	27,300	28,000	28,500	29,200	0	139,900
3	Remote Handled/Large Package Capability (M-091 Capability)	1,100	2,800	2,900	9,600	9,800	5,700	31,900
<b>2</b>	<b>Waste Receiving and Processing Facility (WRAP)</b>	<b>15,300</b>	<b>15,500</b>	<b>5,200</b>	<b>5,300</b>	<b>5,500</b>	<b>5,600</b>	<b>52,400</b>
3	WRAP Upgrades	10,300	10,400	0	0	0	0	20,700
3	WRAP Min Safe	5,000	5,100	5,200	5,300	5,500	5,600	31,700
<b>2</b>	<b>T-Plant</b>	<b>14,500</b>	<b>13,100</b>	<b>13,400</b>	<b>13,700</b>	<b>14,000</b>	<b>14,300</b>	<b>83,000</b>

Table C-3. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Near-Term Schedule and Costs, Level 3, by Fiscal Year (\$1,000, Escalated)

Schedule Level	Scope	2022	2023	2024	2025	2026	2027	Total
3	T Plant Upgrades	2,900	1,300	1,300	1,300	1,300	1,300	9,400
3	T Plant Min Safe	11,600	11,800	12,100	12,400	12,700	13,000	73,600
<b>2</b>	<b>Central Waste Complex (CWC)</b>	<b>17,300</b>	<b>17,400</b>	<b>18,100</b>	<b>10,200</b>	<b>12,000</b>	<b>11,600</b>	<b>86,600</b>
3	Central Waste Complex Ready-to-Serve	8,800	8,800	9,300	1,200	2,400	2,200	32,700
3	Central Waste Complex Upgrades	200	200	200	200	200	200	1,200
3	CWC CENRTC	0	0	0	0	400	0	400
3	CWC Min Safe	8,300	8,400	8,600	8,800	9,000	9,200	52,300
<b>2</b>	<b>Environmental Restoration Disposal Facility (ERDF)</b>	<b>31,100</b>	<b>31,600</b>	<b>43,500</b>	<b>44,300</b>	<b>45,600</b>	<b>46,400</b>	<b>242,500</b>
3	ERDF Cell Expansion	100	100	11,200	11,400	11,700	11,800	46,300
3	ERDF Groundwater Monitoring Wells Relocation	31,000	31,500	32,300	32,900	33,900	34,600	196,200
<b>2</b>	<b>Integrated Disposal Facility (IDF)</b>	<b>40,200</b>	<b>24,600</b>	<b>27,600</b>	<b>28,100</b>	<b>28,900</b>	<b>29,500</b>	<b>178,900</b>
3	IDF Ready-to-Serve	0	2,600	7,500	7,700	7,900	8,000	33,700
3	IDF Startup and Testing	39,700	2,300	0	0	0	0	42,000
3	Integrated Disposal Facility Min Safe	500	19,700	20,100	20,400	21,000	21,500	103,200
<b>2</b>	<b>TRU Disposition</b>	<b>0</b>	<b>0</b>	<b>4,600</b>	<b>5,900</b>	<b>16,500</b>	<b>8,600</b>	<b>35,600</b>
3	Central Characterization Project (CCP) Support	0	0	1,400	2,100	3,900	3,200	10,600
3	Establish Loading to Ship Capability	0	0	1,900	2,400	6,900	0	11,200
3	Waste Handling Support (2050 case)	0	0	1,300	1,400	5,700	5,400	13,800
<b>2</b>	<b>Low Level Waste Burial Grounds</b>	<b>1,100</b>	<b>1,100</b>	<b>1,100</b>	<b>1,100</b>	<b>1,200</b>	<b>1,200</b>	<b>6,800</b>
3	Low Level Burial Grounds Min Safe	1,100	1,100	1,100	1,100	1,200	1,200	6,800
<b>2</b>	<b>Sludge Treatment Phase 2</b>	<b>7,000</b>	<b>71,400</b>	<b>43,900</b>	<b>42,200</b>	<b>24,600</b>	<b>13,100</b>	<b>202,200</b>
3	Sludge Treatment Phase Two Design and Construction	7,000	71,400	43,900	42,200	24,600	13,100	202,200
<b>2</b>	<b>Management of Cesium/Strontium Capsules (MCSC)</b>	<b>9,900</b>	<b>1,100</b>	<b>700</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>11,700</b>
3	Management of Cs/Sr Capsules, Other Project Costs	7,700	1,100	700	0	0	0	9,500
3	WESF Mods & Capsule Storage Area (CSA)	2,200	0	0	0	0	0	2,200
<b>2</b>	<b>Capsule Transfer Startup and Operations</b>	<b>0</b>	<b>0</b>	<b>9,900</b>	<b>28,000</b>	<b>0</b>	<b>0</b>	<b>37,900</b>



Table C-3. Solid Waste Stabilization and Disposition–200 Area (PBS RL-0013C) Near-Term Schedule and Costs, Level 3, by Fiscal Year (\$1,000, Escalated)

Schedule Level	Scope	2022	2023	2024	2025	2026	2027	Total
3	Capsule Transfer Startup and Operations	0	0	9,900	28,000	0	0	37,900
2	<b>General Debris and Excess Cleanup</b>	<b>100</b>	<b>200</b>	<b>200</b>	<b>100</b>	<b>200</b>	<b>100</b>	<b>900</b>
2	<b>Cost and/or Schedule Uncertainty</b>	<b>4,900</b>	<b>3,400</b>	<b>8,200</b>	<b>10,000</b>	<b>10,000</b>	<b>13,100</b>	<b>49,600</b>
	<b>Total</b>	<b>210,600</b>	<b>251,600</b>	<b>250,100</b>	<b>270,400</b>	<b>242,100</b>	<b>209,000</b>	<b>1,433,800</b>
<p>CH = contact-handled.                      PBS = project baseline summary.</p> <p>CSB = Canister Storage Building.        RH = remote-handled.</p> <p>CWC = Central Waste Complex.           SNF = spent nuclear fuel.</p> <p>ERDF = Environmental Restoration Disposal Facility.    TRU = transuranic.</p> <p>IDF = Integrated Disposal Facility.        WESF = Waste Encapsulation Storage Facility.</p> <p>MLLW = mixed low-level waste.           WRAP = Waste Receiving and Processing (Facility)</p>								

### C.1.2 SAFEGUARDS AND SECURITY (PBS RL-0020) SCHEDULE AND COST DETAILS

Scope information for Safeguards and Security, PBS RL-0020, is presented in Table C-4. This PBS is not broken down to Level 3 details, so no additional scope is presented.

Table C-4. Safeguards and Securities (PBS RL-0020) Level 2 Scope Summary

Work Element	Scope Description
Safeguards and Security	Includes management, training, and equipment for staff; physical protective systems, such as imposition protection, Hanford Site access, and badging; information and cyber security; personnel security; material control and accountability; and security program management.
<p><b>NOTE:</b> See Table C-5 for schedule and budget information.</p> <p>PBS = project baseline summary.</p> <p>RL = U.S. Department of Energy, Richland Operations Office.</p>	

Table C-5. Safeguards and Security (PBS RL-0020) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year  
(\$1,000 Escalated)

Fiscal Year	2022	2023	2024	2025	2026	2027	2028
Safeguards and Security	98,800	135,200	110,000	112,100	115,200	117,800	126,000
Fiscal Year	2029	2030	2031	2032	2033	2034	2035
Safeguards and Security	122,700	125,600	128,600	131,400	154,600	137,900	141,600
Fiscal Year	2036	2037	2038	2039	2040	2041	2042
Safeguards and Security	145,600	149,200	160,100	157,400	161,500	166,100	170,500
Fiscal Year	2043	2044	2045	2046	2047	2048	2049
Safeguards and Security	198,200	177,000	180,400	181,100	188,600	204,300	200,500
Fiscal Year	2050	2051	2052	2053	2054	2055	2056
Safeguards and Security	205,200	211,000	217,000	254,300	227,700	233,100	238,200
Fiscal Year	2057	2058	2059	2060	2061	2062	2063
Safeguards and Security	243,100	256,700	254,400	261,100	266,500	272,400	319,400
Fiscal Year	2064	2065	2066	2067	2068	2069	2070
Safeguards and Security	287,400	294,900	138,700	142,000	160,000	150,000	153,900
Fiscal Year	2071	2072	2073	2074	2075	2076	2077
Safeguards and Security	155,900	160,200	212,800	164,300	169,200	174,900	189,600
Fiscal Year	2078	Total					
Safeguards and Security	189,200	10,401,100					
PBS = project baseline summary. RL = U.S. Department of Energy, Richland Operations Office.							

### C.1.3 SOIL AND WATER REMEDIATION–GROUNDWATER / VADOSE ZONE (PBS RL-0030) SCHEDULE AND COST DETAILS

Table C-6. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030)  
Level 3 Scope Summary

Level 2 Work Element	Level 3 Work Element	Scope Summary
Groundwater Program Management	Groundwater Program Management	Includes program management oversight, integrated field work, training, well access roads, strategic integration, groundwater management plan, technical support and evaluations, project control, performance assessment, remediation decision support, sample management and reporting, environmental databases, and CERCLA <sup>1</sup> 5-year review.
	Integration and Assessments	
Groundwater Monitoring	Geophysical Sciences and Logging	Includes geophysical borehole logging; groundwater laboratory analysis and sample data management; groundwater sample collection; purgewater truck and operation and maintenance of the Hanford Geotechnical Sample Library; groundwater data evaluation and reporting including the annual CERCLA, RCRA, and pump-and-treat operations reports; well maintenance, monitoring, and reporting; RCRA well drilling per TPA <sup>2</sup> M-024 milestones; miscellaneous well decommissioning and operation; maintenance, sampling; and dismantlement of the Modutanks.
	Groundwater Lab Analysis and Data Management	
	Groundwater Sample Collection	
	Groundwater Data Evaluation and Reporting	
	Well Maintenance, Monitoring and Reporting	
	RCRA <sup>3</sup> Well Drilling (M-024)	
	Miscellaneous Well Decommissioning	
	Modutanks	
200-WA-1 Operable Unit	200-WA-1 Decision Documents	For the 200 West Area waste sites, includes implementing the CERCLA/RCRA process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparation of the remedial design/remedial action work plan. Also includes the development of Closure Plans for RCRA TSD Units within the OU.
200-EA-1 Operable Unit	200-EA-1 Decision Documents	For the 200 East Area waste sites, includes implementing the CERCLA/RCRA process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparation of the remedial design/remedial action work plan. Also includes the development of Closure Plans for RCRA TSD Units within the OU.

Table C-6. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030)  
Level 3 Scope Summary

Level 2 Work Element	Level 3 Work Element	Scope Summary
200-OA-1 Operable Unit	200-OA-1 Decision Documents	For the Outer Area waste sites, includes implementing the RI/FS process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparation of the remedial design/remedial action work plan.
200-IS-1 Operable Unit	200-IS-1 Decision Documents	For the 200 Area pipelines, includes implementing the CERCLA/RCRA process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparing the remedial design/remedial action work plan. Also includes the development of Closure Plans for RCRA TSD Units within the OU.
200-SW-2 Operable Unit	200-SW-2 Decision Documents	For the 200 Area land disposal units, includes implementing the CERCLA/RCRA process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparing the remedial design/remedial action work plan.
100-BC-5 Operable Unit	100-BC-5 Project Management	For 100-BC groundwater, includes completing the CERCLA <sup>1</sup> process and preparing regulatory decision documents leading to a final ROD, then implementing and monitoring the remedial action to completion, including final reporting and well drilling and decommissioning.
	100-BC-5 Decision Documents	
	100-BC-5 Remedial/Removal Action Implementation	
	100-BC-5 Monitoring and Reporting	
100-KR-4 Operable Unit	100-KR-4 Project Management	For 100-KR groundwater, includes completing the CERCLA process and preparing regulatory decision documents leading to a final ROD, then implementing and monitoring the remedial action to completion, including well drilling and decommissioning, pump-and-treat operations, maintenance, and monitoring, remedial process optimization (well realignments), final reporting and remedy D&D.
	100-KR-4 Decision Documents	
	100-KR-4 Remedial/Removal Action Implementation	
	100-KR-4 Monitoring and Reporting	
100-NR-2 Operable Unit	100-NR-2 Project Management	For 100-NR groundwater, includes completing the CERCLA process and preparing regulatory decision documents leading to a final ROD, then implementing and monitoring the remedial action to completion, including bioventing operations and maintenance final reporting, well drilling and decommissioning, and remedy D&D.
	100-NR-2 Decision Documents	
	100-NR-2 Remedial/Removal Action Implementation	
	100-NR-2 Monitoring and Reporting	

Table C-6. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030)  
Level 3 Scope Summary

Level 2 Work Element	Level 3 Work Element	Scope Summary
100-HR-3 Operable Unit	100-HR-3 Project Management	For 100-HR groundwater, includes implementing and monitoring the remedial action to completion, including well drilling and decommissioning, pump-and-treat operations, maintenance and monitoring, remedial process optimization (well realignments), final reporting, and remedy D&D.
	100-HR-3 Remedial/Removal Action Implementation	
	100-HR-3 Monitoring and Reporting	
100-FR-3 Operable Unit	100-FR-3 Project Management	For 100-FR groundwater, includes implementing and monitoring the remedial action to completion, including final reporting and well drilling and decommissioning.
	100-FR-3 Remedial/Removal Action Implementation	
	100-FR-3 Monitoring and Reporting	
200-BP-5 Operable Unit	200-BP-5 Project Management	For 200-BP groundwater, includes completing the CERCLA process and preparing regulatory decision documents (including for the 200-PO-1 OU) leading to an interim ROD, then implementing and monitoring the remedial action to completion, including reporting and well drilling and decommissioning.
	200-BP-5 & PO-1 Decision Documents	
	200-BP-5 Remedial/Removal Action Implementation	
	200-BP-5 Monitoring and Reporting	
200-PO-1 Operable Unit	200-PO-1 Project Management	For 200-PO groundwater, includes implementing and monitoring the remedial action to completion, including reporting and well drilling and decommissioning.
	200-PO-1 Remedial/Removal Action Implementation	
	200-PO-1 Monitoring and Reporting	
200-UP-1 Operable Unit	200-UP-1 Project Management	For 200-UP groundwater, includes implementing and monitoring the remedial action to completion, including treatability testing, tracer study, well drilling and decommissioning, pump-and-treat operations, maintenance, and monitoring, final reporting, and remedy D&D.
	200-UP-1 Decision Documents	
	200-UP-1 Remedial/Removal Action Implementation	
	200-UP-1 Monitoring and Reporting	
200-ZP-1 Operable Unit	200-ZP-1 Project Management	For 200-ZP groundwater, includes implementing and monitoring the remedial action to completion, including well drilling and decommissioning, pump-and-treat operations, maintenance and monitoring, remedial process optimization (well realignments), final reporting, and remedy D&D.
	200-ZP-1 Remedial/Removal Action Implementation	
	200-ZP-1 Monitoring and Reporting	
200-CB-1 Operable Unit	200-CB-1 Decision Documents	For the B Plant canyon and waste sites, includes implementing the CERCLA/RCRA process through field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparing the remedial design/remedial action work plan.

Table C-6. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030)  
Level 3 Scope Summary

Level 2 Work Element	Level 3 Work Element	Scope Summary
200-CP-1 Operable Unit	200-CP-1 Decision Documents	For the PUREX canyon and waste sites (including the PUREX tunnels), includes implementing the CERCLA/RCRA process though field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparing the remedial design/remedial action work plan.
200-CR-1 Operable Unit	200-CR-1 Decision Documents	For the REDOX canyon and waste sites, includes implementing the CERCLA/RCRA process though field investigations, sampling and analysis, and preparing regulatory decision documents leading to a final ROD, then preparing the remedial design/remedial action work plan.
300-FF-5 Operable Unit	300-FF-5 Project Management	For 300-FF groundwater, includes implementing and monitoring the remedial action to completion, including final reporting, and well drilling and decommissioning.
	300-FF-5 Remedial/Removal Action Implementation	
	300-FF-5 Monitoring and Reporting	
200-DV-1 Operable Unit	200-DV-1 Project Management	For the deep vadose zone, includes completing the CERCLA/RCRA process through treatability studies and preparing regulatory decision documents leading to a final ROD, then preparing the remedial design/remedial action work plan.
	200-DV-1 Decision Documents	
<p><b>NOTE:</b> See Tables C-7 and C-8 for schedule and budget information.</p> <p><sup>1</sup><i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601</i>, et seq.</p> <p><sup>2</sup><i>Ecology, EPA, and DOE, 1989, Hanford Federal Facility Agreement and Consent Order</i>, 2 vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.</p> <p><sup>3</sup><i>Resource Conservation and Recovery Act of 1976, 42 USC 6901</i>, et seq.</p>		
<div><div>CENRTC= Capital Equipment Not Related To Construction. CERCLA= <i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>. D&amp;D = deactivation and decommissioning. GRP = Groundwater Remediation Project. IFW = Integrated Field Work.</div><div>OU = operable unit. PBS = project baseline summary. RI/FS= remedial investigation/feasibility study. RCRA = <i>Resource Conservation and Recovery Act of 1976</i>. TPA = Tri-Party Agreement.</div></div>		

Table C-7. Soil and Water Remediation—Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2022	2023	2024	2025	2026	2027	2028
Groundwater Program Management	42,000	38,000	36,500	37,200	37,700	38,900	36,300
Groundwater Monitoring	35,700	24,800	35,900	36,600	37,200	38,300	28,400
200-WA-1 Operable Unit	2,700	4,000	9,700	7,600	5,200	800	800
200-EA-1 Operable Unit	23,700	11,200	1,600	1,700	900	600	1,800
200-OA-1 Operable Unit	2,100	10,100	4,800	1,200	1,200	700	1,900
200-IS-1 Operable Unit	800	800	26,100	35,300	28,500	3,300	3,400
200-SW-2 Operable Unit	6,700	6,900	7,200	3,600	1,500	1,500	1,900
100-BC-5 Operable Unit	1,100	800	800	800	200	200	200
100-KR-4 Operable Unit	10,800	9,200	17,500	16,600	7,800	7,900	7,900
100-NR-2 Operable Unit	4,800	7,100	7,000	4,400	3,100	3,200	4,400
100-HR-3 Operable Unit	7,900	18,500	19,700	9,300	9,600	9,800	9,800
100-FR-3 Operable Unit	400	900	400	400	400	400	2,500
100-OL-1 Operable Unit	0	0	0	0	0	0	0
200-BP-5 Operable Unit	10,100	20,500	5,200	400	200	200	2,000
200-PO-1 Operable Unit	3,400	5,000	2,500	100	100	100	2,000
200-UP-1 Operable Unit	4,600	5,100	15,500	10,100	2,200	2,300	4,300
200-ZP-1 Operable Unit	27,000	53,000	58,100	78,300	51,600	51,400	31,500
200-CB-1 Decision Documents	1,500	14,700	14,800	15,100	15,600	16,900	2,100
200-CP-1 Decision Documents	13,100	13,300	13,600	13,900	14,800	1,200	1,200
200-CR-1 Decision Documents	700	700	9,600	9,600	9,900	10,100	10,300
300-FF-5 Operable Unit	1,200	1,800	1,200	1,200	1,400	1,400	2,000
200-DV-1 Operable Unit	13,400	8,100	3,300	4,900	3,900	2,500	500
Cost and/or Schedule Uncertainty	12,500	13,400	17,900	37,300	25,700	12,400	11,800
<b>Level 2 Total</b>	<b>226,200</b>	<b>267,900</b>	<b>308,900</b>	<b>325,600</b>	<b>259,100</b>	<b>204,100</b>	<b>167,000</b>



Table C-7. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2029	2030	2031	2032	2033	2034	2035
Groundwater Program Management	37,100	33,600	27,200	24,900	25,000	28,300	31,600
Groundwater Monitoring	43,000	35,400	38,500	35,800	29,400	28,700	28,400
200-WA-1 Operable Unit	700	2,000	0	0	0	0	0
200-EA-1 Operable Unit	0	0	0	0	0	0	0
200-OA-1 Operable Unit	0	0	0	0	0	0	0
200-IS-1 Operable Unit	3,500	1,300	2,900	100	0	0	0
200-SW-2 Operable Unit	1,100	1,300	0	0	0	0	0
100-BC-5 Operable Unit	1,100	200	200	200	200	200	200
100-KR-4 Operable Unit	7,300	7,500	7,700	7,900	2,700	1,300	1,300
100-NR-2 Operable Unit	900	200	200	200	1,600	200	200
100-HR-3 Operable Unit	8,300	8,600	8,800	9,000	2,700	1,400	1,400
100-FR-3 Operable Unit	400	400	400	500	1,200	500	500
100-OL-1 Operable Unit	0	0	0	0	0	0	0
200-BP-5 Operable Unit	200	200	3,300	3,400	5,600	3,600	3,700
200-PO-1 Operable Unit	100	100	100	100	2,300	100	100
200-UP-1 Operable Unit	2,300	2,500	2,500	2,500	4,700	2,700	2,800
200-ZP-1 Operable Unit	29,700	35,700	31,100	31,800	35,100	33,400	40,300
200-CB-1 Decision Documents	2,200	900	2,200	200	0	0	0
200-CP-1 Decision Documents	1,200	1,200	900	2,300	200	0	0
200-CR-1 Decision Documents	10,500	11,800	2,300	2,300	900	2,300	100
300-FF-5 Operable Unit	1,400	1,400	1,500	1,500	2,200	1,500	1,700
200-DV-1 Operable Unit	400	500	500	500	500	500	500
Cost and/or Schedule Uncertainty	9,000	17,500	24,700	46,100	46,400	33,000	10,400
<b>Level 2 Total</b>	<b>160,400</b>	<b>162,300</b>	<b>155,000</b>	<b>169,300</b>	<b>160,700</b>	<b>137,700</b>	<b>123,200</b>

Table C-7. Soil and Water Remediation—Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2036	2037	2038	2039	2040	2041	2042
Groundwater Program Management	34,900	27,900	28,500	29,600	30,400	37,100	38,200
Groundwater Monitoring	29,200	30,100	22,800	29,800	27,600	28,600	29,300
200-WA-1 Operable Unit	0	0	0	0	0	0	0
200-EA-1 Operable Unit	0	0	0	0	0	0	0
200-OA-1 Operable Unit	0	0	0	0	0	0	0
200-IS-1 Operable Unit	0	0	0	0	0	0	0
200-SW-2 Operable Unit	0	0	0	0	0	0	0
100-BC-5 Operable Unit	200	200	200	200	200	200	200
100-KR-4 Operable Unit	1,100	1,200	5,200	3,600	300	300	300
100-NR-2 Operable Unit	100	100	1,700	100	100	100	200
100-HR-3 Operable Unit	1,200	1,200	6,200	4,800	300	300	300
100-FR-3 Operable Unit	500	500	1,300	500	500	600	600
100-OL-1 Operable Unit	0	0	0	0	0	0	0
200-BP-5 Operable Unit	3,800	200	2,500	300	300	300	300
200-PO-1 Operable Unit	3,300	3,400	5,900	3,500	3,600	3,700	100
200-UP-1 Operable Unit	2,900	1,800	700	3,300	700	5,900	6,200
200-ZP-1 Operable Unit	35,400	34,900	7,900	5,100	5,800	5,400	5,500
200-CB-1 Decision Documents	0	0	0	0	0	0	0
200-CP-1 Decision Documents	0	0	0	0	0	0	0
200-CR-1 Decision Documents	0	0	0	0	0	0	0
300-FF-5 Operable Unit	1,700	1,700	2,300	1,500	1,500	1,600	1,700
200-DV-1 Operable Unit	500	500	0	0	0	0	0
Cost and/or Schedule Uncertainty	6,900	10,000	7,300	10,000	8,000	6,600	8,300
<b>Level 2 Total</b>	<b>121,700</b>	<b>113,700</b>	<b>92,600</b>	<b>92,300</b>	<b>79,300</b>	<b>90,700</b>	<b>91,200</b>

Table C-7. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2043	2044	2045	2046	2047	2048	2049
Groundwater Program Management	38,900	33,400	34,000	37,200	35,600	39,500	44,300
Groundwater Monitoring	24,100	30,700	30,700	30,700	31,600	26,200	34,900
200-WA-1 Operable Unit	0	0	0	0	0	0	0
200-EA-1 Operable Unit	0	0	0	0	0	0	0
200-OA-1 Operable Unit	0	0	0	0	0	0	0
200-IS-1 Operable Unit	0	0	0	0	0	0	0
200-SW-2 Operable Unit	0	0	0	0	0	0	0
100-BC-5 Operable Unit	200	200	200	200	200	200	200
100-KR-4 Operable Unit	2,200	300	300	300	300	2,600	400
100-NR-2 Operable Unit	2,000	200	200	200	200	2,200	200
100-HR-3 Operable Unit	2,100	300	300	300	400	2,400	400
100-FR-3 Operable Unit	1,500	600	600	600	600	1,600	700
100-OL-1 Operable Unit	0	0	0	0	0	0	0
200-BP-5 Operable Unit	3,000	300	300	300	300	3,300	400
200-PO-1 Operable Unit	2,900	100	100	100	100	3,300	100
200-UP-1 Operable Unit	9,300	12,500	500	500	500	600	4,000
200-ZP-1 Operable Unit	17,800	14,800	4,400	4,400	4,600	8,600	4,900
200-CB-1 Decision Documents	0	0	0	0	0	0	0
200-CP-1 Decision Documents	0	0	0	0	0	0	0
200-CR-1 Decision Documents	0	0	0	0	0	0	0
300-FF-5 Operable Unit	2,600	1,800	1,800	1,800	1,800	2,900	1,900
200-DV-1 Operable Unit	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	6,300	5,200	5,600	6,000	23,200	19,500	20,300
<b>Level 2 Total</b>	<b>112,900</b>	<b>100,400</b>	<b>79,000</b>	<b>82,600</b>	<b>99,400</b>	<b>113,000</b>	<b>112,700</b>

Table C-7. Soil and Water Remediation—Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2050	2051	2052	2053	2054	2055	2056
Groundwater Program Management	45,300	42,700	40,300	41,200	42,300	47,600	56,900
Groundwater Monitoring	34,500	39,200	36,500	35,000	43,600	45,400	46,300
200-WA-1 Operable Unit	0	0	0	0	0	0	0
200-EA-1 Operable Unit	0	0	0	0	0	0	0
200-OA-1 Operable Unit	0	0	0	0	0	0	0
200-IS-1 Operable Unit	0	0	0	0	0	0	0
200-SW-2 Operable Unit	0	0	0	0	0	0	0
100-BC-5 Operable Unit	200	200	200	200	200	200	200
100-KR-4 Operable Unit	400	400	400	2,900	400	400	400
100-NR-2 Operable Unit	200	200	200	2,500	200	200	200
100-HR-3 Operable Unit	400	400	400	2,700	400	500	500
100-FR-3 Operable Unit	700	800	800	1,900	800	800	900
100-OL-1 Operable Unit	0	0	0	0	0	0	0
200-BP-5 Operable Unit	400	400	500	3,900	500	500	500
200-PO-1 Operable Unit	100	100	100	3,800	100	100	100
200-UP-1 Operable Unit	700	700	700	700	4,500	700	700
200-ZP-1 Operable Unit	5,000	900	1,000	5,400	1,000	1,000	1,100
200-CB-1 Decision Documents	0	0	0	0	0	0	0
200-CP-1 Decision Documents	0	0	0	0	0	0	0
200-CR-1 Decision Documents	0	0	0	0	0	0	0
300-FF-5 Operable Unit	2,000	4,900	5,200	6,500	2,300	2,300	2,300
200-DV-1 Operable Unit	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	16,400	12,600	7,800	8,100	5,600	10,000	8,800
<b>Level 2 Total</b>	<b>106,300</b>	<b>103,500</b>	<b>94,100</b>	<b>114,800</b>	<b>101,900</b>	<b>109,700</b>	<b>118,900</b>

Table C-7. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2057	2058	2059	2060	2061	2062	2063
Groundwater Program Management	53,900	45,200	47,200	51,400	57,200	58,800	65,200
Groundwater Monitoring	47,300	33,700	43,500	27,700	28,500	28,900	29,600
200-WA-1 Operable Unit	0	0	0	0	0	0	0
200-EA-1 Operable Unit	0	0	0	0	0	0	0
200-OA-1 Operable Unit	0	0	0	0	0	0	0
200-IS-1 Operable Unit	0	0	0	0	0	0	0
200-SW-2 Operable Unit	0	0	0	0	0	0	0
100-BC-5 Operable Unit	200	200	300	300	300	300	300
100-KR-4 Operable Unit	400	3,100	500	500	500	500	500
100-NR-2 Operable Unit	200	2,700	200	200	200	200	3,400
100-HR-3 Operable Unit	500	3,100	0	500	500	500	500
100-FR-3 Operable Unit	900	2,100	900	900	1,000	1,000	2,500
100-OL-1 Operable Unit	0	0	0	0	0	0	0
200-BP-5 Operable Unit	500	4,200	500	500	500	600	600
200-PO-1 Operable Unit	200	4,100	200	200	200	200	4,900
200-UP-1 Operable Unit	700	700	5,000	800	800	800	900
200-ZP-1 Operable Unit	1,100	6,000	1,100	1,100	1,100	1,200	6,900
200-CB-1 Decision Documents	0	0	0	0	0	0	0
200-CP-1 Decision Documents	0	0	0	0	0	0	0
200-CR-1 Decision Documents	0	0	0	0	0	0	0
300-FF-5 Operable Unit	2,400	3,700	2,000	600	600	700	2,200
200-DV-1 Operable Unit	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	10,500	6,900	26,400	16,500	12,900	19,500	17,200
<b>Level 2 Total</b>	<b>118,800</b>	<b>115,700</b>	<b>127,800</b>	<b>101,200</b>	<b>104,300</b>	<b>113,200</b>	<b>134,700</b>

Table C-7. Soil and Water Remediation—Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2064	2065	2066	2067	2068	2069	2070
Groundwater Program Management	67,100	58,500	68,200	64,200	64,800	72,800	81,200
Groundwater Monitoring	30,500	31,500	33,800	34,600	35,100	37,000	38,000
200-WA-1 Operable Unit	0	0	0	0	0	0	0
200-EA-1 Operable Unit	0	0	0	0	0	0	0
200-OA-1 Operable Unit	0	0	0	0	0	0	0
200-IS-1 Operable Unit	0	0	0	0	0	0	0
200-SW-2 Operable Unit	0	0	0	0	0	0	0
100-BC-5 Operable Unit	300	300	400	400	400	400	400
100-KR-4 Operable Unit	500	600	600	600	600	600	600
100-NR-2 Operable Unit	300	300	300	300	3,400	300	300
100-HR-3 Operable Unit	600	600	600	600	600	600	700
100-FR-3 Operable Unit	1,000	1,100	1,100	1,200	2,900	1,200	1,200
100-OL-1 Operable Unit	0	0	0	0	0	0	0
200-BP-5 Operable Unit	600	600	600	600	600	700	700
200-PO-1 Operable Unit	300	300	300	300	5,700	300	300
200-UP-1 Operable Unit	5,800	1,000	1,000	1,100	1,100	6,700	1,100
200-ZP-1 Operable Unit	1,200	1,300	1,400	1,400	8,000	1,400	1,500
200-CB-1 Decision Documents	0	0	0	0	0	0	0
200-CP-1 Decision Documents	0	0	0	0	0	0	0
200-CR-1 Decision Documents	0	0	0	0	0	0	0
300-FF-5 Operable Unit	700	700	800	800	2,600	800	800
200-DV-1 Operable Unit	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	13,900	14,100	2,700	2,600	2,700	3,100	5,100
<b>Level 2 Total</b>	<b>122,800</b>	<b>110,900</b>	<b>111,800</b>	<b>108,700</b>	<b>128,500</b>	<b>125,900</b>	<b>131,900</b>

Table C-7. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2071	2072	2073	2074	2075	2076	2077
Groundwater Program Management	87,600	71,100	71,300	72,100	74,400	91,100	103,600
Groundwater Monitoring	38,100	39,200	39,100	39,800	41,000	42,700	46,500
200-WA-1 Operable Unit	0	0	0	0	0	0	0
200-EA-1 Operable Unit	0	0	0	0	0	0	0
200-OA-1 Operable Unit	0	0	0	0	0	0	0
200-IS-1 Operable Unit	0	0	0	0	0	0	0
200-SW-2 Operable Unit	0	0	0	0	0	0	0
100-BC-5 Operable Unit	400	400	400	400	400	400	500
100-KR-4 Operable Unit	700	700	700	700	700	700	800
100-NR-2 Operable Unit	300	300	4,100	300	300	300	400
100-HR-3 Operable Unit	700	700	700	700	700	800	900
100-FR-3 Operable Unit	1,200	1,300	3,100	1,300	1,300	1,400	1,600
100-OL-1 Operable Unit	0	0	0	0	0	0	0
200-BP-5 Operable Unit	700	700	700	700	700	700	800
200-PO-1 Operable Unit	300	300	6,200	300	300	300	400
200-UP-1 Operable Unit	1,100	1,200	1,200	7,300	1,200	1,300	1,500
200-ZP-1 Operable Unit	1,500	1,500	8,800	1,600	1,600	1,700	1,900
200-CB-1 Decision Documents	0	0	0	0	0	0	0
200-CP-1 Decision Documents	0	0	0	0	0	0	0
200-CR-1 Decision Documents	0	0	0	0	0	0	0
300-FF-5 Operable Unit	800	900	2,800	900	900	900	1,100
200-DV-1 Operable Unit	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	8,500	2,000	1,900	1,900	2,600	2,300	3,400
<b>Level 2 Total</b>	<b>141,900</b>	<b>120,300</b>	<b>141,000</b>	<b>128,000</b>	<b>126,100</b>	<b>144,600</b>	<b>165,400</b>

Table C-7. Soil and Water Remediation—Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2078	2079	2080	2081	2082	2083	2084
Groundwater Program Management	105,400	0	0	0	0	0	0
Groundwater Monitoring	49,300	0	0	0	0	0	0
200-WA-1 Operable Unit	0	0	0	0	0	0	0
200-EA-1 Operable Unit	0	0	0	0	0	0	0
200-OA-1 Operable Unit	0	0	0	0	0	0	0
200-IS-1 Operable Unit	0	0	0	0	0	0	0
200-SW-2 Operable Unit	0	0	0	0	0	0	0
100-BC-5 Operable Unit	3,000	0	0	0	0	0	0
100-KR-4 Operable Unit	3,300	0	0	0	0	0	0
100-NR-2 Operable Unit	2,900	0	0	0	0	0	0
100-HR-3 Operable Unit	3,400	0	0	0	0	0	0
100-FR-3 Operable Unit	6,400	0	0	0	0	0	0
100-OL-1 Operable Unit	2,500	0	0	0	0	0	0
200-BP-5 Operable Unit	3,300	0	0	0	0	0	0
200-PO-1 Operable Unit	10,200	0	0	0	0	0	0
200-UP-1 Operable Unit	4,000	0	0	0	0	0	0
200-ZP-1 Operable Unit	13,500	0	0	0	0	0	0
200-CB-1 Decision Documents	0	0	0	0	0	0	0
200-CP-1 Decision Documents	0	0	0	0	0	0	0
200-CR-1 Decision Documents	0	0	0	0	0	0	0
300-FF-5 Operable Unit	6,000	0	0	0	0	0	0
200-DV-1 Operable Unit	2,500	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	26,100	32,600	20,000	15,000	14,100	18,300	14,200
<b>Level 2 Total</b>	<b>241,800</b>	<b>32,600</b>	<b>20,000</b>	<b>15,000</b>	<b>14,100</b>	<b>18,300</b>	<b>14,200</b>



Table C-7. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2085	2086	2087	2088	2089	2090	2091
Groundwater Program Management	0	0	0	0	0	0	0
Groundwater Monitoring	0	0	0	0	0	0	0
200-WA-1 Operable Unit	0	0	0	0	0	0	0
200-EA-1 Operable Unit	0	0	0	0	0	0	0
200-OA-1 Operable Unit	0	0	0	0	0	0	0
200-IS-1 Operable Unit	0	0	0	0	0	0	0
200-SW-2 Operable Unit	0	0	0	0	0	0	0
100-BC-5 Operable Unit	0	0	0	0	0	0	0
100-KR-4 Operable Unit	0	0	0	0	0	0	0
100-NR-2 Operable Unit	0	0	0	0	0	0	0
100-HR-3 Operable Unit	0	0	0	0	0	0	0
100-FR-3 Operable Unit	0	0	0	0	0	0	0
100-OL-1 Operable Unit	0	0	0	0	0	0	0
200-BP-5 Operable Unit	0	0	0	0	0	0	0
200-PO-1 Operable Unit	0	0	0	0	0	0	0
200-UP-1 Operable Unit	0	0	0	0	0	0	0
200-ZP-1 Operable Unit	0	0	0	0	0	0	0
200-CB-1 Decision Documents	0	0	0	0	0	0	0
200-CP-1 Decision Documents	0	0	0	0	0	0	0
200-CR-1 Decision Documents	0	0	0	0	0	0	0
300-FF-5 Operable Unit	0	0	0	0	0	0	0
200-DV-1 Operable Unit	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	12,800	13,100	10,500	2,500	2,600	6,600	3,700
<b>Level 2 Total</b>	<b>12,800</b>	<b>13,100</b>	<b>10,500</b>	<b>2,500</b>	<b>2,600</b>	<b>6,600</b>	<b>3,700</b>

Table C-7. Soil and Water Remediation—Groundwater/Vadose Zone (PBS RL-0030) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

<b>Fiscal Year</b>	<b>Total</b>						
Groundwater Program Management	<b>2,812,400</b>						
Groundwater Monitoring	<b>1,980,900</b>						
200-WA-1 Operable Unit	<b>33,500</b>						
200-EA-1 Operable Unit	<b>41,500</b>						
200-OA-1 Operable Unit	<b>22,000</b>						
200-IS-1 Operable Unit	<b>106,000</b>						
200-SW-2 Operable Unit	<b>31,700</b>						
100-BC-5 Operable Unit	<b>21,000</b>						
100-KR-4 Operable Unit	<b>155,500</b>						
100-NR-2 Operable Unit	<b>70,000</b>						
100-HR-3 Operable Unit	<b>169,100</b>						
100-FR-3 Operable Unit	<b>63,300</b>						
100-OL-1 Operable Unit	<b>2,500</b>						
200-BP-5 Operable Unit	<b>101,000</b>						
200-PO-1 Operable Unit	<b>86,500</b>						
200-UP-1 Operable Unit	<b>168,500</b>						
200-ZP-1 Operable Unit	<b>829,700</b>						
200-CB-1 Decision Documents	<b>86,200</b>						
200-CP-1 Decision Documents	<b>76,900</b>						
200-CR-1 Decision Documents	<b>81,100</b>						
300-FF-5 Operable Unit	<b>107,200</b>						
200-DV-1 Operable Unit	<b>43,500</b>						
Cost and/or Schedule Uncertainty	<b>899,400</b>						
<b>Level 2 Total</b>	<b>7,989,400</b>						
PBS = project baseline summary.                      RL = U.S. Department of Energy, Richland Operations Office.							

Table C-8. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Near-Term Schedule and Costs, Level 3, by Fiscal Year (\$1,000, Escalated)

Schedule Level	Scope	2022	2023	2024	2025	2026	2027	Total
<b>1</b>	<b>Soil and Water Remediation - Groundwater/Vadose Zone</b>	226,200	267,900	308,900	325,600	259,100	204,100	1,591,800
<b>2</b>	<b>Groundwater Program Management</b>	<b>42,000</b>	<b>38,000</b>	<b>36,500</b>	<b>37,200</b>	<b>37,700</b>	<b>38,900</b>	<b>230,300</b>
3	Groundwater Program Management	21,600	21,900	22,500	22,900	21,000	21,500	131,400
3	Integration and Assessments	20,400	16,100	14,000	14,300	16,700	17,400	98,900
<b>2</b>	<b>Groundwater Monitoring</b>	<b>35,700</b>	<b>24,800</b>	<b>35,900</b>	<b>36,600</b>	<b>37,200</b>	<b>38,300</b>	<b>208,900</b>
3	Geophysical Sciences and Logging	700	700	700	500	500	500	3,600
3	Groundwater Data Evaluation and Reporting	4,900	5,000	5,200	5,200	5,400	5,500	31,200
3	Groundwater Lab Analysis and Data Management	4,600	4,600	4,800	4,900	5,000	5,100	29,000
3	Groundwater Sample Collection	7,200	7,300	7,500	7,700	7,900	7,800	45,400
3	Modutanks	500	500	500	500	500	600	3,100
3	RCR Well Drilling (M-024)	10,300	0	10,700	10,900	11,200	11,500	54,600
3	Well Maintenance, Monitoring and Reporting	3,300	2,400	2,400	2,700	2,800	2,900	16,500
3	Usage Based Services Distribution	4,200	4,300	4,100	4,200	4,300	4,400	25,500
<b>2</b>	<b>200-WA-1 Operable Unit</b>	<b>2,700</b>	<b>4,000</b>	<b>9,700</b>	<b>7,600</b>	<b>5,200</b>	<b>800</b>	<b>30,000</b>
3	200-WA-1 Decision Documents	2,700	4,000	9,700	7,600	5,200	800	30,000
<b>2</b>	<b>200-EA-1 Operable Unit</b>	<b>23,700</b>	<b>11,200</b>	<b>1,600</b>	<b>1,700</b>	<b>900</b>	<b>600</b>	<b>39,700</b>
3	200-EA-1 Decision Documents	23,700	11,200	1,600	1,700	900	600	39,700
<b>2</b>	<b>200-OA-1 Operable Unit</b>	<b>2,100</b>	<b>10,100</b>	<b>4,800</b>	<b>1,200</b>	<b>1,200</b>	<b>700</b>	<b>20,100</b>
3	200-OA-1 Decision Documents	2,100	10,100	4,800	1,200	1,200	700	20,100
<b>2</b>	<b>200-IS-1 Operable Unit</b>	<b>800</b>	<b>800</b>	<b>26,100</b>	<b>35,300</b>	<b>28,500</b>	<b>3,300</b>	<b>94,800</b>
3	200-IS-1 Decision Documents	800	800	26,100	35,300	28,500	3,300	94,800
<b>2</b>	<b>200-SW-2 Operable Unit</b>	<b>6,700</b>	<b>6,900</b>	<b>7,200</b>	<b>3,600</b>	<b>1,500</b>	<b>1,500</b>	<b>27,400</b>
3	200-SW-2 Decision Documents	6,700	6,900	7,200	3,600	1,500	1,500	27,400
<b>2</b>	<b>100-BC-5 Operable Unit</b>	<b>1,100</b>	<b>800</b>	<b>800</b>	<b>800</b>	<b>200</b>	<b>200</b>	<b>3,900</b>
3	100-BC-5 Project Management	100	100	100	100	100	100	600

Table C-8. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Near-Term Schedule and Costs, Level 3, by Fiscal Year (\$1,000, Escalated)

Schedule Level	Scope	2022	2023	2024	2025	2026	2027	Total
3	100-BC-5 Decision Documents	300	0	0	0	0	0	300
3	100-BC-5 Remedial/Removal Action Implementation	600	600	600	600	0	0	2,400
3	100-BC-5 Monitoring and Reporting	100	100	100	100	100	100	600
<b>2</b>	<b>100-KR-4 Operable Unit</b>	<b>10,800</b>	<b>9,200</b>	<b>17,500</b>	<b>16,600</b>	<b>7,800</b>	<b>7,900</b>	<b>69,800</b>
3	100-KR-4 Project Management	400	400	400	400	400	400	2,400
3	100-KR-4 Decision Documents	2,400	1,600	1,200	0	0	0	5,200
3	100-KR-4 Remedial/Removal Action Implementation	7,700	7,200	15,900	16,200	7,400	7,500	61,900
3	100-KR-4 Monitoring and Reporting	300	0	0	0	0	0	300
<b>2</b>	<b>100-NR-2 Operable Unit</b>	<b>4,800</b>	<b>7,100</b>	<b>7,000</b>	<b>4,400</b>	<b>3,100</b>	<b>3,200</b>	<b>29,600</b>
3	100-NR-2 Project Management	200	200	100	200	200	200	1,100
3	100-NR-2 Decision Documents	400	1,600	0	0	0	0	2,000
3	100-NR-2 Remedial/Removal Action Implementation	4,100	4,100	6,800	4,200	2,900	3,000	25,100
3	100-NR-2 Monitoring and Reporting	100	1,200	100	0	0	0	1,400
<b>2</b>	<b>100-HR-3 Operable Unit</b>	<b>7,900</b>	<b>18,500</b>	<b>19,700</b>	<b>9,300</b>	<b>9,600</b>	<b>9,800</b>	<b>74,800</b>
3	100-HR-3 Project Management	400	400	400	400	400	400	2,400
3	100-HR-3 Remedial/Removal Action Implementation	7,000	18,100	19,300	8,900	9,200	9,400	71,900
3	100-HR-3 Monitoring and Reporting	500	0	0	0	0	0	500
<b>2</b>	<b>100-FR-3 Operable Unit</b>	<b>400</b>	<b>900</b>	<b>400</b>	<b>400</b>	<b>400</b>	<b>400</b>	<b>2,900</b>
3	100-FR-3 Project Management	300	300	300	300	300	300	1,800
3	100-FR-3 Monitoring and Reporting	100	600	100	100	100	100	1,100
<b>2</b>	<b>200-BP-5 Operable Unit</b>	<b>10,100</b>	<b>20,500</b>	<b>5,200</b>	<b>400</b>	<b>200</b>	<b>200</b>	<b>36,600</b>
3	200-BP-5 Project Management	200	200	300	300	200	200	1,400
3	200-BP-5 & PO-1 Decision Documents	0	0	200	100	0	0	300
3	200-BP-5 Remedial/Removal Action Implementation	7,200	18,300	4,700	0	0	0	30,200
3	200-BP-5 Monitoring and Reporting	2,700	2,000	0	0	0	0	4,700

Table C-8. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Near-Term Schedule and Costs, Level 3, by Fiscal Year (\$1,000, Escalated)

Schedule Level	Scope	2022	2023	2024	2025	2026	2027	Total
<b>2</b>	<b>200-PO-1 Operable Unit</b>	<b>3,400</b>	<b>5,000</b>	<b>2,500</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>11,200</b>
3	200 PO-1 Project Management	100	100	100	100	100	100	600
3	200-PO-1 Remedial/Removal Action Implementation	1,500	200	0	0	0	0	1,700
3	200-PO-1 Monitoring and Reporting	1,800	4,700	2,400	0	0	0	8,900
<b>2</b>	<b>200-UP-1 Operable Unit</b>	<b>4,600</b>	<b>5,100</b>	<b>15,500</b>	<b>10,100</b>	<b>2,200</b>	<b>2,300</b>	<b>39,800</b>
3	200-UP-1 Project Management	300	300	400	400	400	400	2,200
3	200-UP-1 Decision Documents	200	200	0	0	0	0	400
3	200-UP-1 Remedial/Removal Action Implementation	1,600	2,700	15,000	9,600	1,700	1,800	32,400
3	200-UP-1 Monitoring and Reporting	2,500	1,900	100	100	100	100	4,800
<b>2</b>	<b>200-ZP-1 Operable Unit</b>	<b>27,000</b>	<b>53,000</b>	<b>58,100</b>	<b>78,300</b>	<b>51,600</b>	<b>51,400</b>	<b>319,400</b>
3	200-ZP-1 Project Management	900	900	1,000	1,000	1,000	1,000	5,800
3	200-ZP-1 Remedial/Removal Action Implementation	25,900	49,800	56,900	76,600	50,400	50,200	309,800
3	200-ZP-1 Monitoring and Reporting	200	2,300	200	700	200	200	3,800
<b>2</b>	<b>200-CB-1 Operable Unit</b>	<b>1,500</b>	<b>14,700</b>	<b>14,800</b>	<b>15,100</b>	<b>15,600</b>	<b>16,900</b>	<b>78,600</b>
3	200-CB-1 Decision Documents	1,500	14,700	14,800	15,100	15,600	16,900	78,600
<b>2</b>	<b>200-CP-1 Operable Unit</b>	<b>13,100</b>	<b>13,300</b>	<b>13,600</b>	<b>13,900</b>	<b>14,800</b>	<b>1,200</b>	<b>69,900</b>
3	200-CP-1 Decision Documents	13,100	13,300	13,600	13,900	14,800	1,200	69,900
<b>2</b>	<b>200-CR-1 Operable Unit</b>	<b>700</b>	<b>700</b>	<b>9,600</b>	<b>9,600</b>	<b>9,900</b>	<b>10,100</b>	<b>40,600</b>
3	200-CR-1 Decision Documents	700	700	9,600	9,600	9,900	10,100	40,600
<b>2</b>	<b>300-FF-5 Operable Unit</b>	<b>1,200</b>	<b>1,800</b>	<b>1,200</b>	<b>1,200</b>	<b>1,400</b>	<b>1,400</b>	<b>8,200</b>
3	300-FF-5 Project Management	400	400	400	400	500	500	2,600
3	300-FF-5 Monitoring & Reporting	800	1,400	800	800	900	900	5,600
<b>2</b>	<b>200-DV-1 Operable Unit</b>	<b>13,400</b>	<b>8,100</b>	<b>3,300</b>	<b>4,900</b>	<b>3,900</b>	<b>2,500</b>	<b>36,100</b>
3	200-DV-1 Project Management	400	400	400	400	400	400	2,400
3	200-DV-1 Decision Documents	13,000	7,700	2,900	4,500	3,500	2,100	33,700
<b>2</b>	<b>Cost and/or Schedule Uncertainty</b>	<b>12,500</b>	<b>13,400</b>	<b>17,900</b>	<b>37,300</b>	<b>25,700</b>	<b>12,400</b>	<b>119,200</b>

Table C-8. Soil and Water Remediation–Groundwater/Vadose Zone (PBS RL-0030) Near-Term Schedule and Costs, Level 3, by Fiscal Year (\$1,000, Escalated)

Schedule Level	Scope	2022	2023	2024	2025	2026	2027	Total
	Total	226,200	267,900	308,900	325,600	259,100	204,100	1,591,800
PBS = Performance Baseline Summary.                     RCRA = <i>Resource Conservation and Recovery Act of 1976.</i>								

### C.1.4 NUCLEAR FACILITY D&D–REMAINDER OF HANFORD (PBS RL-0040) SCHEDULE AND COST DETAILS

Table C-9. Nuclear Facility D&amp;D–Remainder of Hanford (PBS RL-0040) Level 3 Scope Summary

Level 2 Work Element	Level 3 Work Element	Scope Summary
Regulatory Decisions and Closure Integration	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 crosscutting 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	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 affecting safety, human health, or environment (e.g., major equipment failure, spread of contamination, structural failure) and steam line removal.
Remediation of Geographic Areas	<p>For each implementation area, provides remediation definition, remediation of pipelines, installation of barriers, utility relocations, post-ROD confirmatory sampling, S&amp;M/O&amp;M of installed barriers, and area 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 process, if necessary. Actual remedial actions will be determined through the appropriate decision process and applied through a geographical implementation strategy. The remediation and demolition scope has been organized into the following 25 Implementation Areas (each is a Level 3 work element):</p> <ul style="list-style-type: none"> <li>• 100 Area</li> <li>• 600 Area</li> <li>• 300 Area</li> <li>• 400 Area</li> <li>• Outer Area</li> <li>• PFP Implementation Area</li> <li>• U Plant Implementation Area</li> <li>• 200 East Landfills 3 Implementation Area</li> <li>• Balance of West Implementation Area</li> <li>• Balance of East Implementation Area</li> <li>• 200 East Landfills 1 Implementation Area</li> <li>• B Plant Implementation Area</li> <li>• 200 East Landfills 2 Implementation Area</li> <li>• 200 West Landfills Implementation Area</li> <li>• PUREX Implementation Area</li> <li>• T Plant Implementation Area</li> <li>• REDOX Implementation Area</li> <li>• C Farm Implementation Area</li> <li>• U Farm Implementation Area</li> <li>• A Farm Implementation Area</li> <li>• B Farm Implementation Area</li> <li>• T Farm Implementation Area</li> <li>• S Farm Implementation Area</li> <li>• ERDF Implementation Area</li> <li>• WTP Implementation Area</li> </ul>	

Table C-9. Nuclear Facility D&amp;D–Remainder of Hanford (PBS RL-0040) Level 3 Scope Summary

Level 2 Work Element	Level 3 Work Element	Scope Summary
Central Plateau Maintain Safe and Compliant Facilities and Waste Sites	Central Plateau Waste Sites Min Safe	Includes minimum safe oversight and support, radiation surveillances, tumbleweed collection, surface contamination treatment, sign replacement, surveillance, canyon, and nuclear facilities minimum safe, and general-purpose facilities minimum safe.
	Central Plateau Nuclear Facilities Min Safe	
	Central Plateau General Purpose Facilities Min Safe	
	ORP Support to Inactive Waste Sites	Includes surveillance and maintenance by ORP at inactive waste sites located within ORP occupied areas, but that contractually belong to the Plateau Cleanup Contract.
<b>NOTE:</b> See Tables C-10 and C-11 for schedule and budget information.		
<div> <div> D&amp;D = decontamination and decommissioning.  D4 = deactivation, decommissioning, decontamination, and demolition.  ERDF = Environmental Restoration Disposal Facility.  ESH&amp;Q = Environment, Safety, Health, and Quality.  IA = implementation area.  ISMS = Integrated Safety Management System.  O&amp;M = operation and maintenance.  S&amp;M = surveillance and maintenance.  ORP = U.S. Department of Energy, Office of River Protection. </div> <div> PBS = project baseline summary.  PFP = Plutonium Finishing Plant.  PUREX = Plutonium Uranium Extraction (Plant).  REDOX = Reduction-Oxidation (Plant).  RL = U.S. Department of Energy, Richland Operations Office.  ROD = record of decision.  RTD = remove, treat, dispose.  WTP = Hanford Tank Waste Treatment and Immobilization Plant. </div> </div>		



Table C-10. Nuclear Facility D&amp;D–Remainder of Hanford (PBS RL-0040) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

<b>Fiscal Year</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>
Regulatory Decisions and Closure Integration	18,500	16,400	16,800	17,100	17,600	17,900	18,400
Remediation of Geographic Areas	10,300	16,200	82,200	161,500	191,300	302,700	237,900
Central Plateau Maintain Safe and Compliant Facilities and Waste Sites	13,400	16,500	13,900	14,300	15,500	14,300	17,800
Cost and/or Schedule Uncertainty	3,500	3,700	13,200	40,600	50,800	25,000	53,200
<b>Level 2 Total</b>	<b>45,700</b>	<b>52,800</b>	<b>126,100</b>	<b>233,500</b>	<b>275,200</b>	<b>359,900</b>	<b>327,300</b>
<b>Fiscal Year</b>	<b>2029</b>	<b>2030</b>	<b>2031</b>	<b>2032</b>	<b>2033</b>	<b>2034</b>	<b>2035</b>
Regulatory Decisions and Closure Integration	18,800	19,200	19,700	20,100	20,400	21,100	21,600
Remediation of Geographic Areas	361,400	518,800	539,500	773,600	822,400	412,100	313,500
Central Plateau Maintain Safe and Compliant Facilities and Waste Sites	14,900	15,200	15,600	15,900	19,800	16,600	17,100
Cost and/or Schedule Uncertainty	26,700	195,200	144,500	250,000	267,600	397,900	250,800
<b>Level 2 Total</b>	<b>421,800</b>	<b>748,400</b>	<b>719,300</b>	<b>1,059,600</b>	<b>1,130,200</b>	<b>847,700</b>	<b>603,000</b>
<b>Fiscal Year</b>	<b>2036</b>	<b>2037</b>	<b>2038</b>	<b>2039</b>	<b>2040</b>	<b>2041</b>	<b>2042</b>
Regulatory Decisions and Closure Integration	22,300	22,800	23,300	24,100	24,800	25,500	26,200
Remediation of Geographic Areas	280,600	225,900	355,200	182,300	126,900	108,300	87,800
Central Plateau Maintain Safe and Compliant Facilities and Waste Sites	19,500	18,000	22,500	18,200	18,200	18,700	18,400
Cost and/or Schedule Uncertainty	157,600	148,700	133,700	91,300	126,700	188,000	109,900
<b>Level 2 Total</b>	<b>480,000</b>	<b>415,400</b>	<b>534,700</b>	<b>315,900</b>	<b>296,600</b>	<b>340,500</b>	<b>242,300</b>
<b>Fiscal Year</b>	<b>2043</b>	<b>2044</b>	<b>2045</b>	<b>2046</b>	<b>2047</b>	<b>2048</b>	<b>2049</b>
Regulatory Decisions and Closure Integration	26,700	27,500	28,000	28,000	29,300	30,300	31,100
Remediation of Geographic Areas	127,300	108,500	82,700	63,400	22,200	20,200	26,800
Central Plateau Maintain Safe and Compliant Facilities and Waste Sites	23,600	18,800	17,300	19,800	18,100	24,100	19,200
Cost and/or Schedule Uncertainty	87,100	72,400	47,300	39,600	49,100	21,700	17,200
<b>Level 2 Total</b>	<b>264,700</b>	<b>227,200</b>	<b>175,300</b>	<b>150,800</b>	<b>118,700</b>	<b>96,300</b>	<b>94,300</b>

Table C-10. Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2050	2051	2052	2053	2054	2055	2056
Regulatory Decisions and Closure Integration	32,000	32,900	33,900	34,600	35,500	36,400	37,200
Remediation of Geographic Areas	90,300	48,300	37,300	23,900	11,200	48,100	50,000
Central Plateau Maintain Safe and Compliant Facilities and Waste Sites	19,700	20,400	20,900	27,500	21,800	22,300	22,800
Cost and/or Schedule Uncertainty	21,900	34,200	29,900	40,000	38,100	33,400	18,400
<b>Level 2 Total</b>	<b>163,900</b>	<b>135,800</b>	<b>122,000</b>	<b>126,000</b>	<b>106,600</b>	<b>140,200</b>	<b>128,400</b>
Fiscal Year	2057	2058	2059	2060	2061	2062	2063
Regulatory Decisions and Closure Integration	37,900	38,000	39,700	40,800	41,600	42,500	43,500
Remediation of Geographic Areas	52,000	313,300	100,200	103,000	93,500	72,500	52,000
Central Plateau Maintain Safe and Compliant Facilities and Waste Sites	23,300	23,300	24,300	25,000	24,400	25,000	25,600
Cost and/or Schedule Uncertainty	23,000	24,200	36,300	42,100	47,800	52,900	52,300
<b>Level 2 Total</b>	<b>136,200</b>	<b>398,800</b>	<b>200,500</b>	<b>210,900</b>	<b>207,300</b>	<b>192,900</b>	<b>173,400</b>
Fiscal Year	2064	2065	2066	2067	2068	2069	2070
Regulatory Decisions and Closure Integration	44,900	46,300	49,600	50,800	51,700	54,100	55,700
Remediation of Geographic Areas	51,300	35,300	24,700	28,200	98,300	98,200	65,800
Central Plateau Maintain Safe and Compliant Facilities and Waste Sites	14,000	10,400	11,200	11,500	11,600	12,200	12,500
Cost and/or Schedule Uncertainty	47,400	43,000	24,700	19,400	14,100	9,600	12,900
<b>Level 2 Total</b>	<b>157,600</b>	<b>135,000</b>	<b>110,200</b>	<b>109,900</b>	<b>175,700</b>	<b>174,100</b>	<b>146,900</b>
Fiscal Year	2071	2072	2073	2074	2075	2076	2077
Regulatory Decisions and Closure Integration	55,900	57,700	57,600	58,200	60,200	62,800	71,000
Remediation of Geographic Areas	177,800	184,300	321,300	469,200	435,300	313,300	42,100
Central Plateau Maintain Safe and Compliant Facilities and Waste Sites	12,500	13,000	13,000	11,400	4,700	4,500	0
Cost and/or Schedule Uncertainty	16,100	17,800	28,500	23,500	12,100	11,500	98,100
<b>Level 2 Total</b>	<b>262,300</b>	<b>272,800</b>	<b>420,400</b>	<b>562,300</b>	<b>512,300</b>	<b>392,100</b>	<b>211,200</b>

Table C-10. Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) Remaining Lifecycle Schedule and Costs, Level 2,  
by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2078	2079	2080	2081	2082	2083	2084
Regulatory Decisions and Closure Integration	69,600	0	0	0	0	0	0
Remediation of Geographic Areas	36,800	0	0	0	0	0	0
Central Plateau Maintain Safe and Compliant Facilities and Waste Sites	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	59,800	110,800	88,500	76,700	75,200	72,400	33,300
Level 2 Total	166,200	110,800	88,500	76,700	75,200	72,400	33,300
Fiscal Year	2085	2086	Total				
Regulatory Decisions and Closure Integration	0	0	2,006,100				
Remediation of Geographic Areas	0	0	10,039,000				
Central Plateau Maintain Safe and Compliant Facilities and Waste Sites	0	0	964,000				
Cost and/or Schedule Uncertainty	11,900	900	4,415,700				
Level 2 Total	11,900	900	17,424,800				
PBS = project baseline summary.							

Table C-11. Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) Near-Term Schedule and Costs, Level 3,  
by Fiscal Year (\$1,000, Escalated)

Schedule Level	Scope	2022	2023	2024	2025	2026	2027	Total
<b>1</b>	<b>Nuclear Facility D&amp;D-Remainder of Hanford</b>	<b>45,700</b>	<b>52,800</b>	<b>126,100</b>	<b>233,500</b>	<b>275,200</b>	<b>359,900</b>	<b>1,093,200</b>
<b>2</b>	<b>Regulatory Decisions &amp; Closure Integration</b>	<b>18,500</b>	<b>16,400</b>	<b>16,800</b>	<b>17,100</b>	<b>17,600</b>	<b>17,900</b>	<b>104,300</b>
3	Central Plateau Engineering Studies	1,400	1,400	1,400	1,500	1,500	1,500	8,700
3	Central Plateau Project Management	7,500	7,700	7,900	8,000	8,200	8,400	47,700
3	Emergency Response for Facility/Waste Site ESH&Q or Remediation	9,600	7,300	7,500	7,600	7,900	8,000	47,900
<b>2</b>	<b>Remediation of Geographic Areas</b>	<b>10,300</b>	<b>16,200</b>	<b>82,200</b>	<b>161,500</b>	<b>191,300</b>	<b>302,700</b>	<b>764,200</b>
3	200 East Landfills 3 Implementation Area	0	0	400	700	4,400	1,000	6,500
3	200 West Landfills Implementation Area	0	0	9,200	1,800	10,800	26,800	48,600
3	B Plant Implementation Area	0	0	0	0	2,300	2,300	4,600
3	PFP Implementation Area	2,000	8,200	60,700	140,600	154,600	263,400	629,500
3	PUREX Implementation Area	0	0	0	0	2,300	2,300	4,600
3	REDOX Implementation Area	4,700	4,800	4,900	5,000	5,100	5,200	29,700
3	U Plant Implementation Area	3,600	3,200	7,000	13,400	11,800	1,700	40,700
<b>2</b>	<b>Central Plateau Maintain Safe and Compliant Facilities &amp; Waste Sites</b>	<b>13,400</b>	<b>16,500</b>	<b>13,900</b>	<b>14,300</b>	<b>15,500</b>	<b>14,300</b>	<b>87,900</b>
3	Central Plateau General Purpose Facilities Min Safe	1,300	1,300	1,300	1,400	1,400	1,400	8,100
3	Central Plateau Nuclear Facilities Min Safe	8,200	11,300	8,600	8,700	9,000	9,200	55,000
3	Central Plateau Waste Sites Min Safe	3,600	3,600	3,700	3,800	4,700	3,300	22,700
3	ORP Support to Inactive Waste Sites	300	300	300	400	400	400	2,100

Table C-11. Nuclear Facility D&D–Remainder of Hanford (PBS RL-0040) Near-Term Schedule and Costs, Level 3,  
by Fiscal Year (\$1,000, Escalated)

Schedule Level	Scope	2022	2023	2024	2025	2026	2027	Total
2	Cost and/or Schedule Uncertainty	3,500	3,700	13,200	40,600	50,800	25,000	136,800
	<b>Total</b>	<b>45,700</b>	<b>52,800</b>	<b>126,100</b>	<b>233,500</b>	<b>275,200</b>	<b>359,900</b>	<b>1,093,200</b>
<p> D&amp;D = decontamination and decommissioning.  ESH&amp;Q = environment, safety, health, and quality.  ORP = DOE, Office of River Protection.  PUREX = Plutonium Uranium Extraction (Plant).  REDOX = Reduction-Oxidation (Plant).  FY = fiscal year.  PBS = project baseline summary.  PFP = Plutonium Finishing Plant. </p>								

### C.1.5 NUCLEAR FACILITY D&D-RIVER CORRIDOR CLOSURE PROJECT (PBS RL-0041) SCHEDULE AND COST DETAILS

Table C-12. Nuclear Facility D&D-River Corridor Closure Project (PBS RL-0041)  
Level 3 Scope Summary

Level 2 Work Element	Level 3 Work Element	Scope Summary
River Corridor Cleanup	100 Area Implementation Area	Includes work remaining to complete 100-K Area, 100-D/H, 100-B/C, and 100-N Area remediation, including project management, demolition of K West Basins, disposition of K East and K West Reactors, remediation of the 618-11 burial ground and waste site 300-296 (the contaminated soil below the 324 building B hot cell), D4 of support structures, waste site closeout sampling and documentation, and waste site backfill and revegetation.
	600 Area Implementation Area	
	300 Area Implementation Area	
River Corridor Maintain Safe and Compliant Facilities and Waste Sites	River Corridor Inactive Waste Sites Min Safe	Includes radiation surveys, surface contamination treatment, sign replacement, tumbleweed collection and spraying, inactive waste sites min safe support, min safe for nuclear facilities (K West Basin and 324 Building), and min safe for general purpose facilities.
	River Corridor Nuclear Facilities Min Safe	
	River Corridor General Purpose Facilities Min Safe	
NOTE: See Tables C-13 and C-14 for schedule and budget information.		
PBS = project baseline summary.		

Table C-13. Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041), Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

<b>Fiscal Year</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>
River Corridor Cleanup	138,200	134,200	81,700	143,300	76,700	10,500	200
River Corridor Maintain Safe and Compliant Facilities & Waste Sites	28,200	28,100	18,700	6,300	300	0	0
Cost and/or Schedule Uncertainty	20,000	46,400	34,700	75,100	7,200	21,700	8,700
<b>Level 2 Total</b>	<b>186,400</b>	<b>208,700</b>	<b>135,100</b>	<b>224,700</b>	<b>84,200</b>	<b>32,200</b>	<b>8,900</b>
<b>Fiscal Year</b>	<b>2029</b>	<b>2030</b>	<b>2031</b>	<b>2032</b>	<b>2033</b>	<b>2034</b>	<b>2035</b>
River Corridor Cleanup	0	0	0	0	0	0	0
River Corridor Maintain Safe and Compliant Facilities & Waste Sites	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	200	0	0	0	0	0	0
<b>Level 2 Total</b>	<b>200</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Fiscal Year</b>	<b>2036</b>	<b>2037</b>	<b>2038</b>	<b>2039</b>	<b>2040</b>	<b>2041</b>	<b>2042</b>
River Corridor Cleanup	0	0	0	0	0	0	0
River Corridor Maintain Safe and Compliant Facilities & Waste Sites	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	0	0	0	0	0	0	0
<b>Level 2 Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Fiscal Year</b>	<b>2043</b>	<b>2044</b>	<b>2045</b>	<b>2046</b>	<b>2047</b>	<b>2048</b>	<b>2049</b>
River Corridor Cleanup	0	0	0	426,700	192,700	99,100	66,700
River Corridor Maintain Safe and Compliant Facilities & Waste Sites	0	0	0	0	0	0	0
Cost and/or Schedule Uncertainty	0	0	0	94,700	52,800	45,700	52,800
<b>Level 2 Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>521,400</b>	<b>245,500</b>	<b>144,800</b>	<b>119,500</b>

Table C-13. Nuclear Facility D&D–River Corridor Closure Project (PBS RL-0041), Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

<b>Fiscal Year</b>	<b>2050</b>	<b>2051</b>	<b>2052</b>	<b>2053</b>	<b>Total</b>	
River Corridor Cleanup	19,900	0	0	0	<b>1,389,900</b>	
River Corridor Maintain Safe and Compliant Facilities & Waste Sites	0	0	0	0	<b>81,600</b>	
Cost and/or Schedule Uncertainty	16,700	32,000	5,900	300	<b>514,900</b>	
<b>Level 2 Total</b>	<b>36,600</b>	<b>32,000</b>	<b>5,900</b>	<b>300</b>	<b>1,986,400</b>	
PBS = project baseline summary.						



Table C-14. Nuclear Facility D&amp;D-River Corridor Closure Project (PBS RL-0041), Near-Term Schedule and Costs, Level 3, by Fiscal Year (\$1,000, Escalated)

Schedule Level	Scope	2022	2023	2024	2025	2026	2027	Total
1	Nuclear Facility D&D-River Corridor Closure Project	186,400	208,700	135,100	224,700	84,200	32,200	871,300
2	River Corridor Cleanup	137,200	133,200	80,700	142,200	76,700	10,500	584,600
3	100 Area Implementation Area	102,300	81,700	65,800	37,200	12,200	400	299,600
3	300 Area Implementation Area	35,900	52,500	15,900	106,100	64,500	10,100	285,000
2	River Corridor Maintain Safe and Compliant Facilities & Waste Sites	28,200	28,100	18,700	6,300	300	0	81,600
3	River Corridor Inactive Waste Sites Min Safe	3,500	3,500	3,600	0	0	0	10,600
3	River Corridor Nuclear Facilities Min Safe	3,900	3,900	4,000	4,100	300	0	16,200
3	River Corridor General Purpose Facilities Min Safe	20,800	20,700	11,100	2,200	0	0	54,800
2	Cost and/or Schedule Uncertainty	20,000	46,400	34,700	75,100	7,200	21,700	205,100
	<b>Total</b>	<b>186,400</b>	<b>208,700</b>	<b>135,100</b>	<b>224,700</b>	<b>84,200</b>	<b>32,200</b>	<b>871,300</b>
D&D = decontamination and decommissioning. PBS = project baseline summary.								

### C.1.6 NUCLEAR FACILITY D&D–FAST FLUX TEST FACILITY PROJECT (PBS RL-0042) SCHEDULE AND COST DETAILS

Table C-15. 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 Program Management	FFTF Program Management	Annual project management and closure services.
FFTF Cleanup	400 Area Implementation Area	<p>The ROD for closure of the FFTF (78 FR 75913<sup>1</sup>) published in December 2013 includes the following:</p> <ul style="list-style-type: none"> <li>- Demolition of all structures within the 400 Area Protected Area, except for reactor containment, to at least 3 feet below grade followed by backfill and revegetation; decommissioning waste would be disposed of at appropriate disposal facilities</li> <li>- Removal and disposition of the above-grade containment dome</li> <li>- Grouting of the below-grade portion of the reactor containment building and the reactor vessel (e.g. entombment)</li> <li>- Installing a RCRA<sup>2</sup>-compliant engineered barrier over the grouted area</li> <li>- Post-closure care would include long-term monitoring of air, groundwater, and the vadose zone.</li> </ul>
FFTF Sodium	Manage and Disposition FFTF Sodium	Includes management, disposition, and removal of sodium residuals in FFTF equipment, maintain sodium storage facility operations, and waste transportation and disposal.
Sodium Reaction Facility	Design and Construct Sodium Reaction Capability	Provide design, construction, and turnover to operations of a new facility in the Hanford 400 Area to convert FFTF sodium and Hallam sodium stored in 200 West Area for use as caustic feed to the Waste Treatment Plant.
Maintain Safe and Compliant FFTF Complex	FFTF Min Safe Operations	Includes preventative and scheduled maintenance, corrective maintenance, supervision, work control and training for the FFTF Complex.
	400 Area Potable/Fire Water System	Includes preventative and scheduled maintenance, corrective maintenance, supervision, work control and training for the 400 Area Potable/Fire Water System.
<p><b>NOTE:</b> See Tables C-16 and C-17 for schedule and budget information.</p> <p><sup>1</sup>78 FR 75913, 2013, “Record of Decision: Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington,” <i>Federal Register</i> (December 13, 2013).</p> <p><sup>2</sup> <i>Resource Conservation and Recovery Act of 1976</i>, 42 USC 6901, et seq.</p>		
<p>D&amp;D = decontamination and decommissioning  FFTF = Fast Flux Test Facility.  PBS = project baseline summary.</p> <p>RCRA = <i>Resource Conservation and Recovery Act of 1976</i>.  RL = U.S. Department of Energy, Richland Operations Office.</p>		

Table C-16. 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)

<b>Fiscal Year</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>
FFTF Program Management	0	0	0	0	0	0	0
FFTF Cleanup	0	0	0	400	0	0	0
FFTF Sodium	0	0	0	0	0	0	0
Sodium Reaction Facility	0	0	0	0	0	0	0
Maintain Safe and Compliant FFTF Complex	3,000	2,400	2,500	3,300	2,500	2,700	3,500
Cost and/or Schedule Uncertainty	100	200	100	100	200	100	100
<b>Level 2 Total</b>	<b>3,100</b>	<b>2,600</b>	<b>2,600</b>	<b>3,800</b>	<b>2,700</b>	<b>2,800</b>	<b>3,600</b>
<b>Fiscal Year</b>	<b>2029</b>	<b>2030</b>	<b>2031</b>	<b>2032</b>	<b>2033</b>	<b>2034</b>	<b>2035</b>
FFTF Program Management	0	0	8,000	8,200	8,300	8,600	8,800
FFTF Cleanup	0	0	12,200	12,800	12,800	27,200	15,000
FFTF Sodium	0	0	27,700	35,100	37,200	35,300	26,100
Sodium Reaction Facility	0	0	17,500	17,200	11,100	0	0
Maintain Safe and Compliant FFTF Complex	2,900	2,800	3,700	2,800	2,900	4,000	3,100
Cost and/or Schedule Uncertainty	200	200	9,700	9,800	12,800	13,100	8,800
<b>Level 2 Total</b>	<b>3,100</b>	<b>3,000</b>	<b>78,800</b>	<b>85,900</b>	<b>85,100</b>	<b>88,200</b>	<b>61,800</b>
<b>Fiscal Year</b>	<b>2036</b>	<b>2037</b>	<b>2038</b>	<b>2039</b>	<b>2040</b>	<b>2041</b>	<b>2042</b>
FFTF Program Management	9,100	9,300	9,500	9,800	10,100	10,400	9,000
FFTF Cleanup	25,800	52,100	38,500	20,800	900	4,100	300
FFTF Sodium	44,300	44,000	13,200	700	0	0	0
Sodium Reaction Facility	0	0	0	0	0	0	0
Maintain Safe and Compliant FFTF Complex	3,100	4,300	3,100	2,700	3,900	2,700	0
Cost and/or Schedule Uncertainty	3,800	7,300	22,600	26,800	25,600	9,800	10,500
<b>Level 2 Total</b>	<b>86,100</b>	<b>117,000</b>	<b>86,900</b>	<b>60,800</b>	<b>40,500</b>	<b>27,000</b>	<b>19,800</b>

Table C-16. 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	2043	2044	2045	2046	2047	Total	
FFTF Program Management	0	0	0	0	0	109,100	
FFTF Cleanup	0	0	0	0	0	222,900	
FFTF Sodium	0	0	0	0	0	263,600	
Sodium Reaction Facility	0	0	0	0	0	45,800	
Maintain Safe and Compliant FFTF Complex	0	0	0	0	0	61,900	
Cost and/or Schedule Uncertainty	8,900	5,800	3,500	1,100	200	181,400	
<b>Level 2 Total</b>	8,900	5,800	3,500	1,100	200	884,700	
D&D = decontamination and decommissioning. FFTF = Fast Flux Test Facility. PBS = project baseline summary.							

Table C-17. Nuclear Facility D&amp;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	2022	2023	2024	2025	2026	2027	Total
<b>1</b>	<b>Nuclear Facility D&amp;D-Fast Flux Test Facility Project</b>	<b>3,100</b>	<b>2,600</b>	<b>2,600</b>	<b>3,800</b>	<b>2,700</b>	<b>2,800</b>	<b>17,600</b>
<b>2</b>	<b>FFTF Cleanup</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>400</b>	<b>0</b>	<b>0</b>	<b>400</b>
3	400 Area Implementation Area	0	0	0	400	0	0	400
<b>2</b>	<b>Maintain Safe and Compliant FFTF Complex</b>	<b>3,000</b>	<b>2,400</b>	<b>2,500</b>	<b>3,300</b>	<b>2,500</b>	<b>2,700</b>	<b>16,400</b>
3	400 Area Potable/Fire Water System	1,400	600	600	1,500	600	700	5,400
3	FFTF Min-Safe Operations	1,600	1,800	1,900	1,800	1,900	2,000	11,000
<b>2</b>	<b>Cost and/or Schedule Uncertainty</b>	<b>100</b>	<b>200</b>	<b>100</b>	<b>100</b>	<b>200</b>	<b>100</b>	<b>800</b>
	<b>Total</b>	<b>3,100</b>	<b>2,600</b>	<b>2,600</b>	<b>3,800</b>	<b>2,700</b>	<b>2,800</b>	<b>17,600</b>
D&D = decontamination and decommissioning. FFTF = Fast Flux Test Facility. PBS = project baseline summary.								

**C.1.7 RICHLAND COMMUNITY AND REGULATORY SUPPORT (PBS RL-0100)  
SCHEDULE AND COST DETAILS**

Table C-18. Richland Community and Regulatory Support (PBS RL-0100) Level 2  
Scope Summary

Work Element	Scope Summary
Richland Community and Regulatory Support	Includes RL support to community activities and various boards, such as the Hanford Advisory Board, the Oregon Department of Energy, and other entities through grants and fees. Includes studies for Natural Resource Damage Assessment, but does not include significant restoration of natural resources to resolve any liability of the United States for Natural Resource Damage Assessment and Restoration.
<b>NOTE:</b> See Table C-19 for schedule and budget information.	
PBS= project baseline summary. RL = U.S. Department of Energy, Richland Operations Office.	

Table C-19. Richland Community and Regulatory Support (PBS RL-0100) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000 Escalated)

Fiscal Year	2022	2023	2024	2025	2026	2027	2028
Richland Community and Regulatory Support	9,800	9,900	10,000	10,100	10,200	10,300	10,400
Fiscal Year	2029	2030	2031	2032	2033	2034	2035
Richland Community and Regulatory Support	10,500	10,600	10,700	10,800	10,900	11,000	11,100
Fiscal Year	2036	2037	2038	2039	2040	2041	2042
Richland Community and Regulatory Support	11,200	11,300	11,500	11,600	11,700	11,800	11,900
Fiscal Year	2043	2044	2045	2046	2047	2048	2049
Richland Community and Regulatory Support	11,400	11,500	11,600	11,800	11,900	12,000	12,100
Fiscal Year	2050	2051	2052	2053	2054	2055	2056
Richland Community and Regulatory Support	12,200	12,400	12,500	12,600	12,700	12,900	13,000
Fiscal Year	2057	2058	2059	2060	2061	2062	2063
Richland Community and Regulatory Support	13,100	13,200	13,400	13,500	13,600	13,800	13,900
Fiscal Year	2064	2065	2066	2067	2068	2069	2070
Richland Community and Regulatory Support	11,900	12,000	12,200	12,300	12,400	12,500	12,700
Fiscal Year	2071	2072	2073	2074	2075	2076	2077
Richland Community and Regulatory Support	12,800	12,900	13,000	13,200	13,300	13,400	13,600
Fiscal Year	2078	Total					
Richland Community and Regulatory Support	13,700	684,300					
PBS = project baseline summary. RL = U.S. Department of Energy, Richland Operations Office.							

### C.1.8 HANFORD SITEWIDE SERVICES (PBS RL-0201) SCHEDULE AND COST DETAILS

Table C-20. Hanford Sitewide Services (PBS RL-0201) Level 3 Scope Summary

Level 2 Work Element	Scope Summary
Hanford Sitewide Services	<p>Includes costs for Site services and infrastructure. This work element includes emergency services (fire and emergency response, emergency management), environmental integration services (Sitewide safety standards, environmental integration, public safety and resource protection, radiological site services, and offsite laboratory sample analysis), information management (information management planning and controls, information systems, content and records management, infrastructure/cyber security, information resources/content management, and information support services), Site infrastructure and utilities/logistics and transportation (roads and grounds, biological services, electrical services, water/sewer services, facility services, transportation, mail, property systems/acquisitions, technical services, energy management, work management, land and facilities management), support functions (business operations, human resources, safety, health and quality), and portfolio management (portfolio planning, analysis and performance, project acquisition and support, and independent analysis and assessments).</p> <p>Includes contracted technical services in key areas such as audit, regulatory analysis, cost and risk analysis and estimating. Also includes mission critical support services to DOE and its contractors in key areas such as occupational medicine, information and telecommunications, janitorial, radiological laundry, electrical power and facilities rentals; critical independent legal counsel and litigation services in support of DOE and its contractors; and other mission critical support services to DOE and its contractors in key areas such as land transfers, acquisition and contract closeout, acquisition of natural gas utility services, energy conservation and management (including steam), natural resource trusteeship, Tribal Nation support, Washington Department of Ecology, Washington Department of Health and other small contracts, permits, and payment of fees.</p> <p>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.</p> <p>Includes operations and maintenance activities at the Volpentest HAMMER Federal Training Center in support of the Hanford Site and other training programs.</p> <p>Includes reliability projects to repair and replace infrastructure systems and provides capital upgrades to the infrastructure, including larger scale expense projects. Also includes construction and capital equipment expenditures associated with replacements for biological control, crane and rigging, electrical system, facilities, Hanford Fire Department, network and telecommunications, studies and estimates, transportation, water and sewer utilities and other infrastructure reliability projects.</p>
<b>NOTE:</b> See Table C-21 for schedule and budget information.	
DOE = U.S. Department of Energy. PBS = project baseline summary.	



Table C-21. Hanford Sitewide Services (PBS RL-0201) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000 Escalated)

Fiscal Year	2022	2023	2024	2025	2026	2027	2028
Hanford Sitewide Services	371,500	377,800	396,400	392,500	361,400	381,600	388,500
Fiscal Year	2029	2030	2031	2032	2033	2034	2035
Hanford Sitewide Services	388,100	387,700	332,900	330,100	327,400	328,500	332,800
Fiscal Year	2036	2037	2038	2039	2040	2041	2042
Hanford Sitewide Services	330,000	331,800	331,500	334,800	336,400	336,700	338,200
Fiscal Year	2043	2044	2045	2046	2047	2048	2049
Hanford Sitewide Services	298,800	297,600	296,600	289,500	291,100	291,400	289,900
Fiscal Year	2050	2051	2052	2053	2054	2055	2056
Hanford Sitewide Services	287,100	286,000	282,900	288,700	295,000	301,000	306,900
Fiscal Year	2057	2058	2059	2060	2061	2062	2063
Hanford Sitewide Services	313,700	315,200	326,500	333,900	341,400	349,500	357,200
Fiscal Year	2064	2065	2066	2067	2068	2069	2070
Hanford Sitewide Services	314,700	324,300	344,700	352,400	354,800	362,700	372,500
Fiscal Year	2071	2072	2073	2074	2075	2076	2077
Hanford Sitewide Services	375,400	369,200	355,800	343,500	336,600	331,000	346,100
Fiscal Year	2078	Total					
Hanford Sitewide Services	331,800	19,092,000					
PBS = project baseline summary. RL = U.S. Department of Energy, Richland Operations Office.							

### C.1.9 LONG-TERM STEWARDSHIP (PBS RL-LTS) SCHEDULE AND COST DETAILS

Scope information for long-term stewardship (LTS), PBS RL-LTS, is presented in Table C-22. This PBS is not broken down to Level 3 scope, and no near-term cost details are available for this PBS because of when the work is planned to begin.

Table C-22. Long-Term Stewardship (PBS RL-LTS) Level 2 Scope Summary

Work Element	Scope Description
Long-Term Stewardship	Includes operation and maintenance of Hanford Site infrastructure following cleanup activities; environmental monitoring of groundwater, soil, and vadose zone; monitoring for public safety and resource protection; planning; land management; surveillance and maintenance activities to ensure environmental compliance and protection, payment in lieu of taxes, and management and administration.
<b>NOTE:</b> See Table C-23 for schedule and budget information.	

Table C-23. Long-Term Stewardship (PBS RL-LTS) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2079	2080	2081	2082	2083	2084	2085
Long-Term Stewardship	254,000	260,100	266,300	272,700	279,300	286,000	292,900
Fiscal Year	2086	2087	2088	2089	2090	2091	2092
Long-Term Stewardship	299,900	307,100	314,400	322,000	329,700	329,700	329,700
Fiscal Year	2093	2094	2095	Total			
Long-Term Stewardship	339,300	348,200	351,500	5,182,800			
PBS = project baseline summary. RL = U.S. Department of Energy, Richland Operations Office.							

### C.1.10 FINAL REACTOR DISPOSITION SCHEDULE AND COST DETAILS

Scope information for final reactor disposition is presented in Table C-24. This work is not broken down to Level 3 details, so no additional scope is presented and no near-term cost details are available because of when the work is planned to begin.

Table C-24. Final Reactor Disposition Level 2 Scope Summary

Work Element	Scope Description
Final Reactor Disposition	Includes final reactor disposition of the 100 Area surplus production reactors (except for B Reactor which is part of the Manhattan Project National Historical Park). Following a safe storage period of up to 75 years, final reactor disposition would include demolition of the interim safe storage enclosure and transport of each of the eight reactor blocks intact on a tractor-transporter from its present location in the 100 Areas to the Central Plateau Inner Area for disposal. Following reactor removal, the site formerly occupied by each reactor would be backfilled, graded, and seeded. Although the final end state of N Reactor has not been determined, the planning case is to disposition it in the same manner as the other reactors.
<b>NOTE:</b> See Table C-25 for schedule and budget information.	

Table C-25. Final Reactor Disposition Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2054	2055	2056	2057	2058	2059
Final Reactor Disposition	18,800	37,600	37,600	56,400	94,100	94,100
Fiscal Year	2060	2061	2062	2063	2064	2065
Final Reactor Disposition	131,700	282,200	282,200	282,200	188,100	188,100
Fiscal Year	2066	2067	2068	Total		
Final Reactor Disposition	94,100	56,400	37,600	1,881,200		
PBS = project baseline summary.						
RL = U.S. Department of Energy, Richland Operations Office.						

## **C.2 OFFICE OF RIVER PROTECTION PROJECT BASELINE SUMMARY INFORMATION**

The DOE, Office of River Protection (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 and Immobilization Plant, PBS ORP-0060
- Waste Treatment Plant Operations, PBS ORP-0070

Scope information for PBS ORP-0014, PBS ORP-0060 and PBS ORP-0070 is presented in Chapter 5.0 of the LCR. No additional scope is presented here. The estimated costs for PBSs ORP-0014 and ORP-0060 are presented in Tables C-26 to C-28.

Table C-26. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS-ORP-0014) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2022	2023	2024	2025	2026	2027	2028
Base Operations	651,500	621,900	754,100	831,700	888,100	962,900	1,104,000
Retrieve and Close SSTs	96,500	118,100	286,800	317,000	243,600	315,000	210,500
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	151,300	162,700	139,000	161,800	192,300	212,900	221,600
Supplemental Treatment	2,200	3,700	102,600	352,200	615,700	993,400	1,869,100
Treat Waste	2,000	0	333,200	381,700	405,100	412,400	403,200
Facility Closures	0	0	0	0	400	8,000	11,400
TOC - ORP Project Support	0	0	72,800	75,200	77,400	79,600	81,300
Cost and/or Schedule Uncertainty	31,800	31,300	42,100	48,500	61,300	83,900	93,500
<b>Level 2 Total</b>	<b>935,300</b>	<b>937,700</b>	<b>1,730,600</b>	<b>2,168,100</b>	<b>2,483,900</b>	<b>3,068,100</b>	<b>3,994,600</b>
Fiscal Year	2029	2030	2031	2032	2033	2034	2035
Base Operations	1,152,500	1,266,600	1,104,100	1,104,500	1,081,800	956,400	1,025,800
Retrieve and Close SSTs	250,400	285,600	305,000	246,700	284,400	313,700	370,100
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	244,300	231,100	293,100	320,200	275,400	276,000	225,400
Supplemental Treatment	1,842,600	1,889,200	646,600	186,000	184,800	198,300	621,300
Treat Waste	406,600	412,700	465,700	477,100	477,100	625,000	731,300
Facility Closures	7,600	2,200	9,600	24,400	52,300	9,700	3,400
TOC - ORP Project Support	83,600	86,100	87,900	90,000	92,200	94,400	96,700
Cost and/or Schedule Uncertainty	104,800	138,300	143,400	153,000	104,700	110,500	125,900
<b>Level 2 Total</b>	<b>4,092,400</b>	<b>4,311,800</b>	<b>3,055,400</b>	<b>2,601,900</b>	<b>2,552,700</b>	<b>2,584,000</b>	<b>3,199,900</b>

Table C-26. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS-ORP-0014) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2036	2037	2038	2039	2040	2041	2042
Base Operations	1,060,100	1,024,800	1,070,300	1,041,800	1,062,700	1,148,500	1,212,900
Retrieve and Close SSTs	367,700	431,500	443,800	516,300	573,600	758,900	874,900
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	194,500	194,100	192,800	211,900	268,600	237,400	225,500
Supplemental Treatment	783,100	794,200	793,600	817,400	834,000	848,900	870,700
Treat Waste	773,600	792,000	797,000	808,800	835,600	870,800	891,700
Facility Closures	1,500	1,300	1,800	2,800	2,400	1,900	1,900
TOC - ORP Project Support	99,000	101,400	103,800	106,300	108,900	111,500	114,100
Cost and/or Schedule Uncertainty	137,200	143,300	148,900	151,500	159,100	170,200	172,800
<b>Level 2 Total</b>	<b>3,416,700</b>	<b>3,482,600</b>	<b>3,552,000</b>	<b>3,656,800</b>	<b>3,844,900</b>	<b>4,148,100</b>	<b>4,364,500</b>
Fiscal Year	2043	2044	2045	2046	2047	2048	2049
Base Operations	1,203,200	1,205,000	1,305,600	1,264,600	1,335,500	1,325,400	1,347,600
Retrieve and Close SSTs	888,500	960,000	1,126,800	1,222,300	1,239,800	1,093,600	1,064,600
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	254,200	247,100	266,200	267,900	271,500	257,500	247,800
Supplemental Treatment	891,500	910,400	929,200	944,000	964,000	987,200	1,010,900
Treat Waste	897,500	910,600	940,800	980,200	1,004,100	1,010,500	1,025,200
Facility Closures	2,000	6,500	16,900	6,800	3,100	3,500	2,200
TOC - ORP Project Support	116,900	119,700	122,600	125,500	128,500	131,600	134,700
Cost and/or Schedule Uncertainty	184,700	189,800	191,900	197,000	198,100	207,800	210,500
<b>Level 2 Total</b>	<b>4,438,500</b>	<b>4,549,100</b>	<b>4,900,000</b>	<b>5,008,300</b>	<b>5,144,600</b>	<b>5,017,100</b>	<b>5,043,500</b>

Table C-26. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS-ORP-0014) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2050	2051	2052	2053	2054	2055	2056
Base Operations	1,393,700	1,424,300	1,458,700	1,467,300	1,496,400	1,518,500	1,542,300
Retrieve and Close SSTs	1,106,200	1,019,400	647,800	664,300	885,200	967,500	934,300
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	266,500	272,700	279,400	283,900	288,300	293,000	295,300
Supplemental Treatment	1,035,100	1,060,000	1,085,400	1,111,500	1,138,100	1,165,500	1,193,400
Treat Waste	1,056,700	1,103,400	1,130,700	1,137,700	1,154,200	1,192,200	1,242,300
Facility Closures	1,500	1,100	1,400	2,200	2,300	2,100	11,300
TOC - ORP Project Support	138,000	141,300	144,700	148,200	151,700	155,400	159,100
Cost and/or Schedule Uncertainty	214,000	219,000	224,600	225,100	220,400	231,000	238,500
<b>Level 2 Total</b>	<b>5,211,700</b>	<b>5,241,200</b>	<b>4,972,700</b>	<b>5,040,200</b>	<b>5,336,600</b>	<b>5,525,200</b>	<b>5,616,500</b>
Fiscal Year	2057	2058	2059	2060	2061	2062	2063
Base Operations	1,591,200	1,608,100	1,614,100	1,475,700	1,312,400	1,277,500	1,292,100
Retrieve and Close SSTs	1,042,000	932,400	1,026,800	923,600	417,400	200,200	146,000
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	308,200	337,500	393,400	474,400	548,700	606,300	507,800
Supplemental Treatment	1,222,100	1,251,400	1,281,400	1,312,200	1,343,700	1,375,900	1,408,900
Treat Waste	1,273,100	1,280,900	1,299,600	1,330,800	1,362,700	1,395,400	1,428,900
Facility Closures	3,700	6,400	35,700	15,500	35,100	45,500	23,500
TOC - ORP Project Support	162,900	166,800	170,800	174,900	179,100	183,400	187,800
Cost and/or Schedule Uncertainty	242,400	244,700	243,900	248,500	242,500	244,100	253,700
<b>Level 2 Total</b>	<b>5,845,600</b>	<b>5,828,200</b>	<b>6,065,700</b>	<b>5,955,600</b>	<b>5,441,600</b>	<b>5,328,300</b>	<b>5,248,700</b>



Table C-26. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS-ORP-0014) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2064	2065	2066	2067	2068	2069	2070
Base Operations	1,265,600	1,165,900	971,100	673,100	645,100	497,500	347,500
Retrieve and Close SSTs	105,600	78,100	4,100	3,500	3,400	3,500	3,500
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	643,400	601,000	506,000	353,900	313,000	231,100	106,800
Supplemental Treatment	1,442,800	1,478,900	1,281,500	856,100	884,500	242,000	40,000
Treat Waste	1,463,100	1,498,200	1,342,500	1,032,300	1,057,100	115,700	0
Facility Closures	3,700	300	114,400	124,600	96,400	41,600	11,300
TOC - ORP Project Support	192,300	196,900	191,400	177,700	181,900	166,900	102,300
Cost and/or Schedule Uncertainty	148,300	107,400	85,800	26,200	16,800	700	0
Level 2 Total	5,264,800	5,126,700	4,496,800	3,247,400	3,198,200	1,299,000	611,400
Fiscal Year	2071	2072	2073	2074	Total		
Base Operations	255,000	253,900	260,100	4,200	56,925,200		
Retrieve and Close SSTs	3,600	3,700	3,800	1,100	26,332,700		
Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure	51,500	83,400	85,300	23,400	14,598,300		
Supplemental Treatment	21,300	21,800	22,300	6,400	45,169,000		
Treat Waste	0	0	0	0	41,969,000		
Facility Closures	1,700	0	0	0	764,900		
TOC - ORP Project Support	104,800	100,800	102,800	29,400	6,453,000		
Cost and/or Schedule Uncertainty	0	0	0	0	7,413,400		
Level 2 Total	437,900	463,600	474,300	64,500	199,625,500		
DST = double-shell tank. ORP = U.S. Department of Energy, Office of River Protection. PBS = project baseline summary.							
SST = single-shell tank. TOC = Tank Operations Contract.							

Table C-27. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS-ORP-0014), Near-Term Schedule and Costs, Level 3, by Fiscal Year (\$1,000, Escalated)

Schedule Level	Scope	2022	2023	2024	2025	2026	2027	Total
<b>1</b>	<b>Radioactive Liquid Tank Waste Stabilization and Disposition</b>	<b>935,300</b>	<b>937,700</b>	<b>1,730,600</b>	<b>2,168,100</b>	<b>2,483,900</b>	<b>3,068,100</b>	<b>11,323,700</b>
<b>2</b>	<b>Base Operations</b>	<b>651,500</b>	<b>621,900</b>	<b>754,100</b>	<b>831,700</b>	<b>888,100</b>	<b>962,900</b>	<b>4,710,200</b>
3	Base Operations	255,900	295,100	477,900	547,500	592,900	662,300	2,831,600
3	DST Space Management	181,300	136,400	50,500	54,000	52,900	55,100	530,200
3	TOC Facility Operations	5,600	0	59,600	59,200	64,600	65,300	254,300
3	Tank Farm Upgrades	63,300	42,300	36,600	37,800	40,500	41,800	262,300
3	Project Support	145,400	148,100	129,500	133,200	137,200	138,400	831,800
<b>2</b>	<b>Retrieve and Close SSTs</b>	<b>96,500</b>	<b>118,100</b>	<b>286,800</b>	<b>317,000</b>	<b>243,600</b>	<b>315,000</b>	<b>1,377,000</b>
3	Retrieval/Closure Program	47,600	61,900	33,100	34,200	35,200	35,200	247,200
3	A-Farm Retrieval	23,700	38,700	0	0	0	0	62,400
3	AX-Farm Retrieval	18,000	9,200	0	0	0	0	27,200
3	SST Retrieval East Area	0	0	241,700	259,500	186,200	98,400	785,800
3	SST Retrieval West Area	0	0	0	0	16,000	32,400	48,400
3	Closure Program	6,600	6,300	2,600	2,600	2,700	2,800	23,600
3	SST Closure	600	2,000	9,400	20,700	3,500	146,200	182,400
<b>2</b>	<b>Waste Feed Delivery/Treatment Planning/DST Retrieval/Closure</b>	<b>151,300</b>	<b>162,700</b>	<b>139,000</b>	<b>161,800</b>	<b>192,300</b>	<b>212,900</b>	<b>1,020,000</b>
3	WTP Feed Delivery Program	42,200	44,700	47,900	49,500	47,300	41,700	273,300
3	Construct DST Systems	0	0	45,500	64,800	84,400	106,500	301,200
3	Immobilization Program	3,900	3,300	5,400	5,700	13,400	16,000	47,700
3	WTP Operational Readiness	3,000	3,300	1,700	1,900	1,900	2,000	13,800
3	Strategic Planning and Technology	57,600	55,200	36,400	37,600	38,700	39,700	265,200
3	A/AX Retrieval Common Upgrades & Design	43,500	54,600	0	0	0	0	98,100

Table C-27. Radioactive Liquid Tank Waste Stabilization and Disposition (PBS-ORP-0014), Near-Term Schedule and Costs, Level 3, by Fiscal Year (\$1,000, Escalated)

Schedule Level	Scope	2022	2023	2024	2025	2026	2027	Total
3	Secondary Liquid Waste Treatment	1,100	1,600	2,100	2,300	6,600	7,000	20,700
<b>2</b>	<b>Supplemental Treatment</b>	<b>2,200</b>	<b>3,700</b>	<b>102,600</b>	<b>352,200</b>	<b>615,700</b>	<b>993,400</b>	<b>2,069,800</b>
3	Supplemental Treatment	2,200	3,700	102,600	352,200	615,700	993,400	2,069,800
<b>2</b>	<b>Treat Waste</b>	<b>2,000</b>	<b>0</b>	<b>333,200</b>	<b>381,700</b>	<b>405,100</b>	<b>412,400</b>	<b>1,534,400</b>
3	Waste Treatment Facility (WTP)	0	0	326,200	364,800	368,600	376,100	1,435,700
3	Future TSCR Units	0	0	7,000	16,900	36,500	36,300	96,700
3	LAWPS – Cesium Removal Capability	2,000	0	0	0	0	0	2,000
<b>2</b>	<b>Facility Closures</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>400</b>	<b>8,000</b>	<b>8,400</b>
3	TFC Facility and Other Closure	0	0	0	0	400	8,000	8,400
<b>2</b>	<b>Tank Operations Contract - ORP Project Support</b>	<b>0</b>	<b>0</b>	<b>72,800</b>	<b>75,200</b>	<b>77,400</b>	<b>79,600</b>	<b>305,000</b>
<b>2</b>	<b>Cost and/or Schedule Uncertainty</b>	<b>31,800</b>	<b>31,300</b>	<b>42,100</b>	<b>48,500</b>	<b>61,300</b>	<b>83,900</b>	<b>298,900</b>
	<b>Total</b>	<b>935,300</b>	<b>937,700</b>	<b>1,730,600</b>	<b>2,168,100</b>	<b>2,483,900</b>	<b>3,068,100</b>	<b>11,323,700</b>
<div> DST = double-shell tank.  ETF = Effluent Treatment Facility.  LAWPS = Low Activity Waste Pretreatment System.  ORP = U.S. Department of Energy, Office of River Protection.  PBS = project baseline summary. </div> <div> SST = single-shell tank.  TFC = Tank Farm Contractor.  TOC = Tank Operations Contract.  TWCSF = Tank Waste Characterization and Staging Facility.  WTP = Waste Treatment and Immobilization Plant </div>								

Table C-28. Major Construction – Waste Treatment and Immobilization Plant (PBS-ORP-0060) Remaining Lifecycle Schedule and Costs, Level 2, by Fiscal Year (\$1,000, Escalated)

Fiscal Year	2022	2023	2024	2025	2026	2027	2028
LBL/DFLAW	601,700	559,900	0	0	0	0	0
High-Level Waste Facility	60,000	375,000	700,000	800,000	800,000	900,000	900,000
Pretreatment	339,300	1,194,900	1,288,700	1,444,200	841,100	421,600	337,600
Level 2 Total	1,001,000	2,129,800	1,988,700	2,244,200	1,641,100	1,321,600	1,237,600
Fiscal Year	2029	2030	2031	2032	2033	2034	2035
LBL/DFLAW	0	0	0	0	0	0	0
High-Level Waste Facility	925,000	925,000	850,000	750,000	700,000	700,000	500,000
Pretreatment	500,800	498,500	425,100	485,200	478,900	330,300	0
Level 2 Total	1,425,800	1,423,500	1,275,100	1,235,200	1,178,900	1,030,300	500,000
Fiscal Year	Total						
LBL/DFLAW	1,161,600						
High-Level Waste Facility	9,885,000						
Pretreatment	8,586,200						
Level 2 Total	19,632,800						
PBS = project baseline summary.							