VOLUME 1: COST REPORT FOR TANK CLOSURE AND WASTE MANAGEMENT ENVIRONMENTAL IMPACT STATEMENT ALTERNATIVES

EFFECTIVE DATE: JULY 31, 2009

EXECUTIVE SUMMARY

This revision of the *Cost Report for Tank Closure and Waste Management Environmental Impact Statement (TC&WM EIS) Alternatives* documents the representative total costs, in calendar year 2008 dollars, of 17 alternatives that will be considered in an upcoming TC&WM EIS including:

- Retrieval, treatment, and disposal of waste stored in 177 large single- and double-shell tanks, and the remediation and closure of the single-shell tanks and associated facilities.
- Disposal of low-level and mixed waste generated from the U.S. Department of Energy (DOE) Hanford Site and other DOE sites.
- The final disposition of the Fast Flux Test Facility (FFTF).

On February 2, 2006, DOE issued a Notice of Intent[1] to prepare an EIS that would include scope elements from the in-progress Tank Closure EIS and the in-progress FFTF EIS The new EIS would also provide analysis of the waste types analyzed in the Hanford Solid Waste EIS based on the January 2006 Settlement Agreement. The new EIS, to be titled the *Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington* (commonly referred to as the Tank Closure & Waste Management EIS), includes the Washington State Department of Ecology as a Cooperating Agency. In this EIS DOE initiated analysis of 17 alternatives. Eleven of the alternatives support decisions directly related to disposition of tank waste and associated facilities; three alternatives support decisions relevant to the disposal of low-level and mixed low-level waste; and three alternatives support decisions relevant to the final disposition of the FFTF (Table ES-1).

Table ES–1. Tank Closure & Waste Management EIS Alternatives. (2 Sheets)

Alternative*	Options
Tank Closure	
1 – No Action	--
2A – Existing WTP Vitrification, No Closure	--
2B – Expanded WTP Vitrification, Landfill Closure	--
3A – Existing WTP Vitrification with Bulk Vitrification, Landfill Closure	--
3B – Existing WTP Vitrification with Cast Stone, Landfill Closure	--
3C – Existing WTP Vitrification with Steam Reforming, Landfill Closure	--
4 – Existing WTP Vitrification with Supplemental Technologies, Selective Clean Closure, Landfill Closure	--
5 – Expanded WTP Vitrification with Supplemental Technologies, Landfill Closure	--

[1] 71 FR 5655, 2006, "Notice of Intent to Prepare the Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA," *Federal Register*, February 6.

Table ES–1. Tank Closure & Waste Management EIS Alternatives. (2 Sheets)

Alternative*	Options
6A – All Vitrification / No Separations, Clean Closure	Base Case Options Case
6B – All Vitrification with Separations, Clean Closure	Base Case Options Case
6C – All Vitrification with Separations, Landfill Closure	--
Waste Management	
1 – No Action	--
2 – Disposal in IDF 200-East Only	3 Disposal Groups
3 – Disposal in IDF 200-East & 200-West Areas	3 Disposal Groups
Fast Flux Test Facility	
1 – No Action	--
2 – Entombment	Hanford Idaho
3 – Removal	Hanford Idaho

EIS = Environmental Impact Statement.
IDF = Integrated Disposal Facility.
WTP = Waste Treatment Plant.
*Total number of distinct alternatives is 17.

The costs associated with each of the 17 alternatives considered in the Tank Closure & Waste Management EIS are compared in this cost report. Inability to accurately predict costs well into the future, complexity of the alternatives, and the potential for changing conditions and technologies all introduce uncertainties into the cost estimates.

This cost report uses existing cost information where applicable. Where cost information was not directly applicable, relevant data were scaled to estimate costs. Where cost data were not available, a scoping-level cost estimate was developed. Activities common between alternatives were estimated in consistent manners, but the total estimated cost for each of the alternatives consists of cost elements with potentially different bases. Accordingly, the cost estimates are valid for the purpose of understanding the relative cost differences between alternatives, but do not represent activity-based, bottom-up cost estimates. Cost estimates in this report should not be used for budgetary or appropriations purposes.

Generally, cost differences among the alternatives addressing common scope elements (e.g., tank waste disposition and tank farm closure) were influenced by changes in the duration of major activities (e.g., tank farm operations, waste treatment) or scope of work (e.g., extent of waste retrieval, endstate of tank farm closure). Costs external to the Hanford Site (e.g., disposal of

transuranic waste) varied significantly and were influenced by the classification and treatment and/or disposition pathway of the waste and the volume of the waste requiring treatment and/or disposal.

Revision 0 of this cost report was issued on August 11, 2003, and Revision 1 was issued on May 28, 2004. Since the initial and revised reports were released, the Tank Closure EIS has now become the Tank Closure and Waste Management EIS. Revisions have been made to the scope of the EIS (e.g., the number of alternatives and alternative scopes), as well as changes to data and assumptions. This cumulative collection of change in the EIS scope, revised data, revised assumptions, and modified alternatives led to the decision to issue Revision 2. Minor clarification and corrections were made to Volume 1 of Revision 2 resulting in the decision to issue Revision 3. There were no changes in Volume 2 or in the cost estimates or supporting data from Revision 2 to Revision 3. Revision 4 was issued to address the need for presenting the costs associated with remote-handled special component disposition and bulk sodium disposition independently for FFTF Alternatives 2 (Entombment) and 3 (Removal). There were no changes in the cost estimate or supporting data from Revision 3 to Revision 4, only modification of Table 4–3 and the presentation of costs in the summary sheets for Appendices V through Y.

For Revision 4, the DOE Office of River Protection directed that the cost data included in Volume 2 was no longer Official Use Only (OUO). The OUO label was removed from all cost sheets for Revision 4; however, since no other changes were made the cost sheets were not resigned. A cost analysis contained in Revision 5 was developed in response to a request from the DOE, Office of River Protection to the Tank Operations Contractor to provide a cost analysis for waste disposal for each of the tank closure alternatives. At DOE's direction, Revision 6 was prepared to address changes in DOE's high-level waste disposal strategy.

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CONTENTS

APPENDICES*

*Appendices are contained in Volume 2.

FIGURES

TABLES

LIST OF TERMS

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CH2M HILL	CH2M HILL Hanford Group, Inc.
CWC	Central Waste Complex
DOE	U.S. Department of Energy
DST	double-shell tank
EIS	Environmental Impact Statement
FFTF	Fast Flux Test Facility
HLW	high-level waste
HSW	Hanford Solid Waste
IDF	Integrated Disposal Facility
IHLW	immobilized high-level waste
ILAW	immobilized low-activity waste
LLW	low-level waste
MLLW	mixed low-level waste
MTG/day	metric tons of glass per day
NEPA	*National Environmental Policy Act of 1969*
ORP	Office of River Protection
PPF	Pre-Processing Facility
RCRA	*Resource Conservation and Recovery Act of 1976*
RPP	River Protection Project
RPPDF	River Protection Project Disposal Facility
SAIC	Science Applications International Corporation
SNF	spent nuclear fuel
SST	single-shell tank
TC&WM EIS	*Tank Closure and Waste Management Environmental Impact Statement*
TRU	transuranic (waste)
WESF	Waste Encapsulation and Storage Facility
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing Facility
WRF	waste receiver facility
WTP	Waste Treatment Plant

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1.0 INTRODUCTION

On February 2, 2006, the U.S. Department of Energy (DOE) issued a Notice of Intent to prepare an Environmental Impact Statement (EIS) that would include scope elements from the in-progress Tank Closure EIS and the in-progress Fast Flux Test Facility (FFTF) EIS. The new EIS would also provide analysis of the waste types analyzed in the Hanford Solid Waste EIS based on the January 2006 Settlement Agreement. The new EIS, to be titled the Tank Closure & Waste Management EIS (TC&WM EIS), includes the Washington State Department of Ecology as a Cooperating Agency. The DOE completed a scoping process for the new EIS that provided an opportunity for regulators, Tribal Nations, stakeholders, and the public to comment on the scope, analysis, and alternatives that would be considered in the new EIS.

The TC&WM EIS will evaluate a total of six tank closure alternatives. Two of these alternatives have been further divided into three sub-alternatives and one alternative has been divided into two sub-alternatives for a total of 11 tank closure alternatives. In addition to the 11 tank closure alternatives, the EIS will evaluate a total of three alternatives addressing solid waste management and disposal and three alternatives addressing the final disposition of the FFTF. In total, the TC&WM EIS includes 17 alternatives for comparative analysis (Table 1–1).

Table 1–1.Tank Closure & Waste Management EIS Alternatives. (2 Sheets)

Alternative*	Options
Tank Closure	
1 – No Action	--
2A – Existing WTP Vitrification, No Closure	--
2B – Expanded WTP Vitrification, Landfill Closure	--
3A – Existing WTP Vitrification with Bulk Vitrification, Landfill Closure	--
3B – Existing WTP Vitrification with Cast Stone, Landfill Closure	--
3C – Existing WTP Vitrification with Steam Reforming, Landfill Closure	--
4 – Existing WTP Vitrification with Supplemental Technologies, Selective Clean Closure, Landfill Closure	--
5 – Expanded WTP Vitrification with Supplemental Technologies, Landfill Closure	--
6A – All Vitrification / No Separations, Clean Closure	Base Case Options Case
6B – All Vitrification with Separations, Clean Closure	Base Case Options Case
6C – All Vitrification with Separations, Landfill Closure	--

Table 1–1.Tank Closure & Waste Management EIS Alternatives. (2 Sheets)

Alternative*	Options
Waste Management	
1 – No Action	--
2 – Disposal in IDF 200-East Only	3 Disposal Groups
3 – Disposal in IDF 200-East & 200-West Areas	3 Disposal Groups
Fast Flux Test Facility	
1 – No Action	--
2 – Entombment	Hanford Idaho
3 – Removal	Hanford Idaho

EIS = Environmental Impact Statement.
IDF = Integrated Disposal Facility.
WTP = Waste Treatment Plant.
*Total number of distinct alternatives is 17.

Although a cost-benefit analysis is not required for inclusion in the TC&WM EIS by Title 40, *Code of Federal Regulations*, Part 1502, "Environmental Impact Statement," Section 23, "Cost-benefit analysis" (40 CFR 1502.23) or *Washington Administrative Code*, Chapter 197-11, "SEPA rules," Part 4, "Environmental Impact Statement (EIS)," Section 450, "Cost-benefit analysis" (WAC 197-11-450), the DOE agreed that preparing one could be helpful to understand the relative relationship of the alternatives. The total costs of each alternative are presented in a format consistent with the TC&WM EIS alternatives. A specialized knowledge of the technologies associated with the waste storage, retrieval, treatment, facility deactivation, and tank system closure is not necessary to understand the cost estimates included in this report.

1.1 COST REPORT ORGANIZATION OVERVIEW

This EIS cost report is organized into seven sections with supporting appendices. Section 1.0 introduces the purpose of this report and provides background on the TC&WM EIS and the requirements that establish the relationship between this cost report and the TC&WM EIS alternatives.

Section 2.0 describes each of the TC&WM EIS alternatives.

Section 3.0 describes the methodology used to develop the cost estimates that are summarized in Section 4.0 and provided in detail in the appendices. Included in the discussion of the methodology is a review of the source data, the organization of the data by alternative and functional components (e.g., storage, retrieval, treatment, disposal, and closure), and the cross-walk between the source data and the TC&WM EIS work elements (e.g., construction, operations, deactivation, and closure).

Section 4.0 provides a summary discussion of the cost estimate by TC&WM EIS alternative, as well as an alternative-by-alternative description of the major assumptions that drove the respective cost estimates.

Section 5.0 provides a summary discussion of the costs to dispose of the wastes treated by the TC&WM EIS alternatives.

Section 6.0 lists the references cited in Sections 1.0 through 5.0.

An appendix has been prepared for each of the TC&WM EIS alternatives and sub-alternatives. Each of these appendices consist of up to five Microsoft Windows® Excel® workbooks (one each for retrieval, treatment, storage, disposal, and closure as appropriate for the alternative). Each workbook contains Excel worksheets for each of the work elements (i.e., construction, operations, deactivation, and closure) defined by Science Applications International Corporation (SAIC). Each worksheet provides a cost estimate for a work activity (e.g., construction for storage, retrieval, treatment, and disposal) within the work element as defined by SAIC and modified, as appropriate, by the cost estimator (a very limited number of modifications were made and documented as part of the worksheet). The work activity estimate includes a description of the activity, the activity duration, basis of the estimate, scaling factor to apply to the estimate (as defined by SAIC), and activity cost estimate. Appendix Z provides a reference list for documents cited in the alternative-specific cost estimates.

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2.0 DESCRIPTION OF ALTERNATIVES

The TC&WM EIS Alternatives were defined in the "Notice of Intent to Prepare the Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA" (71 FR 5655) and then reported in Gannon (2007) ("Revised TC&WM EIS Data Sets"). There are 11 main Tank Closure Alternatives, three Waste Management Alternatives, and three FFTF Alternatives included in the TC&WM EIS. Each of the 17 alternatives are addressed in this cost report and described in the following sections.

The 11 Tank Closure Alternatives include six main alternatives, one of which has been subdivided into two sub-alternatives and two are subdivided into three sub-alternatives:

- TC Alternative 1, No Action (Section 2.1.1)
- TC Alternative 2A, Existing Waste Treatment Plant (WTP) Vitrification, No Closure (Section 2.1.2)
- TC Alternative 2B, Expanded WTP Vitrification, Landfill Closure (Section 2.1.3)
- TC Alternative 3A, Existing WTP Vitrification with Bulk Vitrification, Landfill Closure (Section 2.1.4)
- TC Alternative 3B, Existing WTP Vitrification with Cast Stone, Landfill Closure (Section 2.1.5)
- TC Alternative 3C, Existing WTP Vitrification with Steam Reforming, Landfill Closure (Section 2.1.6)
- TC Alternative 4, Existing WTP Vitrification with Supplemental Technologies, Selective Clean Closure, Landfill Closure (Section 2.1.7)
- TC Alternative 5, Expanded WTP Vitrification with Supplemental Technologies, Landfill Closure (Section 2.1.8)
- TC Alternative 6A, All Vitrification / No Separations, Clean Closure, Base and Option Cases (Section 2.1.9)
- TC Alternative 6B, All Vitrification with Separations, Clean Closure, Base and Option Cases (Section 2.1.10)
- TC Alternative 6C, All Vitrification with Separations, Landfill Closure (Section 2.1.11).

The three Waste Management Alternatives include:

- WM Alternative 1, No Action (Section 2.2.1)
- WM Alternative 2, Disposal in IDF 200 East Only (Section 2.2.2)
- WM Alternative 3, Disposal in IDF 200 East & 200 West Areas (Section 2.2.3).

The three FFTF Alternatives include:

- FFTF Alternative 1, No Action (Section 2.3.1)
- FFTF Alternative 2, Entombment (Section 2.3.2)
- FFTF Alternative 3, Removal (Section 2.3.3).

2.1 TANK CLOSURE ALTERNATIVES

There are 11 separate Tank Closure Alternatives described in the following sections. Table 2–1 presents a summary comparison of the Tank Closure Alternatives.

2.1.1 Tank Closure Alternative 1: No Action

Tank Closure Alternative 1, No Action, is based on continued storage and monitoring of the tank waste and cesium/strontium capsules, termination of the WTP construction activities, and a 100-year administrative control period. Under this alternative, no treatment, disposal, or closure activities would take place. The DOE would cease further construction of the WTP and any ongoing construction of upgrades to the tank farm systems in 2007, and the WTP site would be isolated pending some future use. No waste would be retrieved from the tanks, and no immobilized high-level waste (IHLW) or immobilized low-activity waste (ILAW) would be produced. The DOE would continue to store and conduct routine monitoring of the waste in the single-shell tanks (SST) and double-shell tanks (DST) during a 100-year administrative control period (ending in year 2107).

Under the No Action Alternative, except for the liquids removed by way of interim stabilization (as part of routine operations), the remaining waste in tanks would remain in the tank farm indefinitely. Tanks showing signs of deterioration indicating threats to tank integrity based on monitoring results would be filled with grout or gravel as a corrective action or emergency response.

2.1.2 Tank Closure Alternative 2A: Existing Waste Treatment Plant Vitrification, No Closure

Tank Closure Alternative 2A is an all-vitrification treatment case. Under this alternative, waste would be retrieved from the 200 East and 200 West Area tank farms to the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989) goal of 360 ft^3 for the 100-series tanks and 30 ft^3 for the 200-series tanks. This level of waste retrieval is commonly referred to as 99 percent of the waste volume. The retrieved waste volume would be pretreated in the WTP and segregated into two waste streams:

- High-level waste (HLW) stream that would be vitrified in a facility with a 6 metric tons of glass per day (MTG/day) total throughput capacity
- LAW stream that would be vitrified in a facility with a 30 MTG/day total throughput capacity.

Table 2–1. Summary Comparison of Tank Closure Alternatives. (3 Sheets)

Activity	Tank Closure Alternative										
	1	**2A**	**2B**	**3A**	**3B**	**3C**	**4**	**5**	**6A**	**6B**	**6C**
New DSTs	0	28	0	0	0	0	0	4	84	0	0
New waste receiver facility	N/A	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Retrieval	0%	99%	99%	99%	99%	99%	99.9%	90%	99.9%	99.9%	99%
Pretreatment											
HLW/LAW separations	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Technetium-99 removal	N/A	No	Yes	No	Yes	No	No	No	No	No	No
Sulfate removal	N/A	No	No	No	No	No	No	Yes	No	No	No
WTP											
Start-Finish[(a)]	2008-2107	2018-2093	2018-2043	2018-2040	2018-2040	2018-2040	2018-2043	2018-2034	2018-2163	2018-2043	2018-2043
IHLW (MTG/day)	N/A	6	6	6	6	6	6	6	15	6	6
ILAW (MTG/day)	N/A	30	90	30	30	30	30	45	0	90	90
Supplemental Treatment											
Bulk vitrification	N/A	No	No	Yes	No	No	Yes	Yes	No	No	No
Cast stone	N/A	No	No	No	Yes	No	Yes	Yes	No	No	No
Steam reforming	N/A	No	No	No	No	Yes	No	No	No	No	No
TRU	N/A	No	No	Yes	Yes	Yes	Yes	Yes	No	No	No

Table 2–1.Summary Comparison of Tank Closure Alternatives. (3 Sheets)

Activity	Tank Closure Alternative										
	1	**2A**	**2B**	**3A**	**3B**	**3C**	**4**	**5**	**6A**	**6B**	**6C**
Disposal (including Post Treatment Storage)											
ILAW disposal	N/A	Onsite	Onsite	Onsite	Onsite	Onsite	Onsite	Onsite	Indefinite storage onsite	Indefinite storage onsite	Indefinite storage onsite
IHLW[(b)]	N/A	Interim onsite storage	Interim onsite storage	Interim onsite storage	Interim onsite storage	Interim onsite storage	Interim onsite storage	Interim onsite storage	Interim onsite storage	Interim onsite storage	Interim onsite storage
TRU	N/A	No	No	WIPP	WIPP	WIPP	WIPP	WIPP	No	No	No
Closure											
SSTs	100-year administra-tive control period	Not closed, 100-year administra-tive control period.	Landfill closed, 100-year administra-tive control period. Upper 15 ft soil and ancillary equipment removed at BX and SX tank farms.	Landfill closed, 100-year administra-tive control period. Upper 15 ft soil and ancillary equipment removed at BX and SX tank farms.	Landfill closed, 100-year administra-tive control period. Upper 15 ft soil and ancillary equipment removed at BX and SX tank farms.	Landfill closed, 100-year admin-istrative control period. Upper 15 ft soil and ancillary equipment removed at BX and SX tank farms.	BX and SX tank farms clean closed, remaining landfill closed, 100-year administra-tive control period.	Landfill closed, 100-year admin-istrative control period.	Clean closed	Clean closed	Landfill closed, 100-year administra-tive control period. Upper 15 ft soil and ancillary equipment removed at BX and SX tank farms.
Cribs & Trenches	N/A	Not closed	Landfill closed – six sets (B Cribs, BX Trenches, BY Cribs, T Cribs, T & TX Trenches, & TY Cribs).	Landfill closed – six sets (B Cribs, BX Trenches, BY Cribs, T Cribs, T & TX Trenches, & TY Cribs).	Landfill closed – six sets (B Cribs, BX Trenches, BY Cribs, T Cribs, T & TX Trenches, & TY Cribs).	Landfill closed – six sets (B Cribs, BX Trenches, BY Cribs, T Cribs, T & TX Trenches, & TY Cribs).	Landfill closed – six sets (B Cribs, BX Trenches, BY Cribs, T Cribs, T & TX Trenches, & TY Cribs).	Landfill closed – six sets (B Cribs, BX Trenches, BY Cribs, T Cribs, T & TX Trenches, & TY Cribs).	Base Case – Landfill Closed Option Case - Clean closed	Base Case – Landfill closed. Option Case - Clean closed	Landfill closed – six sets (B Cribs, BX Trenches, BY Cribs, T Cribs, T & TX Trenches, & TY Cribs).

Table 2–1. Summary Comparison of Tank Closure Alternatives. (3 Sheets)

Activity	Tank Closure Alternative										
	1	2A	2B	3A	3B	3C	4	5	6A	6B	6C
Closure Barrier	N/A	Not closed	Modified RCRA[(c)] Subtitle C barrier	Modified RCRA[(c)] Subtitle C barrier	Modified RCRA[(c)] Subtitle C barrier	Modified RCRA[(c)] Subtitle C barrier	Modified RCRA[(c)] Subtitle C barrier	Hanford Barrier	Base Case: Modified RCRA[(c)] Subtitle C barrier Option Case: N/A	Base Case: Modified RCRA[(c)] Subtitle C barrier Option Case: N/A	Modified RCRA[(c)] Subtitle C barrier

DST = double-shell tank.
HLW = high-level waste.
IHLW = immobilized high-level waste.
ILAW = immobilized low-activity waste.
LAW = low-activity waste.
MTG = metric tons of glass.
N/A = not applicable.
RCRA = *Resource Conservation and Recovery Act of 1976.*
SST = single-shell tank.
TRU = transuranic (waste).
WIPP = Waste Isolation Pilot Plant.
WTP = Waste Treatment Plant.

[(a)] Includes 100-year period of institutional controls, where appropriate.

[(b)] These alternatives do not assume the inventory in the IHLW canisters remains on site. However, the number of storage facilities needed to store all the IHLW is close to the number of canister storage facilities analyzed under Tank Closure Alternative 2B. As indicated in the Administration's fiscal year 2010 budget request, the Administration intends to terminate the Yucca Mountain program—development of the site as a geologic repository for the disposal of HLW and Spent Nuclear Fuel (SNF)—while developing nuclear waste disposal alternatives. Notwithstanding the decision to terminate the Yucca Mountain program, DOE remains committed to meeting its obligations to manage and ultimately dispose of HLW and SNF. The Administration intends to convene a blue ribbon panel of experts to evaluate alternative approaches for meeting these obligations. The panel will provide the opportunity for a meaningful dialogue on how best to address this challenging issue and will provide recommendations that will form the basis for working with Congress to revise the statutory framework for managing and disposing of HLW and SNF.

[(c)] *Resource Conservation and Recovery Act of 1976*, Public Law 94-580, 90 Stat. 2795, 42 USC 901 et seq.

A WTP configuration that would support the Tank Closure Alternative 2A objectives is already under construction and is scheduled to initiate hot commissioning in 2018. The WTP consists of a pretreatment, LAW, HLW, analytical laboratory, and balance of facilities to support waste treatment operations. Tank Closure Alternative 2A proposes operations for as long as required to treat all of the tank waste, which differs from the currently envisioned WTP operations (*No Action Baseline Tank Farm Operations and Waste Treatment Data Package* [DOE/ORP-2003-08]). The cesium and strontium capsules currently stored in the Waste Encapsulation and Storage Facility (WESF) would be de-encapsulated in a new facility adjacent to the WTP and vitrified in the HLW facility as a separate campaign following treatment of the tank waste.

Based on an assumed 2018 start of hot operations, waste separations and immobilization operations would be complete in 2093 for both tank waste and cesium/strontium capsules. The WTP pretreatment, LAW, and HLW vitrification facilities would be replaced/upgraded during this timeframe because they would exceed their assumed design life. In addition, each of the 28 DSTs and associated underground transfer lines would exceed their design life and would be replaced to support staging of waste feed to the WTP.

IHLW would be stored onsite pending shipment to an undetermined off-site location (assumed to be an off-site facility). ILAW would be disposed in the 200 East Area consistent with the Waste Management Alternatives. No separate transuranic (TRU) treatment capability would be provided under Tank Closure Alternative 2A. Under Alternative 2A, no tank or facility closure would occur, although administrative controls of the tank and waste treatment systems would be maintained for 100 years (until 2193) following completion of waste retrieval and immobilization operations.

2.1.3 Tank Closure Alternative 2B: Expanded Waste Treatment Plant Vitrification, Landfill Closure

Tank Closure Alternative 2B represents a variation of Alternative 2A. In Alternative 2B, instead of extending the operations period for the WTP until the tank waste is vitrified, 60 MTG/day LAW immobilization capacity would be added to the WTP. This added capacity would result in a cumulative vitrification capability of 6 MTG/day IHLW and 90 MTG/day ILAW. In addition, Alternative 2B includes landfill closure of the SST farms.

Hot operations under Alternative 2B would start in 2018 just as under Alternative 2A; however, the expanded ILAW treatment capacity would allow the completion of waste immobilization activities in 2043 for both tank waste and cesium/strontium capsules. Because of the shorter operating period, there would be no need to replace the WTP, DSTs, or associated underground transfer lines. Under Alternative 2B, a technetium-99 separations process would be operated as part of the WTP pretreatment system, resulting in the immobilization of technetium-99 as part of the IHLW, rather than as part of the ILAW as under Alternative 2A. The cesium and strontium capsules currently stored in WESF would be de-encapsulated in a new facility adjacent to the WTP and vitrified in the HLW facility as a separate campaign following treatment of the tank waste.

IHLW would be stored onsite. ILAW would be disposed in the 200 Areas consistent with the Waste Management Alternatives. No separate TRU treatment capability would be provided.

Tank Closure Alternative 2B also includes closure of the twelve 200 East and 200 West Area SST farms following deactivation. Specifically, Alternative 2B would result in landfill closure of the SST farms. Contaminated soil from the BX and SX tank farms (first 15 feet) would be removed along with the ancillary equipment. Landfill closure would include stabilization of the tanks and construction of a closure cap (modified RCRA Subtitle C barrier) over these areas. The closure cap would also be placed over six sets of cribs and trenches (B Cribs, BX Trenches, BY Cribs, T Cribs, T & TX Trenches, and TY Cribs). The closure activities would be followed by 100 years (until 2143) of administrative control of tank farm systems. The SST farm system ancillary equipment outside the boundary of the closure cap would be remediated or removed to meet landfill closure requirements. Treatment facilities outside of the boundary of the closure cap would be deactivated pending future closure decisions.

2.1.4 Tank Closure Alternative 3A: Existing Waste Treatment Plant Vitrification with Bulk Vitrification, Landfill Closure

Tank Closure Alternative 3A evaluates retrieval of 99 percent of the tank waste and waste treatment using a combination of WTP vitrification and supplemental treatment technologies. A portion of the overall tank waste volume would be pretreated in the WTP and segregated into one of two waste streams:

- HLW stream that would be vitrified in the WTP in a facility with a 6 MTG/day total throughput capacity
- LAW stream that would be vitrified in the WTP in a facility with a 30 MTG/day total throughput capacity.

The cesium and strontium capsules currently stored in WESF would be de-encapsulated in a new facility adjacent to the WTP and vitrified in the HLW facility as a separate campaign following treatment of the tank waste.

Supplemental treatment technologies would be employed to treat the portion of the tank waste not treated at the WTP. The following supplemental treatment technologies are included as representative technologies:

- TRU treatment
- Bulk vitrification.

TRU treatment would be deployed to separately treat a select number of waste tanks considered to contain only TRU waste. The TRU would be treated and packaged using mobile contact-handled units located in both the 200 East and 200 West Areas, and a single, fixed facility in the 200 East Area to process remote-handled TRU waste. Packaged TRU waste would be interim stored onsite pending shipment and disposal at the Waste Isolation Pilot Plant (WIPP).

The balance of the tank waste (i.e., that not being vitrified in the WTP or treated as TRU) would be directed to the bulk vitrification supplemental treatment facility in the 200 East Area or the bulk vitrification supplemental treatment facility in the 200 West Area. The waste stream feed for the 200 East Area bulk vitrification facility would be pretreated in the WTP. Pretreatment of the waste stream feed for the 200 West Area bulk vitrification facility would be included in Alternative 3A using a solid/liquid separation facility deployed in the 200 West Area.

With a 2018 hot operations start, the major treatment operations (WTP and the bulk vitrification facilities) are projected to be complete in 2040 for both tank waste and cesium/strontium capsules. IHLW would be stored onsite pending shipment to an undetermined off-site location for disposal. ILAW from the WTP and the bulk vitrification facilities would be disposed onsite at Hanford.

Alternative 3A also includes closure of the twelve 200 East and 200 West SST farms following deactivation. Specifically, Alternative 3A would result in the landfill closure of the SST tank farms. Contaminated soil would be removed from the BX and SX tank farms by removing the upper 15 feet of soil and ancillary equipment. Landfill closure would include stabilization of the tanks and construction of a closure cap (modified RCRA Subtitle C barrier) over these areas. The closure cap would also be placed over six sets of cribs and trenches (B Cribs, BX Trenches, BY Cribs, T Cribs, T & TX Trenches, and TY Cribs). The closure activities would be followed by 100 years (until 2141) of administrative control of tank farm systems. SST farm system ancillary equipment outside the boundary of the closure cap would be remediated or removed to meet landfill closure requirements. Treatment facilities outside of the boundary of the closure cap would be deactivated pending future closure decisions.

2.1.5 Tank Closure Alternative 3B: Existing Waste Treatment Plant Vitrification with Cast Stone, Landfill Closure

Tank Closure Alternative 3B evaluates retrieval and treatment of 99 percent of the tank waste using a combination of WTP vitrification and supplemental treatment technologies. A portion of the overall tank waste volume would be segregated and pretreated into one of two waste streams:

- HLW stream that would be pretreated in the WTP in a facility with a 6 MTG/day throughput capacity
- LAW stream that would be vitrified in the WTP in a facility with a 30 MTG/day throughput capacity.

The cesium and strontium capsules currently stored in WESF would be de-encapsulated in a new facility adjacent to the WTP and vitrified in the HLW facility as a separate campaign following treatment of the tank waste.

Technetium-99 removal would occur as part of WTP pretreatment under Alternative 3B. Supplemental treatment technologies would be employed to treat the portion of the tank waste not treated at the WTP. The following supplemental treatment technologies are included as representative technologies:

- TRU treatment
- Cast stone treatment.

TRU treatment would be deployed to separately treat (e.g., de-water and package) waste from a select number of tanks considered to contain only TRU waste. The TRU would be treated and packaged using mobile, contact-handled units located in both the 200 East and 200 West Areas, and a single, fixed facility in the 200 East Area to process remote-handled TRU waste. The packaged TRU waste would be interim stored onsite pending shipment and disposal at the WIPP.

The balance of the tank waste (i.e., that not being vitrified in the WTP or treated as TRU) would be directed to the cast stone supplemental treatment facility in the 200 East Area or the cast stone supplemental treatment facility in the 200 West Area. The waste stream feed for the 200 East Area cast stone facility would first be pretreated in the WTP. The waste stream feed for the 200 West Area cast stone facility would be pretreated using a solid/liquid separation facility deployed in the 200 West Area.

With a 2018 hot operations start, the major treatment operations (WTP and cast stone facilities) are projected to be complete in 2040 for both tank waste and cesium/strontium capsules. IHLW would be stored onsite pending shipment to an undetermined off-site location for disposal. ILAW from the WTP and cast stone facilities would be disposed onsite at Hanford although the duration of onsite storage and disposal would vary, based on the assumed output of ILAW and duration of WTP operations.

Alternative 3B also includes landfill closure of the twelve 200 East and 200 West SST farms following deactivation. Contaminated soil would be removed from the BX and SX tank farms by removing the upper 15 feet of soil and ancillary equipment. Landfill closure would include stabilizing the tanks and construction of a closure cap (modified RCRA Subtitle C barrier) over these areas. The closure cap would also be placed over six sets of cribs and trenches (B Cribs, BX Trenches, BY Cribs, T Cribs, T & TX Trenches, and TY Cribs). The closure activities would be followed by administrative control of tank farm systems for 100 years (until 2141). SST farm system ancillary equipment outside the boundary of the closure cap would be remediated or removed to meet landfill closure requirements. Treatment facilities outside of the boundary of the closure cap would be deactivated pending future closure decisions.

2.1.6 Tank Closure Alternative 3C: Existing Waste Treatment Plant Vitrification with Steam Reforming, Landfill Closure

Tank Closure Alternative 3C evaluates retrieval and treatment of 99 percent of the tank waste using a combination of WTP vitrification and supplemental treatment technologies. A portion of the overall tank waste volume would be segregated and pretreated into one of two waste streams:

- HLW stream that would be pretreated in the WTP in a facility with a 6 MTG/day throughput capacity
- LAW stream that would be vitrified in the WTP in a facility with a 30 MTG/day throughput capacity.

The cesium and strontium capsules currently stored in WESF would be de-encapsulated in a new facility adjacent to the WTP and vitrified in the HLW facility as a separate campaign following treatment of the tank waste.

Supplemental treatment technologies would be employed to treat the portion of the tank waste not treated at the WTP. The following supplemental treatment technologies are included as representative technologies:

- TRU treatment
- Steam Reforming[1].

TRU treatment would be deployed to separately treat (e.g., de-water and package) waste from a select number of tanks considered to contain only TRU waste. The TRU would be treated and packaged using mobile, contact-handled units located in both the 200 East and 200 West Areas, and a single, fixed facility in the 200 East Area to process remote-handled TRU waste. The packaged TRU waste would be interim stored onsite pending shipment and disposal at the WIPP.

The balance of the tank waste (i.e., that not being vitrified in the WTP or treated as TRU) would be directed to the steam reforming supplemental treatment facility in the 200 East Area or the steam reforming supplemental treatment facility in the 200 West Area. The waste stream feed for the 200 East Area supplemental treatment facility would first be pretreated in the WTP. The waste stream feed for the 200 West Area steam reforming facility would be pretreated using a solid/liquid separation facility deployed in the 200 West Area.

With a 2018 hot operations start, the major treatment operations (WTP and steam reforming facilities) are projected to be complete in 2040 for both tank waste and cesium/strontium capsules. IHLW would be stored onsite pending shipment to an undetermined off-site location for disposal. ILAW from the WTP and steam reforming facilities would be disposed onsite at the Hanford Site, although the duration of onsite storage and disposal would vary, based on the assumed output of ILAW and duration of WTP operations.

Alternative 3C also includes landfill closure of the twelve 200 East and 200 West SST farms following deactivation. Contaminated soil would be removed from the BX and SX tank farms by removing the upper 15 feet of soil and ancillary equipment. Landfill closure would include stabilizing the tanks and construction of a closure cap (modified RCRA Subtitle C barrier) over these areas. The closure cap would also be placed over six sets of cribs and trenches (B Cribs, BX Trenches, BY Cribs, T Cribs, T & TX Trenches, and TY Cribs). The closure activities would followed by administrative control of tank farm systems for 100 years (until 2141). SST farm system ancillary equipment outside the boundary of the closure cap would be remediated or removed to meet landfill closure requirements. Treatment facilities outside of the boundary of the closure cap would be deactivated pending future closure decisions.

[1] Steam Reforming refers to the patented THOR® steam reforming process (hereafter referred to as steam reforming). THOR is a registered trademark of THOR Treatment Technologies, LLC, Aiken, South Carolina.

2.1.7 Tank Closure Alternative 4: Existing Waste Treatment Plant Vitrification with Supplemental Technologies, Selective Clean Closure, Landfill Closure

Tank Closure Alternative 4 includes enhanced waste retrieval (99.9 percent) that would reduce the residual waste volume in support of tank removal actions. There would be a slightly higher volume of tank waste to be treated from the 200 East and 200 West Area tank farms than would be treated under Alternatives 2, 3, 5, or 6C. Removal of this higher tank waste volume would be accomplished by completing a second retrieval campaign in each tank. The second retrieval technology deployment would comprise a tank chemical wash process during waste retrieval operations. Following tank waste retrieval, a portion of the overall tank waste volume would be pretreated in the WTP and segregated into two waste streams:

- HLW stream that would be vitrified in a facility with a 6 MTG/day total throughput capacity
- LAW stream that would be vitrified in a facility with a 30 MTG/day total throughput capacity.

The cesium and strontium capsules currently stored in WESF would be de-encapsulated in a new facility adjacent to the WTP and vitrified in the HLW facility as a separate campaign following treatment of the tank waste.

Alternative 4 also includes using supplemental treatment technologies to treat the portion of the tank waste not treated at the WTP. The following supplemental treatment technologies are included as representative technologies:

- TRU treatment
- Cast stone treatment in 200 East
- Bulk vitrification treatment in 200 West.

TRU treatment would be deployed to separately treat (i.e., de-water and package) waste from a select number of tanks considered to contain only TRU waste. The TRU would be treated and packaged using mobile contact-handled units located in both the 200 East and 200 West Areas, and a single, fixed facility in the 200 East Area to process remote-handled TRU waste. The packaged TRU waste would be interim stored onsite pending shipment and disposal at the WIPP.

The balance of the tank waste (i.e., that not being vitrified in the WTP or treated as TRU) would be apportioned into two groups, one routed to a cast stone supplemental treatment facility in the 200 East Area and the other routed to a bulk vitrification supplemental treatment facility in the 200 West Area. Under Alternative 4, the waste stream feed for the 200 East Area cast stone facility would be pretreated in the WTP and the waste stream feed for the 200 West Area bulk vitrification facility would be pretreated using a 200 West Area solid/liquid separation facility.

With a 2018 hot operations start, the major treatment operations (WTP, cast stone, and bulk vitrification) are projected to be complete in 2043 for both tank waste and cesium/strontium capsules. IHLW would be stored onsite pending shipment to an undetermined off-site location for disposal. ILAW from the WTP, bulk vitrification, and cast stone facilities would be disposed

onsite at the Hanford Site although the duration of onsite storage and disposal would vary based on the assumed output of ILAW and duration of treatment facility operations.

Alternative 4 includes closure of the twelve 200 East and 200 West Area SST farms following deactivation. Specifically, Alternative 4 evaluates the clean closure of two of these SST farms (BX and SX), and landfill closure of the remaining 10 SST farms. Clean closure of the BX and SX tank farms encompasses tank removal, removal of contaminated soil, and backfilling with clean fill to support future unrestricted land use. Landfill closure of remaining tank farms would include stabilizing the tanks and construction of a closure cap (i.e., modified RCRA Subtitle C barrier) over these areas. The closure cap would also be placed over six sets of cribs and trenches (B Cribs, BX Trenches, BY Cribs, T Cribs, T & TX Trenches, and TY Cribs). The closure activities would be followed by administrative control of tank farm systems for 100 years (until 2144). SST farm system ancillary equipment located outside the boundary of the closure cap would be remediated or removed to meet landfill closure requirements. Treatment facilities outside of the boundary of the closure cap would be deactivated pending future closure decisions.

2.1.8 Tank Closure Alternative 5: Expanded Waste Treatment Plant Vitrification with Supplemental Technologies, Landfill Closure

Tank Closure Alternative 5 includes retrieval and treatment of 90 percent of the tank waste from the Hanford 200 East and 200 West Area tank farms using a combination of WTP vitrification and supplemental technologies. A portion of the overall tank waste volume would be pretreated in the WTP and segregated into two waste streams:

- HLW stream that would be vitrified at a facility with a 6 MTG/day throughput capacity
- LAW stream that would be vitrified at a facility with a 45 MTG/day throughput capacity.

The cesium and strontium capsules currently stored in WESF would be de-encapsulated in a new facility adjacent to the WTP and vitrified in the HLW facility as a separate campaign following treatment of the tank waste.

A sulfate removal process would be deployed as part of the WTP pretreatment process to allow higher waste-sodium loading in the ILAW glass. Alternative 5 also includes using the following supplemental technologies as representative technologies to treat the portion of tank waste not treated via the WTP:

- TRU treatment
- Cast stone treatment
- Bulk vitrification treatment.

TRU treatment would be deployed to separately treat (i.e., de-water and package) waste from a select number of tanks considered to contain only TRU waste. The TRU would be treated and packaged using mobile contact-handled units located in both the 200 East and 200 West Areas, and a single, fixed facility in the 200 East Area to process remote-handled TRU waste. The packaged TRU waste would be interim stored onsite pending shipment and disposal at the WIPP.

The balance of the tank waste (i.e., that not being vitrified in the WTP or treated as TRU) would be apportioned into two groups, with one routed to a cast stone supplemental treatment facility in the 200 East Area and the other routed to a bulk vitrification supplemental treatment facility in the 200 West Area. The waste stream feed for the 200 East Area cast stone facility would be pretreated in the WTP and waste stream feed for the 200 West Area bulk vitrification facility would be pretreated using a 200 West Area solid/liquid separation facility.

With a 2018 hot operations start, the major treatment operations (WTP, cast stone, and bulk vitrification) are projected to be complete in 2034 for both tank waste and cesium/strontium capsules. This schedule would require the construction and operation of four new DSTs to facilitate waste retrieval operations. IHLW would be stored onsite pending shipment to an undetermined off-site location for disposal. ILAW from the WTP, bulk vitrification, and cast stone facilities would be disposed onsite at Hanford although the duration of onsite storage and disposal would vary based on the assumed output of ILAW and duration of WTP operations.

Alternative 5 also includes closure of the twelve 200 East and 200 West Area SST farms and the six sets of cribs and trenches following deactivation. Specifically, Alternative 5 evaluates landfill closure of the SST farms. Landfill closure would include tank stabilization and construction of a more robust closure cap, the Hanford Barrier, over these areas compared to the barrier considered under Alternatives 3 and 4. The Hanford Barrier is a multilayer barrier that is thicker than the modified RCRA Subtitle C barrier providing improved long-term performance. Closure of the tank farms would be followed by administrative control of tank farm systems for 100 years (until 2134). To support the accelerated schedule, ancillary equipment outside the closure cap would neither be remediated nor removed. Treatment facilities located outside of the boundary of the closure cap would be deactivated pending future closure decisions. For this alternative, contaminated soils will not be removed from any of the 12 SST farms.

2.1.9 Tank Closure Alternative 6A: All Vitrification / No Separations, Clean Closure

Tank Closure Alternative 6A includes retrieval and treatment of 99.9 percent of the tank waste volume from the Hanford 200 East and 200 West Area tank farms, but assumes no separation of the retrieved tank waste into HLW and LAW streams before treatment. Waste retrieval would be accomplished by deploying an additional tank chemical wash process during retrieval operations. The entire volume of retrieved waste would be managed as HLW and vitrified as IHLW in a facility with a 15 MTG/day capacity. No supplemental treatment technologies would be deployed.

With a 2018 hot operations start, HLW vitrification operations are projected to be complete in 2163 (146 years) for both tank waste and cesium/strontium capsules. This long operating period would exceed existing facilities or assumed life cycles. The WTP complex would have to be replaced twice during the duration of Alternative 6A. The IHLW canister shipping/transfer and interim storage facilities would need to be replaced completely once and partially twice. Underground transfer lines would require one replacement. In addition, each of the 28 DSTs currently operating in the tank farms would need to be replaced 3 times (for a total of 84 new DSTs) to support waste feed to the WTP, the Effluent Treatment Facility would be replaced four times, and the 242-A evaporator would be replaced two times.

The cesium and strontium capsules currently stored in WESF would be de-encapsulated in a new facility adjacent to the WTP and vitrified in the HLW facility as a separate campaign following treatment of the tank waste.

IHLW would be stored onsite pending shipment to an undetermined off-site location for disposal.

Alternative 6A also considers clean closure of all twelve 200 East and 200 West Area SST farms following deactivation. Clean closure of the tank farms would encompass extensive tank and ancillary equipment removal, all of which would be dispositioned as HLW. These materials would be treated and packaged in a new pre-processing facility (PPF) for onsite disposal in shielded boxes. Contaminated soil would also be removed (to the depth of groundwater where necessary) from the nine tank farms showing evidence of deep soil contamination plumes (i.e., B, BX, C, A, AX, TX, U, SX, T), and separately treated in the new PPF for onsite disposal. A base case and an option case are considered for 6 sets of cribs and trenches associated with the tank farms.

2.1.9.1 Tank Closure Alternative 6A Base Case. Under the base case, a Modified RCRA Subtitle C barrier would be placed over the cribs and trenches. No removal or remediation actions would be taken.

2.1.9.2 Tank Closure Alternative 6A Option Case. Under the option case, the cribs and trenches would be excavated and treated in the PPF. Remediated areas would be backfilled with clean fill to support future use of the tank farms on an unrestricted basis. Treatment facilities located outside of the boundary of the closure cap would be deactivated pending future closure decisions.

2.1.10 Tank Closure Alternative 6B: All Vitrification with Separations, Clean Closure

Tank Closure Alternative 6B evaluates retrieval and treatment of 99.9 percent of the waste from the 200 East and 200 West Area tank farms, and assumes separation into HLW and LAW streams. The higher retrieval tank waste volume would be accomplished by deploying an additional tank chemical wash process during waste retrieval operations. In Alternative 6B, the WTP would be configured to produce 6 MTG/day IHLW and 90 MTG/day ILAW. Alternative 6B does not include use of supplemental treatment technologies.

The cesium and strontium capsules currently stored in WESF would be de-encapsulated in a new facility adjacent to the WTP and vitrified in the HLW facility as a separate campaign following treatment of the tank waste.

With a 2018 hot operations start, tank waste vitrification operations are projected to be complete in 2043 for both tank waste and cesium/strontium capsules. However, the HLW waste stream from the PPF will require (minimal throughput) thermal treatment capacity through 2099.

Alternative 6B also considers clean closure of all twelve 200 East and 200 West Area SST farms following deactivation. Clean closure of the tank farms would encompass extensive tank and ancillary equipment removal, all of which would be dispositioned as HLW. These materials would be treated and packaged in a new PPF for onsite disposal in shielded boxes.

Contaminated soil would also be removed (to the depth of groundwater where necessary) from the nine tank farms showing evidence of deep soil contamination plumes (i.e., B, BX, C, A, AX, TX, U, SX, T), and separately treated in the new PPF. A base case and an option case are considered for 6 sets of cribs and trenches associated with the tank farms.

IHLW and ILAW would be stored onsite pending shipment to an undetermined off-site location for disposal.

2.1.10.1 Tank Closure Alternative 6B Base Case. Under the base case, a Modified RCRA Subtitle C barrier would be placed over the cribs and trenches. No removal or remediation actions would be taken.

2.1.10.2 Tank Closure Alternative 6B Option Case. Under the option case, the cribs and trenches would be excavated and treated in the PPF. Remediated areas would be backfilled with clean fill to support future use of the farms on an unrestricted basis. Treatment facilities located outside of the boundary of the closure cap would be deactivated pending future closure decisions.

2.1.11 Tank Closure Alternative 6C: All Vitrification with Separations, Landfill Closure

Tank Closure Alternative 6C evaluates retrieval and treatment of 99 percent of the tank waste from the 200 East and 200 West Area tank farms, and assumes separation into HLW and LAW streams. In Alternative 6C, the WTP would be configured to produce 6 MTG/day IHLW and 90 MTG/day ILAW. Alternative 6C does not include the use of supplemental treatment technologies. With a 2018 hot operations start, tank waste vitrification operations are projected to be complete in 2043 for both tank waste and cesium/strontium capsules.

The cesium and strontium capsules currently stored in WESF would be de-encapsulated in a new facility adjacent to the WTP and vitrified in the HLW facility as a separate campaign following treatment of the tank waste.

Alternative 6C also includes landfill closure of the twelve 200 East and 200 West Area SST farms following deactivation. Contaminated soils at the BX and SX tank farms would be removed to a depth of 15 feet. Landfill closure would include the construction of a closure cap (modified RCRA Subtitle C barrier) over these areas. The closure cap would also be placed over six sets of cribs and trenches (B Cribs, BX Trenches, BY Cribs, T Cribs, T & TX Trenches, and TY Cribs). The closure activities would be followed by 100 years (until 2142) of administrative control of tank farm systems. SST farm system ancillary equipment outside the boundary of the closure cap would be remediated or removed to meet landfill closure requirements. Treatment facilities outside of the boundary of the closure cap would be deactivated pending future closure decisions.

IHLW and ILAW would be stored onsite pending shipment to an undetermined off-site location for disposal.

2.2 WASTE MANAGEMENT ALTERNATIVES

There are three Waste Management Alternatives described in the following sections. Table 2–2 presents a summary comparison of the Waste Management Alternatives.

Table 2–2.Summary Comparison of the Waste Management Alternatives.

Activity	Waste Management Alternative 1, No Action	Waste Management Alternative 2, Disposal in IDF 200 East Only	Waste Management Alternative 3, Disposal in IDF 200 East and 200 West
IDF Construction	No	200 East only; volume depends on disposal group	200 East and 200 West, volume depends on disposal group. IDF 200 East treated tank waste only, IDF 200 West all other sources
RPPDF Construction	No	Yes, volume depends on disposal group	Yes, volume depends on disposal group
Existing trenches 31 and 34 utilized for disposal	Yes	Yes	Yes
Waste Management facilities expanded (CWC, WRAP, and T Plant)	No	Yes	Yes
Closure	Facilities closed in 2035. Administrative controls for 100-year period following closure	Modified RCRA Subtitle C barrier over IDF and RPPDF. Closure of existing trenches (31 & 34), CWC, WRAP, and T Plant facilities not addressed	Modified RCRA Subtitle C barrier over IDF and RPPDF. Closure of existing trenches (31 & 34), CWC, WRAP, and T Plant facilities not addressed

CWC = Central Waste Complex.
IDF = Integrated Disposal Facility.
RCRA = *Resource Conservation and Recovery Act of 1976* (Public Law 94-580, 90 Stat. 2795, 42 USC 901 et seq.).
RPPDF = River Protection Project Disposal Facility.
WRAP = Waste Receiving and Processing Facility.

2.2.1 Waste Management Alternative 1: No Action

Waste Management Alternative 1, No Action, includes continued storage and treatment of low-level waste (LLW), mixed low-level waste (MLLW), and TRU waste at the Central Waste Complex (CWC). Disposal actions would continue at the lined disposal trenches through year 2035 (operational closure date). No offsite shipments of TRU waste or LLW/MLLW will be received.

Administrative controls would be implemented for a period of 100 years following disposal operations (2036 to 2135).

2.2.2 Waste Management Alternative 2: Disposal in Integrated Disposal Facility – 200 East Only

Waste Management Alternative 2, Disposal in IDF – 200 East Only, includes continued storage and treatment of LLW, MLLW, and TRU waste. Existing waste management facilities at the CWC, T Plant, and Waste Receiving and Processing Facility (WRAP) would be expanded to provide greater capacity/throughput. Continued waste management operations at the existing facilities are not analyzed in the EIS and only the facility expansions are analyzed. Consistent with the alternative analysis, the cost report only addresses the construction and operation of facility expansions. The following facility expansions/upgrades would be constructed under this alternative to process waste:

- T Plant – construct and operate a duplicate of the existing 2706-T/TA/TB facility to process LLW and TRU waste
- CWC – construct and operate a duplicate of the existing 2403-WD storage facility
- WRAP – expand the existing WRAP facility to provide additional LLW, MLLW, and TRU processing capability. Construct and operate a new WRAP-type facility (WRAP II) to process remote handled TRU waste.

Under this alternative, no additional offsite TRU waste would be received. Offsite shipments of waste to the Hanford Site would be limited to 82,000 m^3 of LLW and MLLW.

Construction, operation, deactivation, and closure of two disposal facilities would provide for disposal of tank waste, onsite-generated non-*Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) waste, FFTF waste, waste management waste streams, and offsite-received LLW/MLLW. Disposal facilities would include an IDF and a River Protection Project Disposal Facility (RPPDF). The RPPDF would be used for disposing of lightly contaminated equipment and soils associated with clean closure of the tank farms. The IDF would be used for disposal of all other waste streams.

Because of the number of Tank Closure Alternatives and the different waste volumes requiring disposal the Tank Closure, FFTF, and Waste Management Alternatives were grouped into three disposal groups based on operational completion date. Within each disposal group, the largest waste volume was utilized to size the disposal facilities (IDF or RPPDF). The disposal groups include the following.

- Disposal Group 1:
  - Operations complete in 2050
  - IDF = 1.2 x 10^6 m^3 capacity
  - RPPDF = 1.03 x 10^6 m^3 capacity
  - Encompasses Tank Closure Alternatives 2B, 3A, 3B, 3C, 4, 5, and 6C; FFTF Alternatives; and Waste Management Alternatives.
- Disposal Group 2:
  - Operations complete in 2100
  - IDF = 4.25 x 10^5 m^3
  - RPPDF = 8.33 x 10^6 m^3

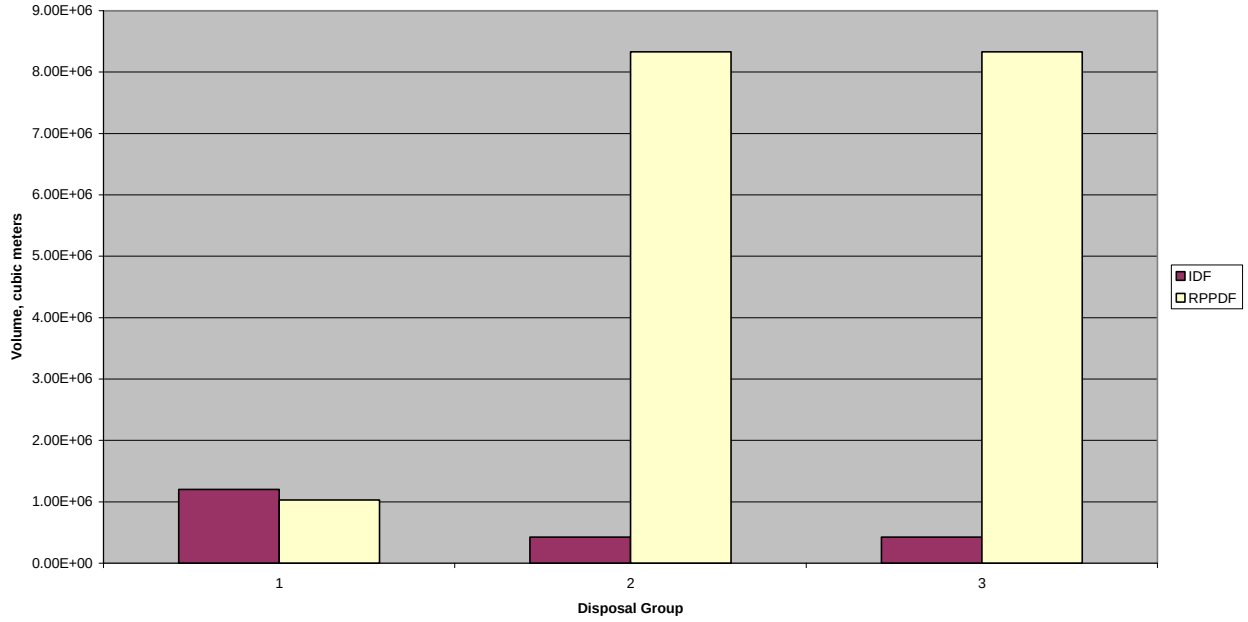
  - Encompasses Tank Closure Alternatives 2A and 6B, FFTF Alternatives, and Waste Management Alternatives.

- Disposal Group 3:
  - Operations complete in 2165
  - IDF = 4.25×10^5 m^3
  - RPPDF = 8.33×10^6 m^3
  - Encompasses Tank Closure Alternative 6A; FFTF Alternatives, and Waste Management Alternatives.

The waste volumes by disposal group and disposal facility are presented in Figure 2–1. Note that there is no waste disposal in IDF 200 West under Waste Management Alternative 2.

Closure actions would include construction of a modified RCRA Subtitle C barrier over the IDF and RPPDF. Closure actions at the CWC, WRAP, T Plant, and burial grounds (Trenches 31 and 34) are not included in the alternative.

Figure 2–1. Disposal Facility Volumes by Waste Group (Waste Management Alternative 2).



IDF = Integrated Disposal Facility.
RPPDF = River Protection Project Disposal Facility.

2.2.3 Waste Management Alternative 3: Disposal in Integrated Disposal Facility – 200 East and 200 West Areas

Waste Management Alternative 3, Disposal in IDF – 200 East and 200 West includes continued storage and treatment of LLW, MLLW, and TRU waste. Existing waste management facilities at the CWC, WRAP, and T Plant would be expanded to provide greater capacity/throughput.

Continued wastes management operations at the existing facilities are not analyzed in the EIS and only the facility expansions are analyzed. Consistent with the alternative analysis, the cost report only evaluates the construction and operation of facility expansions.

The following facility expansions/upgrades would be constructed under this alternative to process waste.

- T Plant – construct and operate a duplicate of the existing 2706-T/TA/TB facility to process LLW and TRU waste.
- CWC – construct and operate a duplicate of the existing 2403-WD storage facility.
- WRAP – expand the existing WRAP facility to provide additional LLW, MLLW, and TRU processing capability. Construct and operate a new WRAP-type facility (WRAP II) to process remote-handled TRU waste.

Under this alternative, no additional offsite TRU waste would be received. Offsite shipments of waste to the Hanford Site would be limited to 82,000 m^3 of LLW and MLLW.

Construction, operation, deactivation, and closure of two IDFs and one RPPDF would provide for disposal of tank waste, onsite-generated non-CERCLA waste, FFTF waste, waste management waste streams, and offsite-received LLW/MLLW. Disposal facilities would consist of one IDF in the 200 East Area that would be used for tank waste only, one IDF in the 200 West area that would be used for onsite generated non-CERCLA, offsite-received LLW/MLLW, FFTF, and waste management waste streams, and an RPPDF. The RPPDF would be used for disposing of lightly contaminated equipment and soils associated with clean closure of the tank farms. The IDF would be used for disposal of all other waste streams.

Because of the number of Tank Closure Alternatives and the different waste volumes requiring disposal the tank closure, FFTF, and Waste Management Alternatives were grouped into three disposal groups based on operational completion date. Within each disposal group the largest waste volume was utilized to size the disposal facilities (IDF or RPPDF). The disposal groups include:

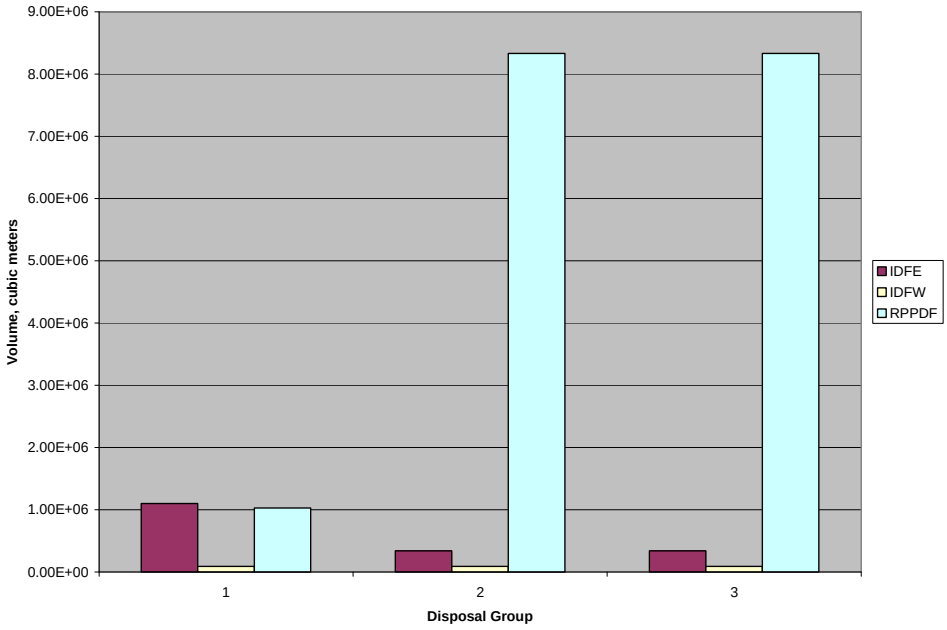
- Disposal Group 1:
  - Operations complete in 2050
  - IDF East = 1.1 x 10^6 m^3 capacity
  - IDF West = 9 x 10^4 m^3 capacity
  - RPPDF = 1.03 x 10^6 m^3 capacity
  - Encompasses Tank Closure Alternatives 2B, 3A, 3B, 3C, 4, 5, and 6C; FFTF Alternatives, and Waste Management Alternatives.
- Disposal Group 2
  - Operations complete in 2100 for IDF East and RPPDF, and 2050 for IDF West
  - IDF East = 3.4 x 10^5 m^3
  - IDF West = 9 x 10^4 m^3 capacity
  - RPPDF = 8.33 x 10^6 m^3
  - Encompasses Tank Closure Alternatives 2A and 6B, FFTF Alternatives, and Waste Management Alternatives.

- Disposal Group 3:
  - Operations complete in 2165 for IDF East and RPPDF, 2050 for IDF West
  - IDF East = 3.4 x 10^5 m^3
  - IDF West = 9 x 10^4 m^3 capacity
  - RPPDF = 8.33 x 10^6 m^3
  - Encompasses Tank Closure Alternative 6A, FFTF Alternatives, and Waste Management Alternatives.

The waste volumes by disposal group and disposal facility are presented in Figure 2–2.

Closure actions would include construction of a modified RCRA Subtitle C barrier over the IDF and RPPDF. Closure actions at the CWC, WRAP, T Plant, and burial grounds (Trenches 31 and 34) are not included in the alternative.

Figure 2–2. Disposal Facility Volumes by Waste Group (Waste Management Alternative 3).



IDF E = Integrated Disposal Facility East.
IDF W = Integrated Disposal Facility West.
RPPDF = River Protection Project Disposal Facility.

2.3 FAST FLUX TEST FACILITY ALTERNATIVES

Three FFTF Alternatives have been defined for analysis in the TC&WM EIS. The alternatives are (1) no action, (2) entombment, and (3) removal. The alternatives focus on disposition of the reactor facility, a group of remote-handled special components, and disposition of approximately 300,000 gallons of bulk sodium. All of the FFTF Alternatives assume that deactivation activities for the FFTF complex and support buildings as defined in the *Environmental Assessment, Sodium Residuals Reaction/Removal and Other Deactivation Work Activities, Fast Flux Test*

Facility (FFTF) Project, Hanford Site, Richland, Washington (DOE/EA-1547F), would be completed. Table 2–3 presents a summary comparison of the FFTF Alternatives.

Table 2–3. Summary Comparison of the Fast Flux Test Facility Alternatives.

Activity	FFTF Alternative 1, No Action	FFTF Alternative 2, Entombment	FFTF Alternative 3, Removal
Facility disposition	Facilities maintained for 100 years	Demolish facilities to grade, stabilize, and cap	Remove all contaminated material/ equipment and dispose of in IDF
Disposition of remote-handled special components (highly radioactively contaminated)	Removed during deactivation and left in storage	Treat and dispose of waste at Hanford or treat at Idaho with waste disposal at Hanford or Nevada Test Site	Same as Alternative 2
Disposition of radioactively contaminated sodium	Removed from reactor during deactivation and left in storage	Convert to caustic at Hanford or Idaho for use at WTP	Same as Alternative 2
Closure	No	Construct modified RCRA Subtitle C barrier	No barrier required

IDF = Integrated Disposal Facility.
FFTF = Fast Flux Test Facility.
RCRA = *Resource Conservation and Recovery Act of 1976* (Public Law 94-580, 90 Stat. 2795, 42 USC 901 et seq.).
WTP = Waste Treatment Plant.

2.3.1 Fast Flux Test Facility Alternative 1: No Action

FFTF Alternative 1, No Action, includes deactivation and 100 years of administrative controls. The deactivation activities include removal of bulk sodium and remote handled special components. The sodium removed from the reactor systems would be stored near the FFTF. Deactivation activities would be performed between 2007 and 2016. The administrative control period is from 2008 through 2107.

2.3.2 Fast Flux Test Facility Alternative 2: Entombment

FFTF Alternative 2, Entombment, provides for demolition of above-grade structures, stabilization of below-grade spaces, and construction of a barrier to isolate the below-grade portions of the reactor building. Stabilization of below-grade spaces would be performed using a combination of grout, demolition debris, and/or other suitable fill material to immobilize remaining hazardous chemicals and radiological materials, and minimize future subsidence.

Several components designated as “remote-handled special components” will require special disposition due to high levels of contamination. It is anticipated that four of the special components would require remote handling for treatment and packaging. Two options are identified for the remote-handled special components including an Idaho Option and a Hanford Site Option.

The bulk sodium (approximately 300,000 gallons) would be converted to liquid caustic for use in the WTP. Two options are identified for conversion of the bulk sodium to liquid caustic including transporting the sodium to an existing sodium processing facility in Idaho or construction of a new sodium conversion facility at the Hanford site.

After demolitioning and stabilizing the reactor building, a modified RCRA Subtitle C barrier would be constructed to reduce infiltration and prevent intrusion.

2.3.3 Fast Flux Test Facility Alternative 3: Removal

FFTF Alternative 3, Removal, provides for demolition of above-grade structures and disposal of the contaminated debris in the IDF. The reactor containment building would be demolished to grade and support facilities would be demolished to 3 feet below grade. The reactor vessel would be stabilized with grout, removed, and disposed of at the IDF. Contaminated material and equipment would be removed and disposed of in the IDF. The lower portion of the reactor containment building would be backfilled with soil or grout. The site would be backfilled and recontoured (no surface barrier required).

Several components designated as “remote-handled special components” will require special disposition due to high levels of contamination. It is anticipated that four of the special components would require remote handling for treatment and packaging. Two options are identified for the remote-handled special components including an Idaho Option and a Hanford Site Option.

The bulk sodium (approximately 300,000 gallons) would be converted to liquid caustic for use in the WTP. Two options are identified for conversion of the bulk sodium to liquid caustic including transporting the sodium to an existing sodium processing facility in Idaho or construction of a new sodium conversion facility at the Hanford Site.

3.0 COST METHODOLOGY

This section provides an overview of the methodology used to prepare the TC&WM EIS alternative-specific cost estimates. Figure 3–1 presents a summary of the approach used to develop cost estimates for the TC&WM EIS Alternatives. It should be noted that the cost estimates are not budgetary estimates and are not intended to represent any current DOE baseline at the Hanford Site. The cost estimating methodology used to develop the cost estimate for each alternative includes the following elements:

- **Assemble Sources of Cost Data** – Source cost data (e.g., Waste Management Baseline Data provided by Plateau Remediation Contract) necessary to establish the basis for the alternative-by-alternative cost estimates were assembled and maintained under control to ensure consistency and traceability among the source data and the alternative cost estimates. Data was provided for the cost report by entities familiar with the work scope for which cost estimates were being prepared. Cost data for activities associated with the WTP was provided by the DOE-Office of River Protection (ORP), cost data for waste management activities was provided by Plateau Remediation Contract, cost data for Tank Farms was provided by the Tank Farm Contractor, cost data for steam reforming was provided by DOE-Idaho through DOE-ORP, and cost data concerning the FFTF was provided by the DOE-Richland Operations Office.

- **Map Source Costs to Work Elements and Identify Cost Data Gaps** – Each alternative was divided into work elements in the scaled data sets provided to CH2M HILL by SAIC (Table 3–1). These work elements make up the major scope components of the alternatives. The components include construction, operations, deactivation, and closure. These work elements were further subdivided in the scaled data sets prepared by SAIC to the extent required to reflect the specific scope details of each alternative. Source cost data were then mapped to the alternative work elements in order to identify gaps in the available cost data (Figure 3–1).

  Cost data gaps were identified based on the mapping of costs to the TC&WM EIS alternative work elements. Where work elements were not provided in the SAIC datasets, work elements were developed by CH2M HILL (e.g., waste form disposal costs) and estimates of costs were prepared based on available cost data. Where cost data gaps were identified, data from publicly available and reviewed sources were used when available. When other sources were not available, technical experts estimated costs for inclusion in this document.

- **Estimate Costs and Scale Cost Data** – Costs of the work elements for each alternative were estimated based on scaling factors developed by SAIC for each TC&WM EIS alternative work element. The scaling factors were provided to CH2M HILL by SAIC in the form of scaled data sets (Table 3–1).

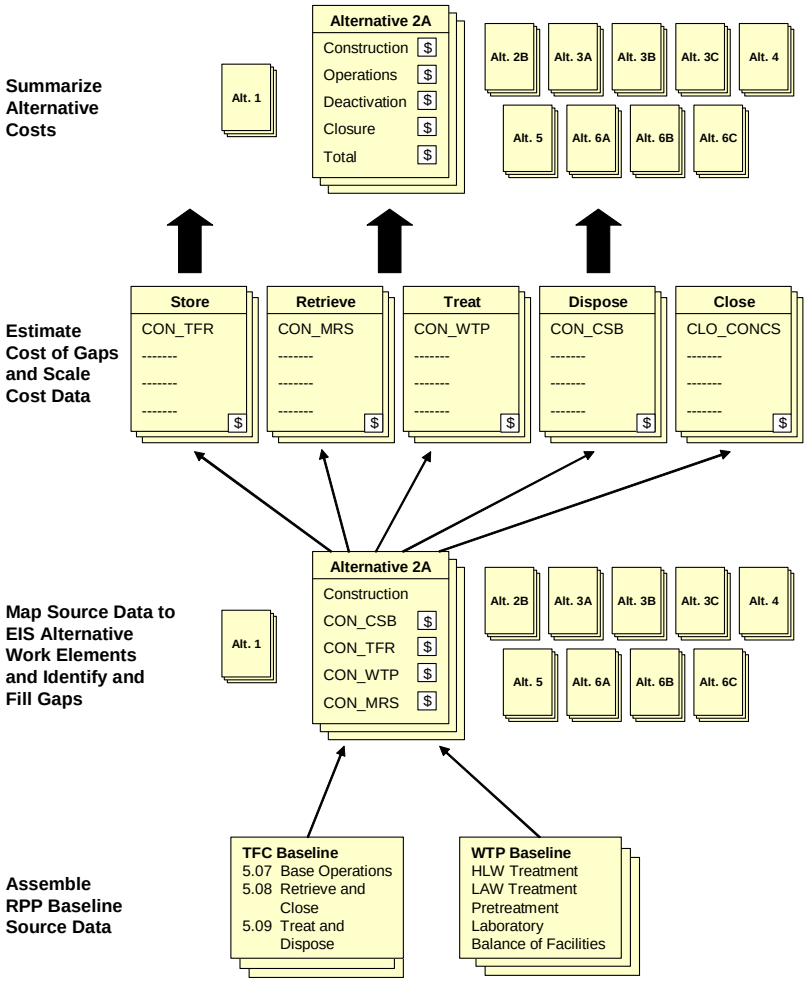
Table 3–1. Tank Closure & Waste Management EIS Data Scaling Packages.

Alternative	Reference*
Tank Closure	
1 – No Action	SAIC_Alternative_TC-1_07-12-07
2A – Existing WTP Vitrification, No Closure	SAIC_Alternative_TC-2A_07-12-07
2B – Expanded WTP Vitrification, Landfill Closure	SAIC_Alternative_TC-2B_07-12-07
3A – Existing WTP Vitrification with Bulk Vitrification, Landfill Closure	SAIC_Alternative_TC-3A_07-12-07
3B – Existing WTP Vitrification with Cast Stone, Landfill Closure	SAIC_Alternative_TC-3B_07-12-07
3C – Existing WTP Vitrification with Steam Reforming, Landfill Closure	SAIC_Alternative_TC-3C_07-12-07
4 – Existing WTP Vitrification with Supplemental Technologies, Selective Clean Closure, Landfill Closure	SAIC_Alternative_TC-4_07-12-07
5 – Expanded WTP Vitrification with Supplemental Technologies, Landfill Closure	SAIC_Alternative_TC-5_07-12-07
6A – All Vitrification / No Separations, Clean Closure	SAIC_Alternative_TC-6ABase_07-12-07; SAIC_Alternative_TC-6AOption_07-12-07
6B – All Vitrification with Separations, Clean Closure	SAIC_Alternative_TC-6BBase_07-12-07; SAIC_Alternative_TC-6BOption_07-12-07
6C – All Vitrification with Separations, Landfill Closure	SAIC_Alternative_TC-6C_07-12-07
Waste Management	
1 – No Action	SAIC_Alternative_WM-1_07-12-07
2 – Disposal in IDF 200-East Only	SAIC_Alternative_WM-2_07-12-07
3 – Disposal in IDF 200-East & 200-West Areas	SAIC_Alternative_WM-3_07-12-07
Fast Flux Test Facility	
1 – No Action	SAIC_Alternative_FFTF-1_07-12-07
2 – Entombment	SAIC_Alternative_FFTF-2_07-12-07
3 – Removal	SAIC_Alternative_FFTF-3_07-12-07

EIS = Environmental Impact Statement.
IDF = Integrated Disposal Facility.
SAIC = Science Applications International Corporation.
WTP = Waste Treatment Plant.

* Information obtained from individual cost sheets in Volume 2. Complete reference citations can be found in Appendix Z of Volume 2 and are not included in Section 6.0 of Volume 1.

Figure 3–1. Example of Environmental Impact Statement Alternative Cost Estimating Approach for Tank Closure.



Note: This figure includes alternative work elements used by the environmental impact statement contractor to scale data from the Data Packages (DOE/ORP-2003-02 to 2003-09)* to the alternatives (e.g., CON_CSB, among others).

TFC = Tank Farm Contractor.
RPP = River Protection Project.
WTP = Waste Treatment Plant.
HLW = high-level waste.
LAW = low-activity waste.
EIS = Environmental Impact Statement.

*DOE/ORP-2003-02, 2003, *Inventory and Source Term Data Package*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

DOE/ORP-2003-03, 2003, *Worker and Public Safety Data Package*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

DOE/ORP-2003-04, 2003, *Waste Disposal Data Package*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

DOE/ORP-2003-05, 2003, *Tank System Closure and Facility Decontamination and Decommissioning Data Package*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

DOE/ORP-2003-06, 2003, *Waste Retrieval and Storage Data Package*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

DOE/ORP-2003-07, 2003, *Waste Treatment and Supplemental Technology*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

DOE/ORP-2003-08, 2003, *No Action Baseline Tank Farm Operations*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

DOE/ORP-2003-09, 2003, *Inventory and Assessment Guidance Data Package*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

- **Summarize Alternative Costs** – The scaled cost estimates by TC&WM EIS alternative work element were summarized by alternative and are presented in Section 4.0 of this report. Cost estimates were provided for the alternatives as defined in the scaled data sets and separately for disposal of the treated waste forms (i.e., ILAW, TRU waste).
- **Review of Cost Estimates** – Cost estimates for each alternative were reviewed by the data providers to ensure data was properly used in the development of the cost estimates. Specifically, data providers were asked to focus on addressing the following issues:
  - Consistency of the scope of the estimation to the work scope element described in the relevant alternative.
  - Consistency and appropriateness of methodology and assumptions used to develop the estimate.
  - Traceability of assumptions and/or input data to documented and appropriate references.
  - Accuracy of application of scaling and escalation factors and math used to generate the estimate.
  - Comments from the data provider's review will be incorporated into the final EIS cost report.

The summarized costs in this report are presented as the total summed cost of the TC&WM EIS work elements in calendar year 2008 dollars. The alternative total costs presented in this report are not manipulated for the purpose of economic comparison of the alternative costs using methods such as present worth analysis. Also, the total costs presented here should not be considered life cycle costs, nor should they be used for budgetary or appropriations purposes.

The cost estimating approach is discussed in additional detail in Section 3.1.

3.1 COST ESTIMATING APPROACH

The first step in assembling the cost estimates for the alternatives was creating a crosswalk as presented in Tables 3–2, 3–3, and 3–4. Without a crosswalk, cost data cannot be traced directly to the TC&WM EIS alternative work elements. After creating the crosswalk and mapping the scope and costs, the data were evaluated for completeness and consistency. The evaluation included identifying and documenting gaps in the data for each alternative. The cost estimate data sheets in the appendices document the source data to maintain traceability back to the data sources.

Table 3–2. Cost Estimate Crosswalk for Tank Closure – All Alternatives. (11 Sheets)

Work Element	Element Designator	Alt 1	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 3C	Alt 4	Alt 5	Alt 6A-B	Alt 6A-O	Alt 6B-B	Alt 6B-O	Alt 6C	Primary Source of Cost Data*
Storage															
DST Replacement	CON_DST		X						X	X	X				DOE/ORP-2003-06 (2003)
Other Infrastructure Upgrades	CON_OIU	X	X	X	X	X	X	X	X	X	X	X	X	X	CEES (2007)
Tank Upgrades	CON_TU	X	X	X	X	X	X	X	X	X	X	X	X	X	CEES (2007)
Waste Receiver Facilities	CON_WRF			X	X	X	X	X	X			X	X	X	CEES (2007)
Admin Controls	DEA_ADM	X	X												DOE/ORP-2003-05 (2003)
Operations Replacement DSTs	OPS_DST								X						COSTEST-001 (2007)
Other Infrastructure Upgrades	OPS_OIU		X	X	X	X	X	X	X	X	X	X	X	X	N/A
Routine Operations	OPS_ROUT	X	X	X	X	X	X	X	X	X	X	X	X	X	COSTEST-001 (2007)
Retrieval															
Chemical Wash System	CON_CHW							X		X	X	X	X		DOE/ORP-2003-06 (2003)
Mobile Retrieval System	CON_MRS		X	X	X	X	X	X	X	X	X	X	X	X	COSTEST-001 (2007)
Modified Sluicing	CON_MS		X	X	X	X	X		X					X	COSTEST-001 (2007)
Risers	CON_RIS		X	X	X	X	X	X	X	X	X	X	X	X	DOE/ORP-2003-06 (2003)
Underground Transfer Line Replacement	CON_UTLU		X							X	X				DOE/ORP-2003-06 (2003)
Vacuum-Based Retrieval	CON_VBR		X	X	X	X	X	X	X	X	X	X	X	X	COSTEST-001 (2007)
Chemical Wash Deactivation	DEA_CHW							X		X	X	X	X		DOE/ORP-2003-06 (2003)
Mobile Retrieval System Deactivation	DEA_MRS		X	X	X	X	X	X	X	X	X	X	X	X	DOE/ORP-2003-06 (2003)

Table 3–2. Cost Estimate Crosswalk for Tank Closure – All Alternatives. (11 Sheets)

Work Element	Element Designator	Alt 1	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 3C	Alt 4	Alt 5	Alt 6A-B	Alt 6A-O	Alt 6B-B	Alt 6B-O	Alt 6C	Primary Source of Cost Data*
Modified Sluicing Deactivation	DEA_MS		X	X	X	X	X		X					X	DOE/ORP-2003-06 (2003)
Vacuum-Based Retrieval Deactivation	DEA_VBR		X	X	X	X	X	X	X	X	X	X	X	X	DOE/ORP-2003-06 (2003)
Chemical Wash Operations	OPS_CHW							X		X	X	X	X		DOE/ORP-2003-06 (2003)
Interim Stabilization / DST Ops	OPS_IST		X	X	X	X	X	X	X	X	X	X	X	X	N/A
Mobile Retrieval System Operations	OPS_MRS		X	X	X	X	X	X	X	X	X	X	X	X	COSTEST-001 (2007)
Modified Sluicing Operations	OPS_MS		X	X	X	X	X		X					X	COSTEST-001 (2007)
Retrieval Operations	OPS_RET		X	X	X	X	X	X	X	X	X	X	X	X	COSTEST-001 (2007)
Vacuum-Based Retrieval Operations	OPS_VBR		X	X	X	X	X	X	X	X	X	X	X	X	COSTEST-001 (2007)
Treatment															
Construction Bulk Vitrification in 200 West	CON_BV							X	X						CEES (2007)
Bulk Vitrification East Construction	CON_BVE				X										CEES (2007)
Bulk Vitrification West Construction	CON_BVW				X										CEES (2007)
Containerized Grout Cast Stone in 200 East	CON_CG							X	X						RPP-03-004 (2003)
Containerized Grout East Facility	CON_CGE					X									RPP-03-004 (2003)
Containerized Grout West Facility	CON_CGW					X									RPP-03-004 (2003)
Contact-handled Transuranic Facilities	CON_CH				X	X	X	X	X						CEES (2007)

Table 3–2. Cost Estimate Crosswalk for Tank Closure – All Alternatives. (11 Sheets)

Work Element	Element Designator	Alt 1	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 3C	Alt 4	Alt 5	Alt 6A-B	Alt 6A-O	Alt 6B-B	Alt 6B-O	Alt 6C	Primary Source of Cost Data*
Cesium/Strontium De-Encapsulation Facility	CON_CSC		X	X	X	X	X	X	X	X	X	X	X	X	Van Leuven (2002)
Effluent Treatment Facility Replacement	CON_ETF		X	X	X	X	X	X	X	X	X	X	X	X	WHC-SA-2235-FP
Effluent Treatment Facility U	CON_ETFU		X							X	X	X	X		WHC-SA-2235-FP
Evaporator Replacement	CON_EVA		X	X	X	X	X	X	X	X	X	X	X	X	Izatt (1990)
Evaporator U Replacement	CON_EVAU									X	X				Izatt (1990)
Additional LAW Melters	CON_LAW			X								X	X	X	CEES (2007)
Remote-Handled TRU Construction	CON_RH				X	X	X	X	X						CEES (2007)
200 West Separations	CON_SEPW				X	X	X	X	X						CEES (2007)
Steam Reforming East Facility	CON_SRE						X								• Garman (2006) • Kimmel (2007) • *Perry's Chemical Engineer's Handbook* (1984) • DOE/ORP-2003-07 (2003)
Steam Reforming West Facility	CON_SRW						X								• Garman (2006) • Kimmel (2007) • *Perry's Chemical Engineer's Handbook* (1984) • DOE/ORP-2003-07 (2003)
Sulfate Removal System	CON_SUL								X						N/A
WTP Construction	CON_WTP	X	X	X	X	X	X	X	X	X	X	X	X	X	• *Response to New or Changed Data Form 263* (2007) • WT-ST-033 (2007)
WTP Replacement	CON_WTPU		X							X	X				• *Response to New or Changed Data Form 263* (2007) • WT-ST-033 (2007)

Table 3–2. Cost Estimate Crosswalk for Tank Closure – All Alternatives. (11 Sheets)

Work Element	Element Designator	Alt 1	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 3C	Alt 4	Alt 5	Alt 6A-B	Alt 6A-O	Alt 6B-B	Alt 6B-O	Alt 6C	Primary Source of Cost Data*
Bulk Vitrification in 200 West	DEA_BV							X	X						CEES (2007)
Bulk Vitrification East Deactivation	DEA_BVE				X										CEES (2007)
Bulk Vitrification West Deactivation	DEA_BVW				X										CEES (2007)
Containerized Grout Cast Stone in 200 East	DEA_CG							X	X						RPP-03-004 (2003)
Containerized Grout East Deactivation	DEA_CGE					X									RPP-03-004 (2003)
Containerized Grout West Deactivation	DEA_CGW					X									CEES (2007)
Contact-Handled TRU Deactivation	DEA_CH				X	X	X	X	X						CEES (2007)
Cesium/Strontium De-Encapsulation Facility	DEA_CSC		X	X	X	X	X	X	X	X	X	X	X	X	WT-ST-053 (2006)
Effluent Treatment Facility Replacement	DEA_ETF		X	X	X	X	X	X	X	X	X	X	X	X	• Henderson (2007) • 6734-ETF-001 (2006)
Effluent Treatment Facility Original	DEA_ETFO		X	X	X	X	X	X	X					X	• Henderson (2007) • 6734-ETF-001 (2006)
Effluent Treatment Facility U	DEA_ETFU		X												• Henderson (2007) • 6734-ETF-001 (2006)
Evaporator Replacement	DEA_EVA		X	X	X	X	X	X	X	X	X	X	X	X	CEES (2007)
Evaporator Original	DEA_EVAO		X	X	X	X	X	X	X			X	X	X	CEES (2007)
Remote-Handled TRU Deactivation	DEA_RH				X	X	X	X	X						CEES (2007)

Table 3–2. Cost Estimate Crosswalk for Tank Closure – All Alternatives. (11 Sheets)

Work Element	Element Designator	Alt 1	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 3C	Alt 4	Alt 5	Alt 6A-B	Alt 6A-O	Alt 6B-B	Alt 6B-O	Alt 6C	Primary Source of Cost Data*
Separations West Deactivation	DEA_SEPW				X	X	X	X	X						CEES (2007)
Steam Reforming East Facility	DEA_SRE						X								CEES (2007)
Steam Reforming West Facility	DEA_SRW						X								CEES (2007)
Sulfate Removal Deactivation	DEA_SUL								X						CEES (2007)
WTP Deactivation	DEA_WTP		X	X	X	X	X	X	X	X	X	X	X	X	NOBTRO&WT001 (2003)
Waste Treatment Plant U	DEA_WTPU		X												N/A
Bulk Vitrification in 200 West	OPS_BV							X	X						CEES (2007)
Bulk Vitrification East Operations	OPS_BVE				X										CEES (2007)
Bulk Vitrification West Operations	OPS_BVW				X										CEES (2007)
Containerized Grout Cast Stone in 200 East	OPS_CG							X	X						RPP-03-004 (2003)
Containerized Grout East Ops	OPS_CGE					X									RPP-03-004 (2003)
Containerized Grout West Ops	OPS_CGW					X									RPP-03-004 (2003)
Contact-Handled TRU Operations	OPS_CH				X	X	X	X	X						CEES (2007)
Cesium/Strontium De-Encapsulation Facility	OPS_CSC		X	X	X	X	X	X	X	X	X	X	X	X	Van Leuven (2002)
Effluent Treatment Facility Replacement	OPS_ETF		X	X	X	X	X	X	X	X	X	X	X	X	• Henderson (2007) • 6734-ETF-001 (2006)
Evaporator Replacement	OPS_EVA		X	X	X	X	X	X	X	X	X	X	X	X	CEES (2007)

Table 3–2. Cost Estimate Crosswalk for Tank Closure – All Alternatives. (11 Sheets)

Work Element	Element Designator	Alt 1	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 3C	Alt 4	Alt 5	Alt 6A-B	Alt 6A-O	Alt 6B-B	Alt 6B-O	Alt 6C	Primary Source of Cost Data*
Remote-Handled TRU Operations	OPS_RH				X	X	X	X	X						CEES (2007)
Separations West Operations	OPS_SEPW				X	X	X	X	X						CEES (2007)
Steam Reforming East Facility	OPS_SRE						X								CEES (2007)
Steam Reforming West Facility	OPS_SRW						X								CEES (2007)
Sulfate Removal Operations	OPS_SUL								X						N/A
WTP Operations	OPS_WTP		X	X	X	X	X	X	X	X	X	X	X	X	• *Response to New or Changed Data Form 263* (2007) • WT-ST-033 (2007)
Waste Treatment Plant Cesium/ Strontium Capsules	OPS_WTPCSC		X	X	X	X	X	X	X	X	X	X	X	X	• *Response to New or Changed Data Form 263* (2007) • WT-ST-033 (2007)
Disposal															
Canister Storage Building	CON_CSB	X	X	X	X	X	X	X	X	X	X	X	X	X	• CEES (2007)
Removed Tank/Ancillaries HLW Storage	CON_HLWST									X	X	X	X		• WT-ST-038 (2006) • RSMeans (2005)
ILAW Interim Storage Space	CON_ILAWST											X	X	X	• Gannon (2003) • RSMeans (2005)
IHLW Interim Storage Modules	CON_ISM		X	X	X	X	X	X	X	X	X	X	X	X	• RPP-03-004 (2003) • CEES (2007)
IHLW Interim Storage Modules Replacement	CON_ISMU									X	X				• RPP-03-004 (2003)
Spent Melter Storage Pads	CON_PAD		X	X	X	X	X	X	X	X	X	X	X	X	• DOE/ORP-2003-04 (2003) • RSMeans (2005)

Table 3–2. Cost Estimate Crosswalk for Tank Closure – All Alternatives. (11 Sheets)

Work Element	Element Designator	Alt 1	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 3C	Alt 4	Alt 5	Alt 6A-B	Alt 6A-O	Alt 6B-B	Alt 6B-O	Alt 6C	Primary Source of Cost Data*
IHLW Shipping & Transfer Facility	CON_STF		X	X	X	X	X	X	X	X	X	X	X	X	• RPP-03-004 (2003) • CEES (2007)
IHLW Shipping & Transfer Facility Replacement	CON_STFU									X	X				• RPP-03-004 (2003) • CEES (2007)
TRU Interim Storage Facility	CON_TRU				X	X	X	X	X						• WT-ST-056 (2006) • *Response to New or Changed Data Form 259* (2006)
Storage Facility Deactivation	DEA_ISF		X	X	X	X	X	X	X	X	X	X	X	X	DOE/ORP-2003-04 (2003)
TRU Interim Storage Deactivation	DEA_TRU				X	X	X	X	X						DOE/ORP-2003-04 (2003)
ILAW Disposal	DISP_ILAW		X	X	X	X	X	X	X	X	X	X	X		*Response to New or Changed Data Form 260* [2006]
Melter Disposal	DISP_MEL		X	X	X	X	X	X	X	X	X	X	X		• *Response to New or Changed Data Form 260* (2006) • Owens (2003)
Secondary Waste Disposal	DISP_SEC_ WASTE		X	X	X	X	X	X	X	X	X	X	X	X	*Response to New or Changed Data Form 260* (2006)
Soils Disposal	DISP_SOIL			X	X	X	X	X		X	X	X	X	X	*Response to New or Changed Data Form 260* (2006)
TRU Disposal	DISP_TRU				X	X	X	X	X						• CEES-0207 (2005) • DOE/ORP-2003-07 (2003)
Removed Tank/Ancillaries HLW Storage	OPS_HLWST									X	X	X	X		N/A
ILAW Interim Storage Space	OPS_ILAWST											X	X	X	N/A
Interim Storage Facility	OPS_ISF		X	X	X	X	X	X	X	X	X	X	X	X	• CEES (2007) • DOE/EIS-0250 (2002)
Melter Storage Pad Operations	OPS_PAD		X	X	X	X	X	X	X	X	X	X	X	X	N/A

Table 3–2. Cost Estimate Crosswalk for Tank Closure – All Alternatives. (11 Sheets)

Work Element	Element Designator	Alt 1	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 3C	Alt 4	Alt 5	Alt 6A-B	Alt 6A-O	Alt 6B-B	Alt 6B-O	Alt 6C	Primary Source of Cost Data*
TRU Interim Storage Operations	OPS_TRU				X	X	X	X	X						N/A
Closure															
Ancillary Equipment Grouting	CLO_ANCFIL			X	X	X	X	X	X					X	N/A
Ancillary Equipment Removal	CLO_ANCREM			X	X	X	X							X	• HNF-3441 (1998) • Henderson (2007) • Nichols (2007) • WT-ST-029 (2006)
Containment Structure (Const)	CLO_CONCS			X	X	X	X	X		X		X		X	• HNF-3378 (1998) • *Perry's Chemical Engineer's Handbook* (1984)
Closure Containment Structure	CLO_CONCS1										X		X		• HNF-3378 (1998) • *Perry's Chemical Engineer's Handbook* (1984)
Closure Containment Structure	CLO_CONCS2										X		X		• HNF-3378 (1998) • *Perry's Chemical Engineer's Handbook* (1984)
Tank-Filling Grout Facility (Const)	CLO_CONGRO			X	X	X	X	X	X					X	N/A
Pre-Processing Facility Const	CLO_CONPPF							X		X	X	X	X		• HNF-4098 (1999) • WT-ST-044 (2007)
D&D of 10 Selected Facilities	CLO_D&DTEN		X	X	X	X	X	X	X	X	X	X	X	X	DOE/ORP-2003-05 (2003)
Containment Structure (Deact)	CLO_DEACS			X	X	X	X	X		X		X		X	N/A
Containment Structure	CLO_DEACS1										X		X		N/A
Containment Structure	CLO_DEACS2										X		X		N/A
Tank-Filling Grout Facility (Deact)	CLO_DEAGRO			X	X	X	X	X	X					X	N/A

Table 3–2. Cost Estimate Crosswalk for Tank Closure – All Alternatives. (11 Sheets)

Work Element	Element Designator	Alt 1	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 3C	Alt 4	Alt 5	Alt 6A-B	Alt 6A-O	Alt 6B-B	Alt 6B-O	Alt 6C	Primary Source of Cost Data*
Pre-Processing Facility Deact	CLO_DEAPPF							X		X	X	X	X		• HNF-4098 (1999) • WT-ST-044 (2007) • WT-ST-052 (2007)
Hanford Barrier Construction	CLO_HAN								X						• DOE/RL-93-33 (1996) • WT-ST-050 (2006)
Tank Farms Landfill	CLO_LANDFILL			X	X	X	X	X	X					X	COSTEST-001 (2007)
Tank-Filling Grout Facility (Ops)	CLO_OPSGRO			X	X	X	X	X	X					X	N/A
Pre-Processing Facility Ops	CLO_OPSPPF							X		X	X	X	X		HNF-4098 (1999)
Post Closure Monitoring	CLO_POST			X	X	X	X	X	X	X		X		X	• Crumpler (2003) • DOE/ORP-2003-05 (2003)
RCRA C Barrier Construction	CLO_RCRA			X	X	X	X	X		X		X		X	• DOE/RL-93-33 (1996) • WT-ST-050 (2006)
Removal of B Area Cribs and Trenches	CLO_REMBC&T										X		X		• HNF-4195 (1999) • WT-ST-052 (2007)
A Farm Deep Soil Removal	CLO_REMSA									X	X	X	X		• HNF-4195 (1999) • WT-ST-029 (2006)
AX Farm Deep Soil Removal	CLO_REMSAX									X	X	X	X		HNF-4195 (1999)
B Farm Deep Soil Removal	CLO_REMSB									X	X	X	X		• HNF-4195 (1999) • WT-ST-029 (2006)
BX Farm Deep Soil Removal	CLO_REMSBX							X		X	X	X	X		• HNF-4195 (1999) • WT-ST-029 (2006)
C Farm Deep Soil Removal	CLO_REMSC									X	X	X	X		• HNF-4195 (1999) • WT-ST-029 (2006)

Table 3–2. Cost Estimate Crosswalk for Tank Closure – All Alternatives. (11 Sheets)

Work Element	Element Designator	Alt 1	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 3C	Alt 4	Alt 5	Alt 6A-B	Alt 6A-O	Alt 6B-B	Alt 6B-O	Alt 6C	Primary Source of Cost Data*
SX Farm Deep Soil Removal	CLO_REMSSX							X		X	X	X	X		• HNF-4195 (1999) • WT-ST-029 (2006)
T Farm Deep Soil Removal	CLO_REMST									X	X	X	X		• HNF-4195 (1999) • WT-ST-029 (2006)
TX Farm Deep Soil Removal	CLO_REMSTX									X	X	X	X		• HNF-4195 (1999) • WT-ST-029 (2006)
U Farm Deep Soil Removal	CLO_REMSU									X	X	X	X		• HNF-4195 (1999) • WT-ST-029 (2006)
Removal of A Tank Farm	CLO_REMTA									X	X	X	X		• HNF-3441 (1998) • HNF-3378 (1998)
Removal of AX Tank Farm	CLO_REMTAX									X	X	X	X		• HNF-3441 (1998) • HNF-3378 (1998)
Removal of B Tank Farm	CLO_REMTB									X	X	X	X		• HNF-3441 (1998) • HNF-3378 (1998)
Removal of BX Tank Farm	CLO_REMTBX							X		X	X	X	X		• HNF-3441 (1998) • HNF-3378 (1998)
Removal of BY Tank Farm	CLO_REMTBY									X	X	X	X		• HNF-3441 (1998) • HNF-3378 (1998)
Removal of C Tank Farm	CLO_REMTC									X	X	X	X		• HNF-3441 (1998) • HNF-3378 (1998)
Removal of T Area Cribs and Trenches	CLO_REMTC&T										X		X		• HNF-4195 (1999) • WT-ST-029 (2006) • WT-ST-052 (2007)

Table 3–2. Cost Estimate Crosswalk for Tank Closure – All Alternatives. (11 Sheets)

Work Element	Element Designator	Alt 1	Alt 2A	Alt 2B	Alt 3A	Alt 3B	Alt 3C	Alt 4	Alt 5	Alt 6A-B	Alt 6A-O	Alt 6B-B	Alt 6B-O	Alt 6C	Primary Source of Cost Data*
Removal of S Tank Farm	CLO_REMTS									X	X	X	X		• HNF-3441 (1998) • HNF-3378 (1998)
Removal of SX Tank Farm	CLO_REMTSX							X		X	X	X	X		• HNF-3441 (1998) • HNF-3378 (1998)
Removal of T Tank Farm	CLO_REMTT									X	X	X	X		• HNF-3441 (1998) • HNF-3378 (1998)
Removal of TX Tank Farm	CLO_REMTTX									X	X	X	X		• HNF-3441 (1998) • HNF-3378 (1998)
Removal of TY Tank Farm	CLO_REMTTY									X	X	X	X		• HNF-3441 (1998) • HNF-3378 (1998)
Removal of U Tank Farm	CLO_REMTU									X	X	X	X		• HNF-3441 (1998) • HNF-3378 (1998)
B & T Farm Soil Removal	CLO_SOIL			X	X	X	X							X	• HNF-4195 (1999) • WST-ST-029 (2006)
Operations Area C	OPS_CAREA		X	X	X	X	X	X	X	X	X	X	X	X	• U. S. Energy Information Association (2007) • PNNL-6415 (2005)

DST = double-shell tank.
Ops = operations.
LAW = low-activity waste.
TRU = transuranic (waste).
WTP = Waste Treatment Plant.
ILAW = immobilized low-activity waste.
IHLW = immobilized high-level waste.
N/A = not applicable.
D&D = deactivation and decontamination.
RCRA = *Resource Conservation and Recovery Act of 1976*, 42 USC 6901 et seq.

*Information obtained from individual cost sheets in Volume 2. Complete reference citations can be found in Appendix Z of Volume 2 and are not included in Section 6.0 of Volume 1.

Table 3–3. Cost Estimate Crosswalk for Waste Management – All Alternatives. (2 Sheets)

Work Element	Element Designator	Alt. 1	Alt. 2			Alt. 3			Primary Source of Cost Data*
			Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	
Integrated Disposal Facility	CLO_IDF		X	X	X				• *Response to New or Changed Data Form 260* (2006) • COSTEST-001 (2007) • CEES (2007)
Integrated Disposal Facility – East	CLO_IDFE					X	X	X	• CEES (2007)
Integrated Disposal Facility – West	CLO_IDFW					X	X	X	• CEES (2007)
Integrated Disposal Facility	CLO_ POSTIDF		X	X	X				• DOE/ORP-2003-05 (2003) • DOE/RL-98-72 (1999) • Crumpler (2003) • PNNL-15670 (2006)
Integrated Disposal Facility – East	CLO_ POSTIDFE					X	X	X	• DOE/ORP-2003-05 (2003) • DOE/RL-98-72 (1999) • Crumpler (2003) • PNNL-15670 (2006)
Integrated Disposal Facility – West	CLO_ POSTIDFW					X	X	X	• DOE/ORP-2003-05 (2003) • DOE/RL-98-72 (1999) • Crumpler (2003) • PNNL-15670 (2006)
River Protection Project Disposal Facility	CLO_ POSTRPPDF		X	X	X	X	X	X	• DOE/ORP-2003-05 (2003) • DOE/RL-98-72 (1999) • Crumpler (2003) • PNNL-15670 (2006)
River Protection Project Disposal Facility	CLO_RPPDF		X	X	X	X	X	X	• CEES (2007)
Central Waste Complex – East	CON_CWCE		X	X	X	X	X	X	• 6734-CWC-001 (2006) • RSMeans (2005)
Integrated Disposal Facility	CON_IDF		X	X	X				• CEES (2007)
Integrated Disposal Facility – East	CON_IDFE					X	X	X	• CEES (2007)
Integrated Disposal Facility – West	CON_IDFW					X	X	X	• CEES (2007)
River Protection Project Disposal Facility	CON_RPPDF		X	X	X	X	X	X	• CEES (2007)
T Plant	CON_ TPLANT		X	X	X	X	X	X	• 6734-T-Plant-001 (2006) • *Response to New or Changed Data Form 263* (2007) • *Response to New or Changed Data Form 259* (2006)
Waste Receiving and Processing – Contact-Handled	CON_ WRAPCH		X	X	X	X	X	X	• 6734-WRAP-001 (2006) • Bernardi (1997)
Waste Receiving and Processing – Remote-Handled	CON_ WRAPRH		X	X	X	X	X	X	• 6734-WRAP-001 (2006) • PNNL-15779 (2006) • *Response to New or Changed Data Form 259* (2006)

Table 3–3. Cost Estimate Crosswalk for Waste Management – All Alternatives. (2 Sheets)

Work Element	Element Designator	Alt. 1	Alt. 2			Alt. 3			Primary Source of Cost Data*
			Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	
100 years of post closure of Trenches 31 and 34 in LLBG 218-W-5	DEA_ADM	X							• DOE/ORP-2003-05 (2003) • DOE/RL-98-72 (1999) • Crumpler (2003) • PNNL-15670 (2006)
Central Waste Complex – East	DEA_CWCE		X	X	X	X	X	X	6734-CWC-001 [2006]
	DEA_IDF	X							• PNNL-15237 • RS Means 2005 • City of Richland (2007)
T Plant	DEA_ TPLANT		X	X	X	X	X	X	• 6734-T-Plant-001 (2006) • *Response to New or Changed Data Form 260* (2006) • Henderson (2006)
Waste Receiving and Processing – Contact-Handled	DEA_ WRAPCH		X	X	X	X	X	X	• 6734-WRAP-001 (2006) • *Response to New or Changed Data Form 260* (2006)
Waste Receiving and Processing – Remote-Handled	DEA_ WRAPRH		X	X	X	X	X	X	6734-WRAP-001 (2006)
Integrated Disposal Facility	DISP_IDF		X	X	X				*Response to New or Changed Data Form 260* (2006)
Integrated Disposal Facility – West	DISP_IDFW					X	X	X	N/A
Central Waste Complex – East	OPS_CWCE		X	X	X	X	X	X	• *Response to New or Changed Data Form 260* (2006) • 6734-CWC-001 (2006)
Integrated Disposal Facility	OPS_IDF		X	X	X				CEES (2007)
Integrated Disposal Facility – East	OPS_IDFE					X	X	X	*Response to New or Changed Data Form 260* (2006)
Integrated Disposal Facility – West	OPS_IDFW					X	X	X	CEES (2007)
Low-Level Burial Grounds	OPS_LLBG	X	X	X	X	X	X	X	CEES (2007)
River Protection Project Disposal Facility	OPS_RPPDF		X	X	X	X	X	X	CEES (2007)
T Plant	OPS_TPLANT		X	X	X	X	X	X	• *Response to New or Changed Data Form 260* (2006) • Henderson (2006)
Waste Receiving and Processing – Contact-Handled	OPS_ WRAPCH		X	X	X	X	X	X	• *Response to New or Changed Data Form 260* (2006) • 6734-WRAP-001 (2006)
Waste Receiving and Processing – Remote-Handled	OPS_ WRAPRH		X	X	X	X	X	X	• *Response to New or Changed Data Form 260* (2006) • 6734-WRAP-001 (2006)
Transportation Costs for Off-Site Waste Shipments to Hanford	TRANS_ PORT		X	X	X	X	X	X	• Karimi 2007a • Karimi 2007b • F0000-0079-ES-00 (2002)

*Information obtained from individual cost sheets in Volume 2. Complete reference citations can be found in Appendix Z of Volume 2 and are not included in Section 7.0 of Volume 1.

Table 3–4. Cost Estimate Crosswalk for FFTF – All Alternatives. (2 Sheets)

Work Element	Element Designator	Alt. 1	Alt. 2		Alt. 3		Primary Source of Cost Data*
			Hanford	Idaho	Hanford	Idaho	
Provides 100 years of post closure monitoring	CLO_POST		X	X	X	X	• DOE/RL-98-72 (1999) • RL-14708-LEU-001 (2006)
Constructs a Modified RCRA Subtitle C Barrier	CLO_RCRA		X	X			DOE/RL-93-33 (1996)
Re-vegetates the FFTF site	CLO_REV		X	X	X	X	• Walker (2007) • RL14708-BAW-002 (2006)
Provides re-grading of the FFTF site for the Entombment Alternative	CLO_SRG		X	X	X	X	RL14708-BAW-005
Constructs facility at Hanford's T-Plant for the treatment of the RH-SC	CON_HRTP		X		X		W7000-0134-ES (2004)
Constructs a SRF in the 400 Area of Hanford	CON_HSRF		X		X		F0000-0079-ES-00 (2002)
Constructs a Remote Treatment process facility at INL	CON_IRTP			X		X	W7000-0134-ES (2004).
Modifies the existing SPF at ANL-W	CON_ISPF			X		X	F0000-079-ES-00 (2002).
100-year Administrative Control for FFTF complex	DEA_ADM	X					• *Response to New or Changed Data Form 261* (2006) • DOE/EA-1547F (2006)
Deactivates the Hanford RTP at T Plant	DEA_HRTP		X		X		W7000-0134-ES (2004)
Deactivated the Hanford SRF in the 400 Area	DEA_HSRF		X		X		F0000-0079-ES-00 (2002)
Deactivates the INLRTP	DEA_IRTP			X		X	W7000-0134-ES (2004)
Deactivation of the ANL-W SPF	DEA_ISPF			X		X	F0000-0079-ES-00 (2002)
Complete removal of above grade structures and 3 feet below grade	DEC_AGSR		X	X	X	X	*Response to New or Changed Data Form 261* (2006)
Grout backfilling of the Reactor Containment Building (405)	DEC_GB1		X	X			• *Response to New or Changed Data Form 261* (2006) • RL14708-KAP-004 (2006)
Grout backfilling of the 491 East and West below grade areas	DEC_GB2		X	X			• RL 14708-SDW-001 (2006) • *Response to New or Changed Data Form 261* (2006).
Construction of an onsite grout facility	DEC_OGFC		X	X	X	X	• WHC-SD-WM-ES-399(1996) • RL14708-SDW-001 (2006)
Deactivation of onsite grout facility	DEC_OGFD		X	X	X	X	See DEC_OGFO
Onsite grout facility operations	DEC_OGFO		X	X	X	X	• WHC-SD-WM-ES-399 (1996) • RL-14708-SDW-001 (2006)
Reactor vessel and irradiated internals grouted and removed for disposal in IDF	DEC_RVRG				X	X	• RL14708-KAP-005 (2006) • *Response to New or Changed Data Form 261* (2006)
Non-hazardous waste transportation resources	DEC_WTR		X	X	X	X	• RL14708-BAW-005 (2006) • U.S. Energy Information Association (2007)

Table 3–4. Cost Estimate Crosswalk for FFTF – All Alternatives. (2 Sheets)

Work Element	Element Designator	Alt. 1	Alt. 2		Alt. 3		Primary Source of Cost Data*
			Hanford	Idaho	Hanford	Idaho	
Disposal of FFTF wastes	DISP_FFTF	X	X	X	X	X	• *Response to New or Changed Data Form 260* (2006) • City of Richland (2007)
Transports and operates the Hanford RTP facility	OPS_HRTP		X		X		W7000-0134-ES (2004)
Provides transportation for materials stored in CWC to the 400 Area	OPS_HSP		X		X		• RL14708-JWB-004 (2006) • U.S. Energy Information Association (2007) • PNNL-6415 (2005) • F0000-0079-ES-00 (2002)
Operates the Hanford SRF in the 400 Area	OPS_HSRF		X		X		F0000-0079-ES-00 (2002)
Transports and operates the INL-MFC RTP	OPS_IRTP			X		X	• W7000-0134-ES (2004) • RL14708-RDW-004 (2006) • U.S. Energy Information Association (2007) • Karimi 2007a • Karimi 2007b • F0000-0079-ES-00 (2002)
Provides for preparation of shipment to INL	OPS_ISP			X		X	• RL14708-JWB-003 (2006) • U.S. Energy Information Association (2007) • PNNL-6415 (2005) • F0000-0079-ES-00 (2002)
Operates the modified ANL-W SPF	OPS_ISPF			X		X	F0000-0079-ES-00 (2002)

ANL-W = Argonne National Laboratories West
CWC = Central Waste Complex.
FFTF = Fast Flux Test Facility.
INL = Idaho National Laboratory.
MFC = Material Fuels Complex.
RCRA = *Resource Conservation and Recovery Act of 1976*, 42 USC 6901 et seq.
RH-SC = remote handled special components.
RTP = remote treatment project.
SPF = Sodium Processing Facility.
SRF = Sodium Reaction Facility.

*Information obtained from individual cost sheets in Volume 2. Complete reference citations can be found in Appendix Z of Volume 2 and are not included in Section 6.0 of Volume 1.

After identifying and filling the data gaps, the cost data were assembled as construction, operations, deactivation, and closure cost estimates for each scope element of each alternative. The application process used consistent scaling factors provided to CH2M HILL by SAIC. For example, if two different alternatives require performing the same or a similar activity, but one alternative requires performing the activity for twice as long as the other, then the cost for the activity should be twice as high. Scaling factors were evaluated and applied as appropriate. Where deviations were implemented from the SAIC-provided scaling factors, the basis for the deviation was documented in the worksheets provided for each work element.

Each alternative work element (e.g., CON_CSB) has an associated worksheet wherein costs are estimated for the associated alternative scope. The appendices to this report contain all of the worksheets as defined by the alternative scaled data sets. In several instances, it was not possible to segregate the costs from the source data to align with the alternative work element. For example, operations costs for tank farm infrastructure upgrades (OPS_OIU) cannot be

segregated from routine tank farm operations (OPS_ROUT) from the TFC baseline cost data. For these occurrences, the worksheets identify the location of the costs for these work elements.

The final cost estimates consisting of construction, operations, deactivation, and closure costs were rolled up into work elements defined by SAIC for each alternative (i.e., waste storage, waste retrieval, waste treatment, and disposal and closure costs) to give a total cost for each alternative.

The approach used to assemble the cost estimates for this report has the following advantages.

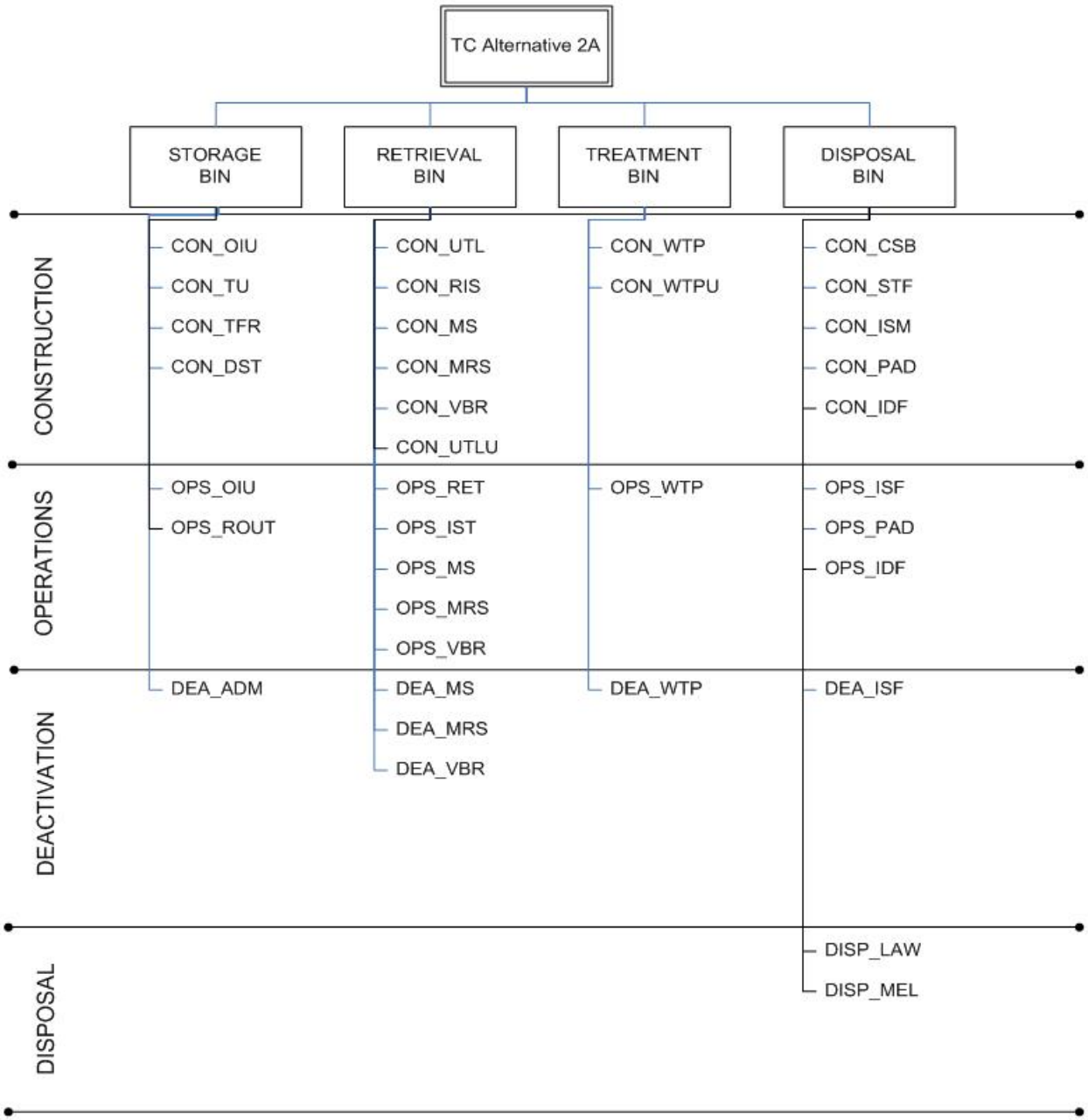
- The cost data for each element of each alternative are traceable to the source of the estimate.
- Whenever possible, the cost estimates use existing data already reviewed and approved by the DOE.
- Cost data sources and scaling of the data are explicitly identified and documented to maintain traceability.
- The cost data for each element was reviewed by the data provider to ensure that their data was appropriately applied.
- The cost estimates are consistent with alternative scopes and scaling used to evaluate environmental impacts.
- Deviations from the SAIC scaled data sets are documented and the rationale for any deviations is documented.

3.1.1 Cost Estimate Structure

For each alternative, a cost estimate data sheet was prepared for each work element (e.g., CON_OIU) based on a standard cost estimate worksheet template. The individual cost estimate data sheets were collected into a single Excel workbook according to cost bin (storage, retrieval, treatment, disposal, and closure). A cost bin lead was assigned to each of the cost bin categories and was responsible for ensuring that common assumptions, cost estimating methodologies, and source data were applied consistently across alternatives. Figure 3–2 presents an example of a cost binning tree for Tank Closure Alternative 2A. This approach helps to ensure consistency across multiple alternatives.

Costs by component (i.e., construction, operations, deactivation, and disposal) were summarized on a single worksheet within each workbook. This simplified overall cost reporting into work activity phases and allowed a relative cost comparison across alternatives.

Figure 3–2. Cost Binning Example (Tank Closure Alternative 2A).



3.1.2 Cost Gaps

Due to the nature of the EIS process, scope elements exist within alternatives that do not have a corresponding activity under current Hanford Site planning. Consequently, cost estimate data for these scope elements were not available and were generated. In these cases, proportional and parametric estimation methodologies were employed. When possible, proportional or parametric estimation utilized published costs from similar activities or facilities on the Hanford Site. When Hanford-specific surrogates were not available, preference was given to similar activities or facilities within the DOE complex. If surrogates were not available within the DOE complex, commercial activities were used.

3.1.3 Escalation

As directed by the DOE-ORP, costs are presented in calendar year 2008 dollars ("Year of Dollars for DOE/ORP-2003-14, Rev. 2" [Nichols 2006]). Escalation was applied to source data when provided in non-2008 dollars. When the rate of escalation for the non-2008 dollars was known, the data were adjusted using the known escalation rate. When the rate was unknown, the data were adjusted at an annual escalation rate of 2.1 percent in accordance with the DOE's Office of Engineering and Construction Management guidelines for 2003. An average escalation rate, determined by the data provider, was applied for source data with complex escalation methodologies, as appropriate.

3.2 PRIMARY SOURCES OF COST DATA

This cost report uses existing cost information where applicable and as a result the alternative costs are based on a range of estimate types. Where available the order of preference for cost data is actual historical data, construction estimates, Title II or definitive design estimates, preliminary design estimates, budget/conceptual design, and planning/feasibility estimates. Where cost information was available but not directly applicable, parametric estimates were developed by scaling. Where cost data were not available, a rough order of magnitude scoping-level cost estimate was developed using analogous facilities and scaling to accommodate differences in facility footprint or capacity. Activities common between alternatives were estimated using consistent approaches, but the total estimated cost for each of the alternatives consists of cost elements with potentially different bases. Accordingly, the cost estimates are valid for the purpose of understanding the relative cost differences between alternatives but do not represent activity-based, bottom-up cost estimates. Cost estimates in this report should not be used for budgetary or appropriations purposes.

A brief discussion of the primary sources of cost data are discussed in the following sections.

3.2.1 Waste Treatment Plant

The DOE-ORP provided the major cost data for the WTP in the *Response to New or Changed Data Form 263* (Daniels 2007). The data included an estimate at completion for construction of the WTP as of May 31, 2006, and the DOE-ORP update to the basis of estimate for operations of the WTP. This cost data formed the basis for the construction and operations estimates associated with the WTP.

The WTP estimate at completion, as of May 31, 2006, projected a total project cost of approximately $12.263B. This value includes base costs, management reserve, contract contingency, fee, project contingency, other project costs and transition costs associated with the transfer from the privatization contract. For the purposes of the cost report, a consistent construction cost basis was established by summing the facility-specific base costs and project contingency only. For example, the WTP Pretreatment Facility base costs and project contingency comprise the construction cost basis for the WTP Pretreatment Facility. Non-facility-specific costs, such as management reserve, contract contingency, fee, other project costs, and transition costs, are omitted from the construction cost basis.

This approach provides a consistent facility-specific cost basis across Tank Closure Alternatives and aids in the relative comparison across alternatives with different WTP configurations (e.g., TC Alternative 2A versus TC Alternative 6A). However, it does not allow the re-creation of the total project cost value of $12.263B because of the omission of non-facility-specific costs.

Furthermore, DOE-ORP directed the cost report to disregard expended or sunk costs for long-term, on-going construction projects, such as the WTP ("Issues Associated with Preparation of DOE/ORP-2003-14, Rev. 2 (Resolution with DOE-ORP and SAIC)") (Nichols 2007). Consequently, construction costs for the WTP are captured from 2006 through construction completion. Costs expended prior to 2006 are not reflected in the cost estimates, primarily CON_WTP and dependent cost sheets, presented in the appendices.

3.2.2 Tank Farm Contractor Baseline

The Tank Farm Contractor, provided cost data extracted from the current Tank Farm Contractor Baseline ("Tank Closure and Waste Management EIS" [CEES 2007]) in unescalated 2006 dollars. The cost data were confined to the activities associated with the scope of the TC&WM EIS Alternatives and does not include activities within the Tank Farm Contractor Baseline that fall outside of the scope of the EIS. These cost data formed the basis for the construction, operations, and deactivation estimates associated with tank farm operations.

3.2.3 Waste Management Baseline

The Plateau Remediation Contractor provided cost data extracted from the current Waste Management Baseline in the *Response to New or Changed Data Form 259, Capital Costs/EIS RF1-2* (Higgins 2006a) and the *Response to New or Changed Data Form 260* (Higgins 2006b). The cost data were confined to the activities associated with the scope of the TC&WM EIS Alternatives and does not include activities within the Waste Management Baseline that fall outside of the scope of the EIS. This cost data formed the basis for the estimates associated with the Waste Management Alternatives.

3.2.4 Fast Flux Test Facility

The DOE-Richland Operations Office provided cost data associated with the FFTF in the *Response to New or Changed Data Form 261* (Chapin 2006). The primary source for FFTF cost data from Chapin (2006) was the *Final Report Independent Cost Estimate of the Fast Flux Test Facility (FFTF) Closure Project at Hanford, Richland, Washington* (Burns & Roe 2003). Burns

& Roe (2003) provided the cost basis for FFTF activities under the Entombment and Removal Alternatives. Chapin 2006 also provided additional references for activities outside the scope of Burns & Roe (2003) (e.g., conversion of FFTF bulk sodium to sodium hydroxide).

3.3 UNCERTAINTY AND CONTINGENCY

Cost estimates for all of the alternatives presented are affected by uncertainties that influence confidence in the cost values shown. Uncertainty in cost estimates represents a measure of the potential difference between the estimated cost and the actual cost if an alternative were implemented.

Each of the 17 alternatives considered in the TC&WM EIS represents a potential technical solution to a complex environmental problem. The alternatives are made up of a large number of work elements that are categorized into functional areas of store, retrieve, treat, dispose, and close. Collectively the work elements define the alternative scope and are used to develop and organize the cost data. The level of definition and available information for the work elements varies widely. Some of the work elements are currently ongoing activities or have been performed in the past while others are conceptual facilities that rely on new technologies. For example operating costs for the 242-A evaporator are based on actuals while the PPF concept for the Clean Closure Alternatives is based on a facility concept.

There is inherent difficulty in predicting costs for large, complex, remediation programs that extend decades into the future. The inability to accurately predict costs well into the future, complexity of the alternatives, and the potential for changing conditions introduce uncertainties into the cost estimates. To provide some perspective, the WTP, a facility that is currently under construction, has a contingency of approximately 19 percent to address the uncertainties that existed within the scope of the WTP project (Daniels 2007). Similarly, Daniels (2007) includes a technical and programmatic risk value of approximately 13 percent to address uncertainties that exist outside the scope of the WTP project.

The overall uncertainty in the estimated cost for any one of the alternatives is a function of the uncertainty of the individual work elements along with the influence of the work elements on each other. A quantitative assessment of the cost uncertainty is beyond the scope of this report. However, a qualitative discussion of the cost uncertainty is provided as appropriate.

The following are among the uncertainties common to all the alternatives:

- ***National Environmental Policy Act of 1969* (NEPA) analysis**. The NEPA analysis provides an understanding of potential environmental impacts associated with the proposed action and alternatives to the proposed action. Conservative estimates of labor and material requirements, technology performance, and other aspects of the alternatives are adopted. To the extent that conservatism is inherent in the components of the alternatives, the cost estimate for the alternatives will reflect costs that are higher than point estimates developed for allocation of budgets and other planning exercises.
- **Scope Definition**. The level of definition associated with the alternative and/or the specific work element contributes to the uncertainty. Estimates based on limited definition (planning level estimates or preconceptual data) have a higher degree of uncertainty than estimates based on detailed design information. Furthermore, estimates

for activities involving uncertain radiological and chemical inventories (e.g., soil remediation) may have wider uncertainty bands because of the unknown impact the actual inventory may have on remediation costs. Source term uncertainty is documented in DOE/ORP-2003-02.

- **Schedule and Duration of activities**. Each alternative, with the exception of the No Action Alternatives, includes durations for completing the waste storage, retrieval, treatment, and disposal components of the River Protection Project (RPP) mission, as well as the deactivation and closure components, which vary among the alternatives. Cost estimates based on projecting current costs into the future introduce a high degree of uncertainty. These uncertainties are driven by changes in economic condition and labor and material markets, changes in regulatory, technical and safety requirements, and technological advances. All of the alternatives also assume a 100-year period of administrative controls following the completion of decontamination and decommissioning and/or closure activities. Cost estimates for activities that extend into the next century are inherently uncertain and should only be interpreted as rough estimates used to understand the total cost of an alternative and the relative differences among alternatives.
- **Application of requirements**. Cost estimates are prepared based on an understanding of how current requirements will influence the scope, schedule, and cost of activities undertaken to conform with regulatory, technical, and safety requirements. In addition to the inherent uncertainty associated with assurance that current requirements have been accurately applied to a complex scope of activities, requirements change over time as political, scientific, and cultural conditions change.
- **Development and deployment of technologies**. Each alternative, with the exception of the No Action Alternatives, includes the application of technologies that have the following characteristics:

  – First-of-a-kind applications
  – Inherently complex
  – Conceptual or early in the design process.

  Because of these factors, assumptions regarding technology performance (e.g., facility throughputs, waste loading, separations efficiencies) have been made and incorporated into the scaled data sets provided to the Tank Farm Contractor by SAIC. Should key assumptions be found to be invalid, unquantifiable impacts to the alternative cost, schedule, and scope would occur. These impacts are likely to be both positive and negative because it is likely that under some circumstances, technology performance will exceed current expectations while under other circumstances performance will fall short of current projections.

  The Tank Farm Contractor baseline for SST waste retrieval serves as a good example of the evolution of technology performance to address technology uncertainty. In 2003, when the retrieval data package (DOE/ORP-2003-06) was developed it was assumed that a single technology deployment, modified sluicing, could achieve the 99 percent (by volume) retrieval goal for the non-leaking SSTs. The current Tank Farm Contractor

baseline has evolved to assume that 55 of the SSTs would require deployment of a second waste retrieval technology to achieve the 99 percent (by volume) waste retrieval goal.

- **Dependence upon external interfaces.** The activities addressed in the TC&WM EIS are not performed in a vacuum. Current activities are dependent upon interfacing services provided by other DOE field offices including the Richland Operations Office (e.g., site security; secondary waste treatment and disposal; and infrastructure such as water, electricity, and transportation). Many of the alternatives are dependent on the ability of an undetermined off-site facility to accept IHLW from the ORP, and on the ability of WIPP and other onsite disposal facilities to accept and dispose of waste forms other than IHLW (e.g., ILAW and contact-handled TRU mixed waste). Unquantifiable impacts to the alternative cost, schedule, and scope would occur if the adopted assumptions for each of the alternatives proved to be invalid.
- **Embedded costs.** Efforts were made to remove embedded escalation, management reserves, contingency, and fee (e.g., estimate-at-completion values for WTP) in source data when the contribution of these overall cost adders were clearly identified. However, the contribution of overall cost adders were typically not clearly identified within the source documents or could not be removed due to insufficient detail regarding the basis or calculation method.

3.4 VALIDATION OF COST ESTIMATING APPROACH AND PROCESSES

The following actions were taken during the production of this report to validate the estimates.

- **Perform peer review.** A peer review was conducted after completion of the revised cost estimates. The cost estimators performed a peer review of the cost estimates to validate the correctness of the source data, assumptions, calculations, and other information. The preparer, checker, and Project Manager signed the cost estimate data sheets once the review was completed and any errors, omissions, or issues requiring correction had been implemented to the satisfaction of the checker.
- **Perform data provider review.** A review by data providers was conducted to ensure the appropriateness of the application of provided data. Comments from the review were incorporated as appropriate.
- **Resolve comments developed during the external review of the draft cost report.** A draft cost report was provided to the Tank Farm Contractor, ORP, SAIC, RL, PRC, and others, as designated by ORP, for review. Comments on the draft cost report were evaluated, resolved, and incorporated into the final cost report. Each reviewer submitted comments on a Review Comment Record form, providing documentation of comments received. Each comment was dispositioned via the Review Comment Record to provide documentation of the proposed resolution and any changes to the draft cost report resulting from comments.

- **Perform technical editing.** Technical editors read the draft cost report and provided edits to ensure conformance with Hanford Site document conventions, to ensure consistency, and to enhance readability.

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4.0 COST ESTIMATE RESULTS

This section presents the cost estimates of the 17 TC&WM EIS alternatives, defines the major uncertainties associated with each of the alternatives, and describes the effect of those uncertainties on the costs of the alternatives. The factors applied to the estimates to establish a potential range of costs for each alternative based on those uncertainties are also described.

Cost estimates for all of the alternatives are presented in calendar year 2008 dollars rounded to the nearest $10,000. Escalation was not applied to the estimates except when required to ensure consistent use of 2008 dollars. Appendices A through Y provide the activity-specific cost estimates for each alternative, the documentation of the basis of the estimate, and the scaling factors applied to each activity based on alternative-specific parameters. Appendix Z includes a list of references contained in Appendices A through Y.

Table 4–1 presents the summary results for the 11 Tank Closure cost estimates developed in this report with the following exception. Table 4–1 presents disposal costs for constructing, operating and deactivating disposal facilities on the Hanford Site. It does not address costs for disposing of Final Waste Forms. Section 5.0 addresses these costs. Table 4–2 presents the summary results for the three Waste Management cost estimates and Table 4–3 presents the summary results for the three FFTF cost estimates. Costs are presented for the work elements of the alternatives (construction, operations, and deactivation), as well as the cost bins (retrieval, treatment, disposal, storage, and closure).

4.1 TANK CLOSURE ALTERNATIVE 1 – NO ACTION

The detailed cost estimate for Tank Closure Alternative 1 is provided in Appendix A. The estimate includes costs to operate and deactivate the tank farms through 2007 and associated facilities and the costs for WTP construction for a 3-year period, followed by a 100-year administrative control period that would extend from 2008 through 2107. The administrative control costs are based on the No Action alternative scope defined in the TC&WM EIS. As presented in Table 4–1, the total estimated cost of this alternative is approximately $3.0 billion.

The following assumptions substantively influenced the Tank Closure Alternative 1 cost estimate presented in this report:

- There would be no waste retrieval, treatment, or disposal.
- Construction of the WTP would cease at the end of 2008.
- The WTP site would be isolated pending some future use and the tank farms and associated facilities would be deactivated.
- Monitoring and surveillance would continue for tank farms and associated facilities for integrity and intrusion.
- Waste in SSTs, DSTs, and miscellaneous underground storage tanks would remain in the tank farms indefinitely.

Table 4–1.Summary Cost Estimates for the Eleven Tank Closure EIS Alternatives. [a][b] (3 Sheets)

Work Element	Storage ($K)[c]	Retrieval ($K)[c]	Treatment ($K)[c]	Disposal ($K)[c]	Closure ($K)[c]	Total ($K)[c]
Alternative 1 - No Action						
Construction	15,060	--	1,947,600	--	--	1,962,660
Operations	627,190	--	--	--	--	627,190
Deactivation	388,330	--	--	--	--	388,330
Total ($K)[c]	**1,030,580**	**--**	**1,947,600**	**--**	**--**	**2,978,180**
Alternative 2A - Existing WTP Vitrification, No Closure						
Construction	3,450,950	2,825,100	14,699,550	1,161,070	--	22,136,670
Operations	15,986,440	2,102,880	24,548,130	1,008,270	671,570	44,317,290
Deactivation	388,330	134,870	920,430	10	--	1,443,640
Total ($K)[c]	**19,825,720**	**5,062,850**	**40,168,110**	**2,169,350**	**671,570**	**67,897,600**
Alternative 2B - Expanded WTP Vitrification, Landfill Closure						
Construction	1,502,730	2,576,620	8,671,550	1,481,790	2,339,750	16,572,440
Operations	7,085,090	1,488,660	11,332,420	658,740	501,210	21,066,120
Deactivation	--	128,300	579,890	50	1,752,220	2,460,460
Total ($K)[c]	**8,587,820**	**4,193,580**	**20,583,860**	**2,140,580**	**4,593,180**	**40,099,020**
Alternative 3A - Existing WTP Vitrification with Bulk Vitrification, Landfill Closure						
Construction	1,502,730	2,576,620	8,143,400	1,594,780	2,339,750	16,157,280
Operations	6,358,450	1,448,250	10,967,340	658,740	501,210	19,933,990
Deactivation	--	128,300	501,220	60	1,752,220	2,381,800
Total ($K)[c]	**7,861,180**	**4,153,170**	**19,611,960**	**2,253,580**	**4,593,180**	**38,473,070**
Alternative 3B - Existing WTP Vitrification with Cast Stone, Landfill Closure						
Construction	1,502,730	2,576,620	7,880,490	1,594,780	2,339,750	15,894,370
Operations	6,358,450	1,448,250	11,164,050	658,740	501,210	20,130,700
Deactivation	--	128,300	522,420	60	1,752,220	2,403,000
Total ($K)[c]	**7,861,180**	**4,153,170**	**19,566,960**	**2,253,580**	**4,593,180**	**38,428,070**

Table 4–1.Summary Cost Estimates for the Eleven Tank Closure EIS Alternatives. [a][b] (3 Sheets)

Work Element	Storage ($K)[c]	Retrieval ($K)[c]	Treatment ($K)[c]	Disposal ($K)[c]	Closure ($K)[c]	Total ($K)[c]
Alternative 3C - Existing WTP Vitrification with Steam Reforming, Landfill Closure						
Construction	1,502,730	2,576,620	9,492,160	1,594,780	2,339,750	17,506,040
Operations	6,358,450	1,448,250	10,967,340	658,740	501,210	19,933,990
Deactivation	--	128,300	501,220	60	1,752,220	2,381,800
Total ($K)[c]	**7,861,180**	**4,153,170**	**20,960,720**	**2,253,580**	**4,593,180**	**39,821,830**
Alternative 4 – Existing WTP Vitrification with Supplemental Technologies, Selective Clean Closure, Landfill Closure						
Construction	1,502,730	3,624,320	8,006,500	1,594,780	3,023,420	17,751,750
Operations	6,903,430	1,762,310	11,905,070	658,740	2,468,950	23,698,500
Deactivation	--	211,590	511,820	60	1,400,270	2,123,740
Total ($K)[c]	**8,406,160**	**5,598,220**	**20,423,390**	**2,253,580**	**6,892,640**	**43,573,990**
Alternative 5 - Expanded WTP Vitrification with Supplemental Technologies, Landfill Closure						
Construction	1,835,580	2,135,300	8,402,470	1,273,730	2,246,590	15,893,670
Operations	5,443,920	1,149,940	8,721,460	658,740	340,510	16,314,570
Deactivation	--	117,740	582,430	50	799,400	1,499,620
Total ($K)[c]	**7,279,500**	**3,402,980**	**17,706,360**	**1,932,520**	**3,386,500**	**33,707,860**
Alternative 6A - All Vitrification / No Separations, Clean Closure Base Case						
Construction	8,110,860	5,073,680	21,809,900	69,886,290	2,577,440	107,458,170
Operations	28,702,650	3,424,900	48,587,990	36,230,510	10,875,690	127,821,740
Deactivation	--	298,000	1,387,430	870	3,178,520	4,864,820
Total ($K)[c]	**36,813,510**	**8,796,580**	**71,785,320**	**106,117,670**	**16,631,650**	**240,144,730**
Alternative 6A - All Vitrification / No Separations, Clean Closure Option Case						
Construction	8,110,860	5,073,680	21,809,900	69,886,290	3,814,160	108,694,890
Operations	28,702,650	3,424,900	48,587,990	36,230,510	21,013,570	137,959,620
Deactivation	--	298,000	1,387,430	870	3,579,400	5,265,700
Total ($K)[c]	**36,813,510**	**8,796,580**	**71,785,320**	**106,117,670**	**28,407,130**	**251,920,210**

Table 4–1. Summary Cost Estimates for the Eleven Tank Closure EIS Alternatives. [a][b] (3 Sheets)

Work Element	Storage ($K)[c]	Retrieval ($K)[c]	Treatment ($K)[c]	Disposal ($K)[c]	Closure ($K)[c]	Total ($K)[c]
Alternative 6B - All Vitrification with Separations, Clean Closure Base Case						
Construction	1,502,730	3,624,320	8,815,490	3,172,160	2,577,440	19,692,140
Operations	7,085,090	1,772,410	12,282,670	658,740	9,322,060	31,120,970
Deactivation	--	211,590	599,990	50	3,178,520	3,990,150
Total ($K)[c]	**8,587,820**	**5,608,320**	**21,698,150**	**3,830,950**	**15,078,020**	**54,803,260**
Alternative 6B - All Vitrification with Separations, Clean Closure Option Case						
Construction	1,502,730	3,624,320	8,815,490	3,172,160	3,814,160	20,928,860
Operations	7,085,090	1,772,410	12,282,670	658,740	19,459,940	41,258,850
Deactivation	--	211,590	599,990	50	3,579,400	4,391,030
Total ($K)[c]	**8,587,820**	**5,608,320**	**21,698,150**	**3,830,950**	**26,853,500**	**66,578,740**
Alternative 6C – All Vitrification with Separations, Landfill Closure						
Construction	1,502,730	2,576,620	8,671,550	2,255,800	2,339,750	17,346,450
Operations	7,085,090	1,488,660	11,150,920	658,740	501,210	20,884,620
Deactivation	--	128,300	579,890	50	1,752,220	2,460,460
Total ($K)[c]	**8,587,820**	**4,193,580**	**20,402,360**	**2,914,590**	**4,593,180**	**40,691,530**

EIS = Environmental Impact Statement.
LAW = low-activity waste.
TRU = transuranic (waste).
[a] Costs for the option cases of Alternatives 6A and 6B are presented separately for clarity
[b] Costs for disposal of the final waste forms (e.g.., LAW, and TRU waste) are presented separately in Table 5–1.
[c] All costs are in calendar year 2008 dollars.

Table 4–2. Summary Cost Estimates for the Three Waste Management Alternatives.[a]

Work Element	WM-1 No Action ($K)[b]	WM-2 Disposal in IDF 200-East Only ($K)[b]	WM-3 Disposal in IDF 200-East & 200-West Areas ($K)[b]
Construction	--	337,850	337,850
Operations	17,540	2,016,000	2,016,000
Deactivation	451,280	30,690	30,690
Total ($K)[b]	**468,820**	**2,384,540**	**2,384,540**

IDF = Integrated Disposal Facility.
WM = Waste Management.
[a] Values presented only reflect storage and treatment costs. Waste Management disposal group costs are presented separately in Tables 4–4 and 4–5.
[b] All costs are in calendar year 2008 dollars.

Table 4–3. Summary Cost Estimates for the Three FFTF Alternatives.

Work Element	FFTF-1 No Action ($K)[a]	FFTF-2 Entombment ($K)[a]		FFTF-3 Removal ($K)[a]	
Construction	--	3,920		2,510	
Operations	--	99,100		109,230	
Deactivation	492,530	670		320	
Sub-Total ($K)[a]	**492,530**	**103,690**		**112,060**	
Work Element	**FFTF-1 No Action ($K)[a]**	**Hanford Option**	**Idaho Option**	**Hanford Option**	**Idaho Option**
Bulk Sodium Disposition[b]	--	64,310	33,930	64,310	33,930
RH-SC Disposition[b]	--	121,060	121,210	121,060	121,210

FFTF = Fast Flux Test Facility.
RH-SC = Remote handled special components.
[a] All costs are in calendar year 2008 dollars. Disposal costs are presented in Table 5–5.
[b] Separate costs for construction, operations, and deactivation are available in Appendices V through Y.

The major uncertainties associated with Tank Closure Alternative 1 (in addition to those related to the uncertainties common to all of the alternatives discussed in Section 3.3), include the following:

- The alternative could not be implemented without substantial regulatory relief from applicable state and federal environmental protection regulations.
- Waste would remain in aging SSTs and other facilities that have already exceeded their design lives for an indefinite period of time, which poses an increasing, but unquantifiable risk of a release to the environment requiring corrective action.
- The specific actions required to deactivate tank farms with waste remaining in place for an indefinite period of storage have not been defined and the costs have not been estimated.

There would be no costs associated with disposal of final waste forms under this alternative.

4.2 COST FOR TANK CLOSURE ALTERNATIVE 2A – EXISTING WTP VITRIFICATION, NO CLOSURE

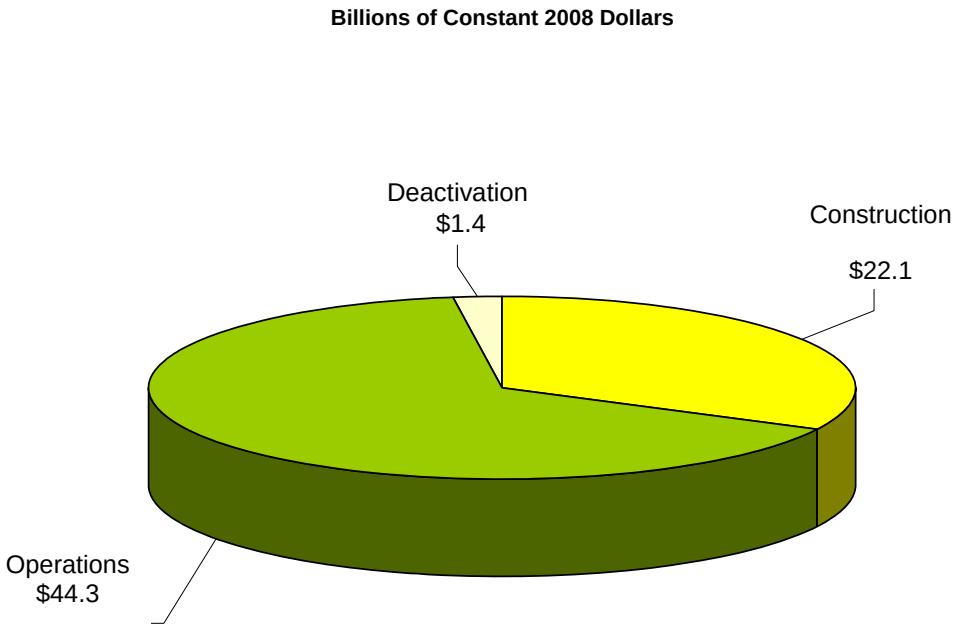
The detailed cost estimate for Tank Closure Alternative 2A is provided in Appendix B. The estimate includes costs to do the following:

- Operate and deactivate the tank farms and associated facilities through completion of waste retrieval
- Construct and operate the WTP through completion of waste treatment of approximately 99 percent of the waste volume
- Store IHLW onsite
- Dispose of ILAW onsite
- Retrieve, de-encapsulate and treat in the WTP the cesium and strontium capsules currently stored in the WESF.
- Deactivate waste treatment facilities and tank farms
- Maintain administrative control over a 100-year period that would extend from 2094 through 2193.

Because of the extended period of waste treatment, the estimate includes costs associated with replacement of DSTs, associated waste transfer systems, and the WTP and the cost of retrieving waste from aging DSTs for storage in replacement DSTs pending waste treatment.

As presented in Table 4–1, the estimated cost for Tank Closure Alternative 2A is approximately $67.9 billion (excluding disposal costs). Figure 4–1 graphically depicts the costs for Tank Closure Alternative 2A by the TC&WM EIS work scope elements (construction, operations, and deactivation). Costs for Tank Closure Alternative 2A by cost bin (storage, retrieval, treatment, disposal, closure) are graphically depicted in Figure 4–2.

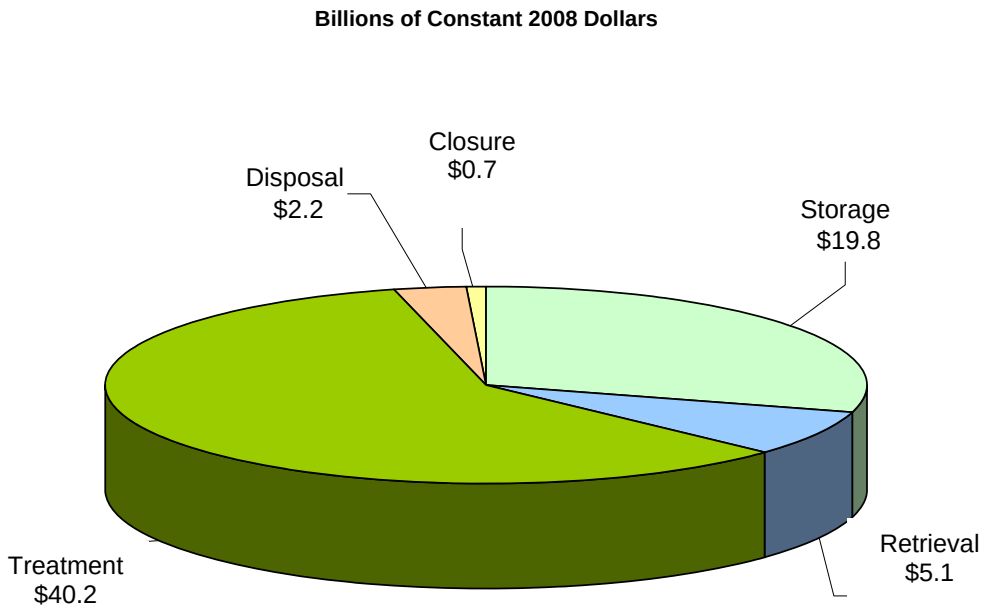
Figure 4–1. Tank Closure Alternative 2A Costs by TC&WM EIS Work Scope Elements.



Substantive assumptions that influenced the Tank Closure Alternative 2A cost estimate presented in this report include the following:

- Waste throughput and loading would result in completion of immobilization of all tank waste and cesium/strontium capsules in 2093.
- WTP facilities would be replaced at the end of their 60-year design life.
- All 28 DSTs and associated underground transfer lines would be replaced at the end of their design life.
- Waste would be retrieved to the *Hanford Federal Facility Agreement and Consent Order* goal, based on a single retrieval technology deployment.
- IHLW would be stored onsite.
- ILAW would be disposed in the 200 Areas consistent with the disposal configuration presented in the Waste Management Alternatives description.
- No SST farm or facility closure would occur.
- Administrative controls of the tank and waste treatment systems would be maintained for 100 years (until 2193).

Figure 4–2. Tank Closure Alternative 2A Costs by Cost Bin.



The major uncertainties associated with Tank Closure Alternative 2A (in addition to the common uncertainties discussed in Section 3.3) include the following:

- The alternative could not be implemented without substantial regulatory relief from applicable state and federal environmental protection regulations associated with closure of waste management units.
- This alternative will complete the RPP waste storage, retrieval, treatment and disposal mission by approximately 2093. Cost estimates for projecting current costs this far into the future introduces a higher degree of uncertainty than alternatives with shorter schedules.
- The alternative includes new replacement WTP, DSTs, and tank farm waste transfer systems because these systems will reach the end of their useful lives during the Tank Closure Alternative 2A implementation period. The costs estimated for replacement systems are based on systems that use current designs and construction methods. Future requirements and technologies associated with the design, construction, and operation of replacement WTP, DSTs, and waste transfer systems may change.
- The average age of an SST and the associated infrastructure would be approximately 80 years by the time it is retrieved. Likewise, the entire tank farm infrastructure would be aging. Additional unquantifiable costs could be incurred to complete corrective and/or emergency response actions to aging systems.
- Although the costs for waste retrieval systems have been adjusted to reflect the increased experience with retrieval construction and operations, the ability of the retrieval

technologies (i.e., modified sluicing system, mobile retrieval system, and vacuum-based retrieval system) to reach 99 percent waste retrieval (by volume) effectiveness has not been demonstrated across the range of tank conditions expected in the tank farms. The retrieval technologies are assumed to achieve 99 percent retrieval effectiveness. The technology and associated cost impacts in the event 99 percent retrieval effectiveness cannot be achieved are not included in this cost estimate.

- Annualized steady-state operations costs provided in Daniels (2007) were derived from WTP hot commissioning cost estimates provided in the WTP Project Forecast Document. The derivation of WTP operations cost from projected hot commissioning costs provides an early cost target useful for cost comparison as the project matures, but is not a definitive steady-state operations cost estimate. Operations cost projections will be refined as the project matures and are likely to vary from the early cost estimates presented in this report.
- Deactivation cost estimates for one-of-a-kind technologies or unique technology deployments in the early project stages (e.g., those currently under construction or evaluation to treat tank waste) are typically based on the estimated operations cost. This is true for the deactivation costs presented in this report and therefore have compounded uncertainty; the uncertainty associated with the estimated operations cost compounded by the assumption of operations costs as a surrogate for deactivation costs.
- Operating costs for the immobilized waste storage and disposal facilities were scaled from the corresponding cost data based on corresponding number of facilities or years of operation. Future efficiencies because of standardized designs, construction methods, or operating methods are not recognized in the estimates, nor are potential changes in facilities configurations.
- Cost for indefinite onsite storage or future shipping and disposal of IHLW are not included in the estimates.
- Failed HLW melters will be stored onsite and costs for disposal of HLW melters are not included in the cost estimates.

4.3 TANK CLOSURE ALTERNATIVE 2B – EXPANDED WTP VITRIFICATION, LANDFILL CLOSURE

The detailed cost estimate for Tank Closure Alternative 2B is provided in Appendix C. The cost estimate includes costs to do the following:

- Operate and deactivate the tank farms and associated facilities through completion of waste retrieval
- Construct and operate the WTP through completion of waste treatment of approximately 99 percent of the waste volume
- Store IHLW onsite
- Dispose of ILAW onsite

- Retrieve, de-encapsulate and treat in the WTP the cesium and strontium capsules currently stored in the WESF
- Deactivate waste treatment facilities and tank farms
- Perform landfill closure of SST farms (i.e., tanks, ancillary equipment, and soils)
- Maintain administrative control over a 100-year period that would begin in 2045.

The major differences between Alternatives 2A and 2B are treatment capacity and closure. Under Alternative 2B, the WTP LAW capacity would be increased from 30 MTG/day to 90 MTG/day with full WTP operations beginning in 2018. This change results in higher capital costs for the initial waste treatment facility but lower overall capital costs because the WTP and DSTs would not require replacement and lower overall operating costs resulting from the approximately 50-year-shorter duration of waste storage and treatment. Also, Alternative 2B includes landfill closure of all SST farms, unlike Alternative 2A which does not address any type of closure.

As presented in Table 4–1, the estimated cost for Alternative 2B is approximately $40 billion (excluding costs for disposal of waste forms). Figure 4–3 graphically depicts the costs for Alternative 2B by the TC&WM EIS work scope elements (construction, operations, deactivation). Costs for Alternative 2B by cost bin (storage, retrieval, treatment, disposal, closure) are graphically depicted in Figure 4–4.

Figure 4–3. Tank Closure Alternative 2B Costs by TC&WM EIS Work Scope Elements.

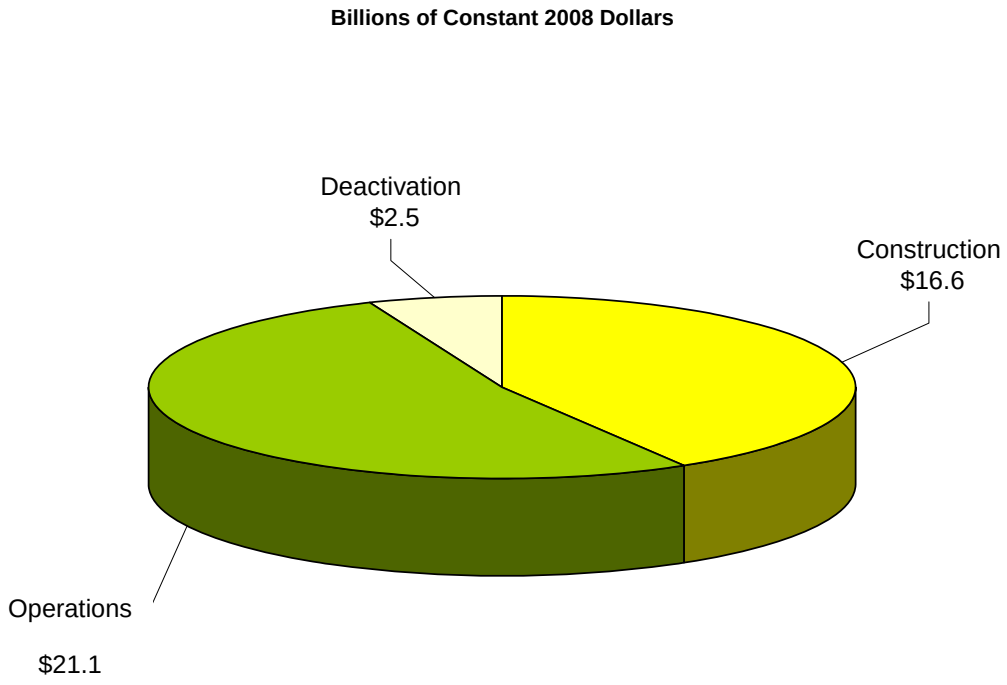
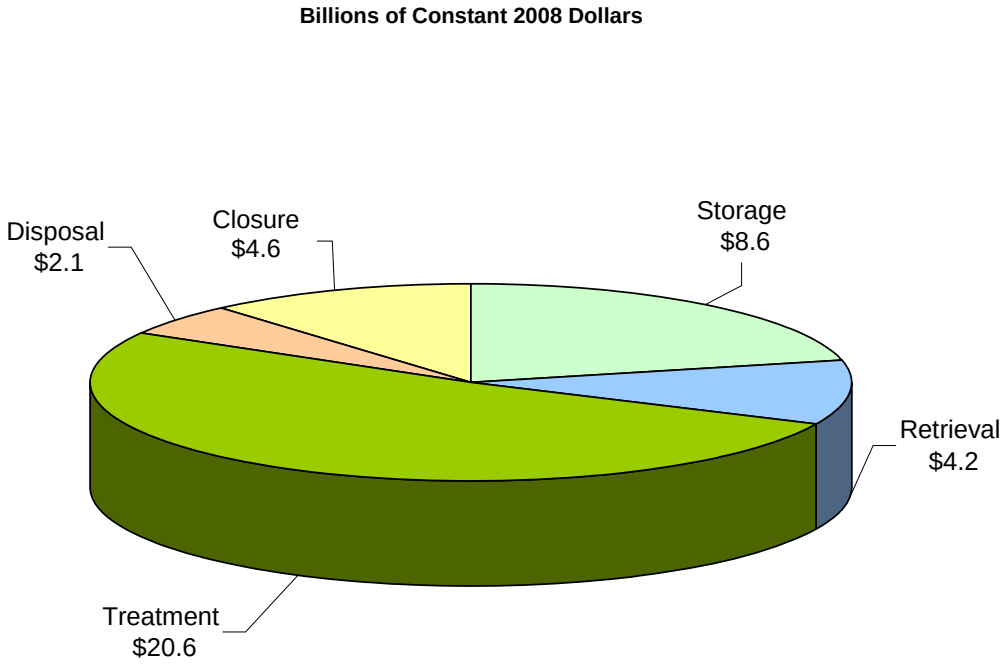


Figure 4–4. Tank Closure Alternative 2B Costs by Cost Bin.



Substantive assumptions that influenced the Alternative 2B cost estimate presented in this report include the following:

- 60 MTG/day LAW immobilization capacity would be added to the WTP, resulting in a cumulative vitrification capability of 6 MTG/day IHLW and 90 MTG/day ILAW.
- Expanded ILAW treatment capacity would result in the completion of waste immobilization activities in 2043.
- Based on the shorter operating period than Alternative 2A, there would be no need to replace the WTP, DSTs, or tank farm transfer lines.
- A technetium-99 separations process would be operated as part of the WTP pretreatment system resulting in the immobilization of technetium-99 as part of the IHLW.
- This alternative includes landfill closure of the twelve 200 East and 200 West Area SST farms following deactivation.
- Administrative controls of the tank and waste treatment systems would be maintained for 100 years (until 2144).
- Treatment facilities outside of the boundary of the closure cap would be deactivated pending future closure decisions.

The major uncertainties associated with Alternative 2B cost estimate include the following:

- This alternative will complete the RPP mission by approximately 2043. Cost estimates for projecting current costs this far into the future introduces a relatively lower degree of uncertainty than do options with longer execution schedules.
- The average age of an SST and the associated infrastructure would be approximately 65 years by the time it is retrieved. Likewise, the entire tank farm infrastructure would be aging. Additional unquantifiable costs could be incurred to complete corrective and/or emergency response actions to aging systems.
- The waste retrieval uncertainties for Alternative 2B are identical to those identified for Alternative 2A.
- Costs for waste receiver facilities (WRF) required to support SST retrievals are based on early engineering assessments, as designs of the WRFs are not complete. The WRF capacities, integration with the tank farm infrastructure, and schedule for completion may affect the costs of these facilities.
- Annualized steady-state operations costs for the WTP provided in Daniels (2007) were scaled to reflect the increased WTP capacity assumed by this alternative. As with Alternative 2A, this estimating method introduces compounded uncertainty to the preliminary operating costs developed in the Daniels (2007). Operations cost projections will be refined as the project matures and are likely to vary from the early cost estimates presented here.
- Designing, constructing, and operating a waste processing plant with a capacity as assumed by this alternative has never been accomplished, and would be much more complex than the WTP as currently envisioned. The affect on the costs is not quantifiable in the cost estimate provided by this report.
- The tank farm operating, retrieval, and waste storage requirements to support feed delivery to the WTP as the only recipient of retrieved waste is believed to be highly complicated given the waste retrieval and feed delivery schedule. The cost estimate has attempted to capture the costs associated with feed delivery based upon the activities envisioned for this alternative, but the efficacy of the cost estimate is highly uncertain given the complicated retrieval and feed delivery schedule.
- Deactivation cost estimates for one-of-a-kind technologies or unique technology deployments in the early project stages, such as those currently under construction or evaluation to treat tank waste, are typically based on the estimated operations cost. This is true for the deactivation costs presented here and therefore have compounded uncertainty: the uncertainty associated with the estimated operations cost compounded by the assumption of operations costs as a surrogate for deactivation costs.
- Operating costs for the immobilized waste storage and disposal facilities were scaled from the corresponding cost data based on corresponding number of facilities or years of operation. Future efficiencies because of standardized designs, construction methods, or operating methods are not recognized in the estimates, nor are potential changes in facilities configurations.

- Contaminated soil and equipment removal, packaging, treatment and disposal costs are based on early estimates that have not been validated through detailed engineering analysis, and would likely change.
- Failed HLW melters will be stored onsite and costs for disposal of the HLW melters are not included in the cost estimate.
- Landfill closure of underground tank farms containing waste residual similar to the Hanford tank farms has not been conducted. Estimated costs for landfill closure could vary significantly from the estimated costs.

4.4 TANK CLOSURE ALTERNATIVE 3A – EXISTING WTP VITRIFICATION WITH BULK VITRIFICATION, LANDFILL CLOSURE

The detailed cost estimate for Tank Closure Alternative 3A is provided in Appendix D. The cost estimate includes costs to do the following:

- Operate and deactivate the tank farms and associated facilities through completion of waste retrieval
- Construct and operate the WTP and supplemental treatment technologies (i.e., bulk vitrification for LAW and TRU packaging for contact-handled and remote-handled TRU waste) through completion of waste treatment of approximately 99 percent of the waste volume
- Store IHLW onsite
- Store packaged TRU waste onsite pending shipment and disposal offsite
- Dispose of ILAW onsite
- Retrieve, de-encapsulate and treat in the WTP the cesium and strontium capsules currently stored in the WESF.
- Deactivate waste treatment facilities
- Perform landfill closure of SST farms (i.e., tanks, ancillary equipment, and soils)
- Maintain administrative controls of the closed tank system for 100 years (until 2141).

The major differences between Alternative 3A and Alternatives 2A and 2B are that under Alternative 3A, the WTP LAW capacity would not be increased from the current facility configuration (similar to Alternative 2A); however, supplemental treatment technologies would be deployed resulting in completion of the waste retrieval and treatment mission in roughly the same timeframe as Alternative 2B. Alternative 3A would also result in the closure of the SST farms compared to the deactivation provided for under Alternative 2A.

As presented in Table 4–1, the estimated cost for Alternative 3A is approximately $38.5 billion (excluding disposal costs for waste forms). Figure 4–5 graphically depicts the costs for Alternative 3A by the TC&WM EIS work scope elements (construction, operations, deactivation). Costs for Alternative 3A by cost bin (storage, retrieval, treatment, disposal, closure) are graphically depicted in Figure 4–6.

Figure 4–5. Tank Closure Alternative 3A Costs by TC&WM EIS Work Scope Elements.

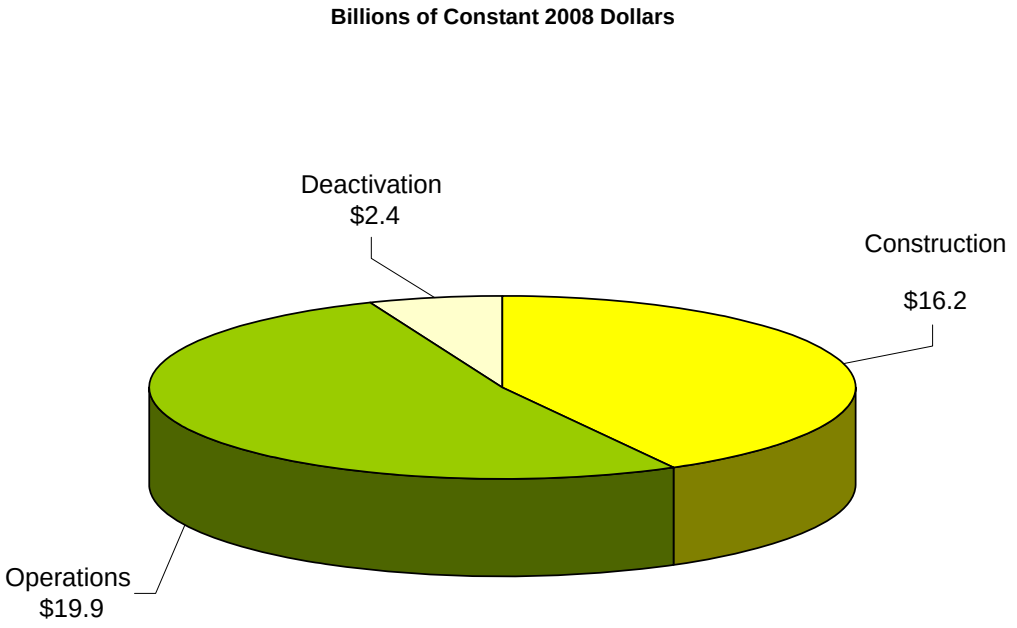
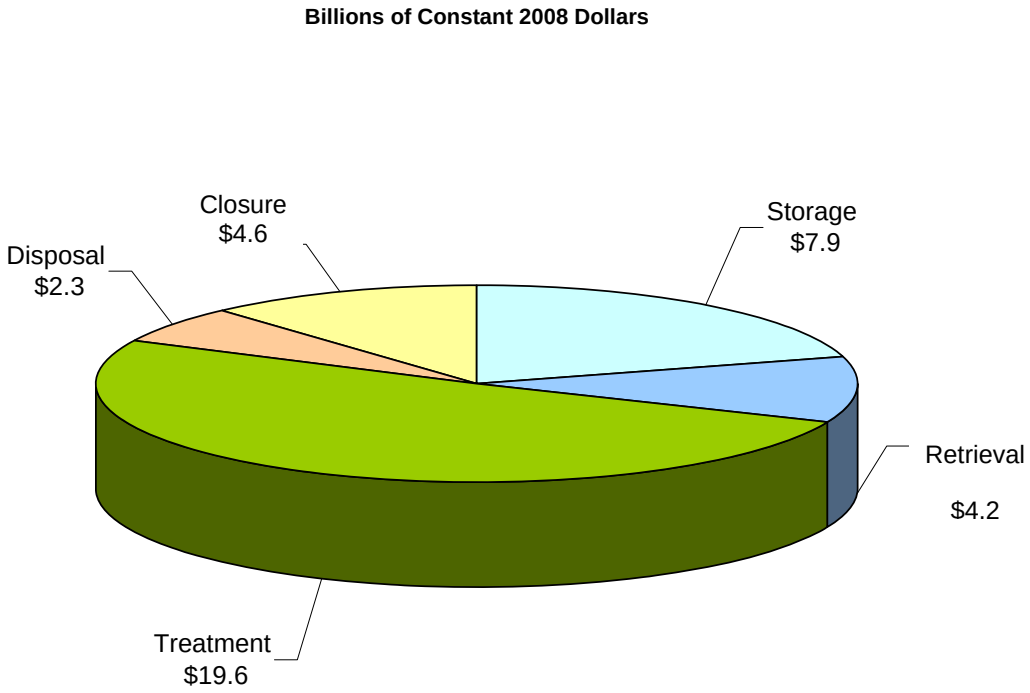


Figure 4–6. Tank Closure Alternative 3A Costs by Cost Bin.



Substantive assumptions that influenced the Alternative 3A cost estimate presented in this report include the following:

- This alternative evaluates retrieval of 99 percent of the tank waste and waste treatment using a combination of WTP vitrification and supplemental treatment technologies.
- Technetium-99 removal would not occur as part of WTP pretreatment.
- This alternative includes using the supplemental technologies to treat the portion of the tank waste not treated via the WTP including TRU supplemental treatment and bulk vitrification supplemental treatment.
- Packaged TRU waste would be interim stored onsite pending shipment and disposal at WIPP.
- The balance of the tank waste (i.e., that not being vitrified in the WTP or treated as TRU) would be directed to the bulk vitrification supplemental treatment facilities.
- Pretreatment of the waste stream feed for the 200 West Area bulk vitrification facility will be included in the alternative.
- With a 2018 WTP operations start, the major treatment operations (WTP and bulk vitrification) are projected to be complete in 2040.
- IHLW would be stored onsite.
- This alternative includes landfill closure of the twelve 200 East and 200 West Area SST farms following deactivation.
- Administrative controls of the tank and waste treatment systems would be maintained for 100 years (until 2141).
- Treatment facilities outside of the boundary of the closure cap would be deactivated pending future closure decisions.

The major uncertainties associated with Alternative 3A cost estimate include the following:

- This alternative will complete the RPP mission by approximately 2042. Cost estimates for projecting current costs this far into the future introduces a lower degree of uncertainty than do options with longer execution schedules.
- The ability of the retrieval technologies (i.e., modified sluicing system, mobile retrieval system, and vacuum-based retrieval system) to reach 99 percent waste retrieval (by volume) effectiveness has not been demonstrated across the range of tank conditions expected in the tank farms. The retrieval technologies are assumed to achieve 99 percent retrieval effectiveness. The technology and associated cost impacts in the event 99 percent retrieval effectiveness cannot be achieved are not included in this cost estimate.
- Although the costs for waste retrieval systems have been adjusted to reflect the increased experience with retrieval construction and operations, the ability of the retrieval technologies (i.e., modified sluicing system, mobile retrieval system, and vacuum-based retrieval system) to reach 99 percent waste retrieval (by volume) effectiveness has not been demonstrated across the range of tank conditions expected in the tank farms. The

retrieval technologies are assumed to achieve 99 percent retrieval effectiveness. The technology and associated cost impacts in the event 99 percent retrieval effectiveness cannot be achieved are not included in this cost estimate.

- Costs for WRFs required to support SST retrievals are based on early engineering assessments, as designs of the WRFs are not complete. The WRF capacities, integration with the tank farm infrastructure, and schedule for completion may affect the costs of these facilities.
- Annualized steady-state operations costs for the WTP provided in Daniels (2007) were used to reflect the WTP capacity assumed by this alternative. Operations cost projections will be refined as the project matures and are likely to vary from the early cost estimates presented here.
- Deactivation cost estimates for one-of-a-kind technologies or unique technology deployments in the early project stages (e.g., as those currently under construction or evaluation to treat tank waste) are typically based on the estimated operations cost. This is true for the deactivation costs presented here and therefore have compounded uncertainty; the uncertainty associated with the estimated operations cost compounded by the assumption of operations costs as a surrogate for deactivation costs.
- Operating costs for the immobilized waste storage and disposal facilities were scaled from the corresponding cost data based on corresponding number of facilities or years of operation. Future efficiencies because of standardized designs, construction methods, or operating methods are not recognized in the estimates, nor are potential changes in facilities configurations.
- Costs for indefinite onsite storage or future shipping and disposal of IHLW are not included in the estimates.
- Failed HLW melters will be stored onsite and costs for disposal of the HLW melters are not included in the cost estimates.
- The costs for handling, storing, shipping, and disposing contact-handled and remote handled TRU wastes were not developed to differentiate between the different waste types for this estimate. The costs for these activities may vary because of the different safety, radiation protection, shipping, and disposal requirements from the different radiation levels in the waste.
- Contaminated soil and equipment removal, packaging, treatment, and disposal costs are based on early estimates that have not been validated through detailed engineering analysis, and would likely change.
- Packaging of TRU waste from Hanford tanks has not been attempted. Estimated costs are based on preliminary engineering estimates with a large uncertainty. Estimated costs for supplemental TRU packaging system design, construction, and operation could vary significantly from the estimated costs.

- Landfill closure of underground tank farms containing waste residual similar to the Hanford tank farms has not been conducted. Estimated costs for landfill closure could vary significantly from the estimated costs.

4.5 TANK CLOSURE ALTERNATIVE 3B – EXISTING WTP VITRIFICATION WITH CAST STONE, LANDFILL CLOSURE

The detailed cost estimate for Tank Closure Alternative 3B is provided in Appendix E. The alternative cost estimate includes all of the cost elements identified for Alternative 3A with the exception that deployment of bulk vitrification as a supplemental treatment technology would be replaced with the deployment of supplemental treatment via cast stone facilities.

The major differences between Alternatives 3A and 3B are that under Alternative 3B, the supplemental treatment technology deployed would include cast stone rather than bulk vitrification. Also, technetium-99 removal would be provided in WTP pretreatment.

As presented in Table 4–1, the estimated cost for Alternative 3B is approximately $38.4 billion (excluding disposal costs of waste forms). Figure 4–7 graphically depicts the costs for Alternative 3B by the TC&WM EIS work scope elements (construction, operations, deactivation). Costs for Alternative 3B by cost bin (storage, retrieval, treatment, disposal, closure) are graphically depicted in Figure 4–8.

Substantive assumptions that influenced the cost estimate presented in this report are the same as those identified for Alternative 3A. The major uncertainties associated with this alternative are the same as those for Alternative 3A, except that there are somewhat higher uncertainties related to the regulatory approval of the waste form for disposal onsite.

Figure 4–7. Tank Closure Alternative 3B Costs by TC&WM EIS Work Scope Elements.

Billions of Constant 2008 Dollars

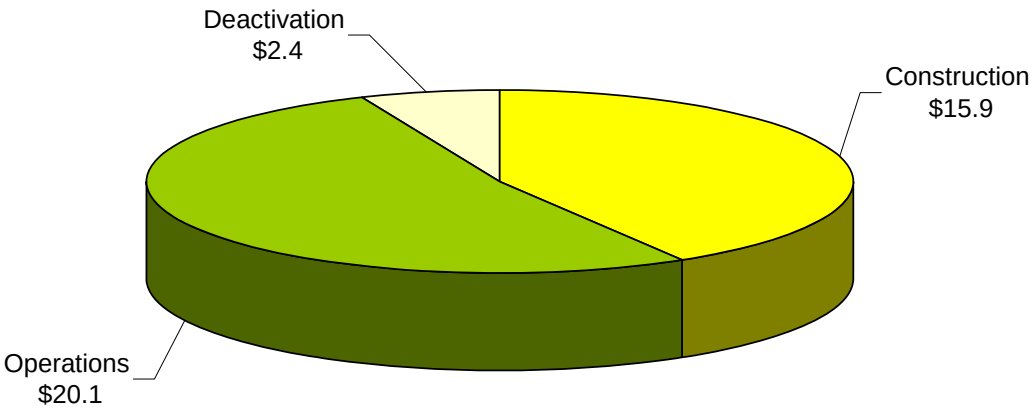
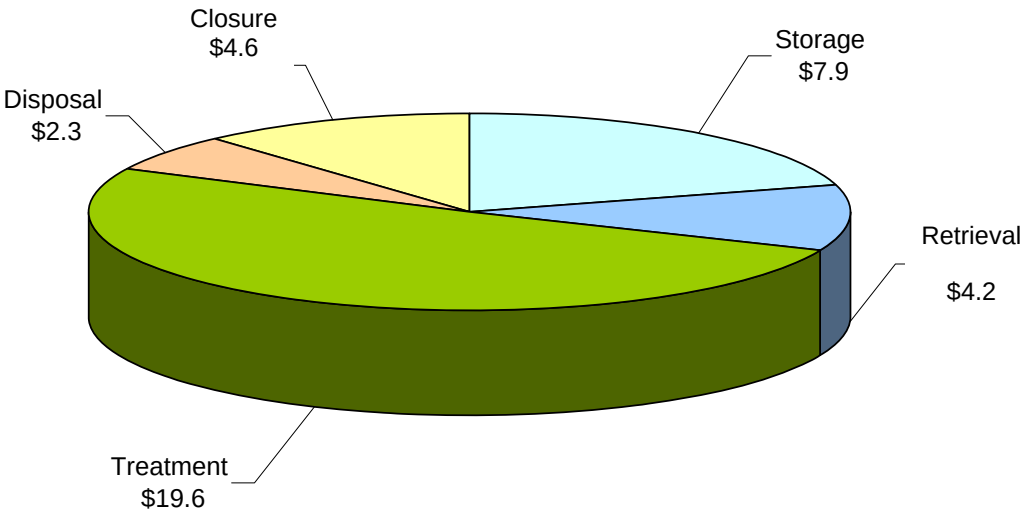


Figure 4–8. Tank Closure Alternative 3B Costs by Cost Bin.

Billions of Constant 2008 Dollars



4.6 TANK CLOSURE ALTERNATIVE 3C – EXISTING WTP VITRIFICATION WITH STEAM REFORMING, LANDFILL CLOSURE

The detailed cost estimate for Tank Closure Alternative 3C is provided in Appendix F. The alternative cost estimate includes all of the cost elements identified for Alternative 3A with the exception that deployment of bulk vitrification as a supplemental treatment technology would be replaced with the deployment of supplemental treatment via steam reforming.

The major differences between Alternatives 3A and 3C are that under Alternative 3C, the supplemental treatment technology deployed would include steam reforming rather than bulk vitrification.

As presented in Table 4–1, the estimated cost for Alternative 3C is approximately $39.8 billion (excluding disposal costs of waste forms). Figure 4–9 graphically depicts the costs for Alternative 3C by the TC&WM EIS work scope elements (construction, operations, deactivation). Costs for Alternative 3C by cost bin (storage, retrieval, treatment, disposal, closure) are graphically depicted in Figure 4–10.

Substantive assumptions that influenced the cost estimate presented in this report are the same as those identified for Alternative 3A. The major uncertainties associated with the cost estimate for this alternative are the same as those for Alternative 3A.

Figure 4–9. Tank Closure Alternative 3C Costs by TC&WM EIS Work Scope Elements.

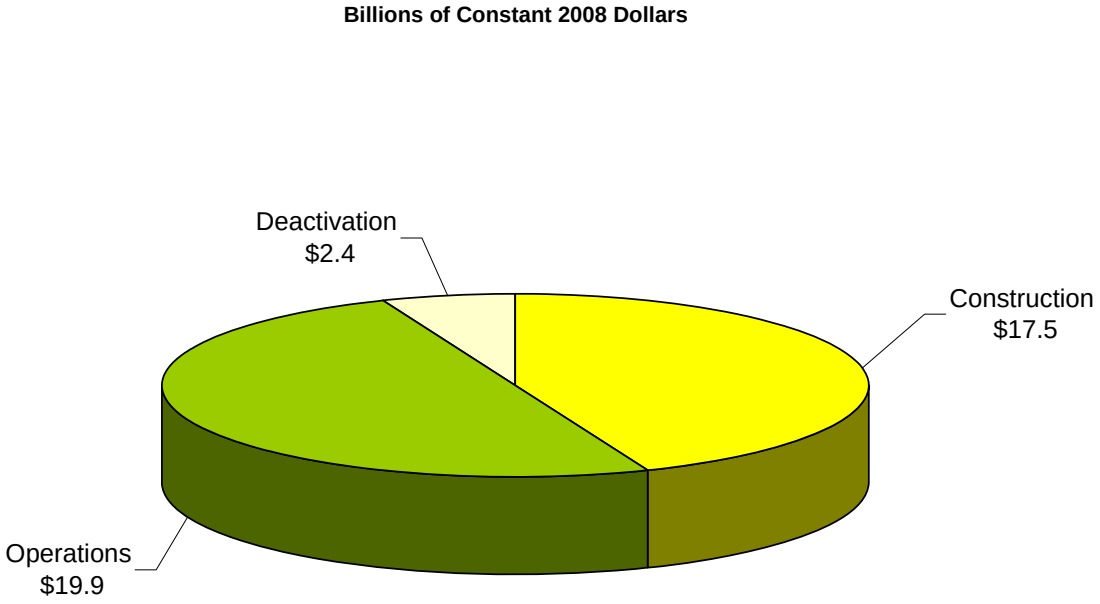
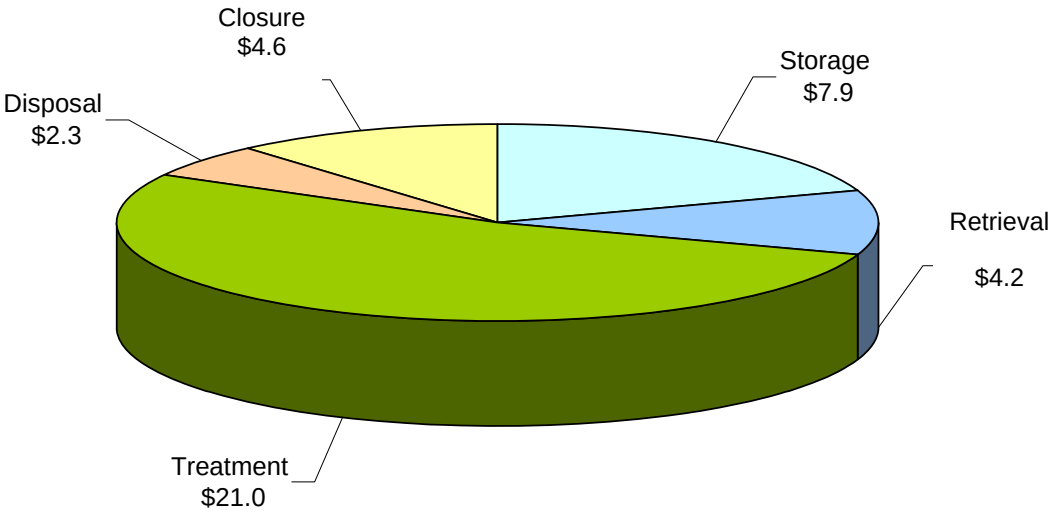


Figure 4–10. Tank Closure Alternative 3C Costs by Cost Bin.



4.7 TANK CLOSURE ALTERNATIVE 4 – EXISTING WTP VITRIFICATION WITH SUPPLEMENTAL TECHNOLOGIES, SELECTIVE CLEAN CLOSURE, LANDFILL CLOSURE

The detailed cost estimate for Tank Closure Alternative 4 is provided in Appendix G. The cost estimate includes costs to do the following:

- Operate and deactivate the tank farms and associated facilities through completion of waste retrieval
- Construct and operate the WTP and supplemental treatment technologies (i.e., bulk vitrification and cast stone for LAW and TRU packaging for contact-handled and remote-handled TRU waste) through completion of waste treatment of approximately 99.9 percent of the waste volume
- Store IHLW onsite
- Store packaged TRU waste onsite pending shipment and disposal offsite
- Dispose of ILAW onsite
- Retrieve, de-encapsulate and treat in the WTP the cesium and strontium capsules currently stored in the WESF.
- Deactivate waste treatment facilities
- Perform clean closure of the BX and SX SST farms
- Perform landfill closure of the remaining 10 SST farms (i.e., tanks, ancillary equipment, and soils)
- Maintain administrative control over a 100-year period that would extend to 2144.

The major differences between Alternative 4 and Alternatives 3A, 3B and 3C are that under Alternative 4, a slightly higher volume of tank waste would be treated at the WTP and supplemental treatment facilities because the waste retrieved from the SSTs is higher (99.9 percent versus 99 percent), both bulk vitrification and cast stone are used to treat LAW, and two SST farms are assumed to be clean-closed. Under Alternative 4, additional costs would be incurred to deploy an additional retrieval system in each SST to retrieve a higher waste volume from the tanks, and substantial costs would be incurred to clean close the two SST farms.

As presented in Table 4–1, the estimated cost for Alternative 4 is approximately $43.6 billion (excluding disposal costs for final waste forms). Figure 4–11 graphically depicts the costs for Alternative 4 by the TC&WM EIS work scope elements (construction, operations, deactivation). Costs for Alternative 4 by cost bin (storage, retrieval, treatment, disposal, closure) are graphically depicted on Figure 4–12.

Figure 4–11. Tank Closure Alternative 4 Costs by TC&WM EIS Work Scope Elements.

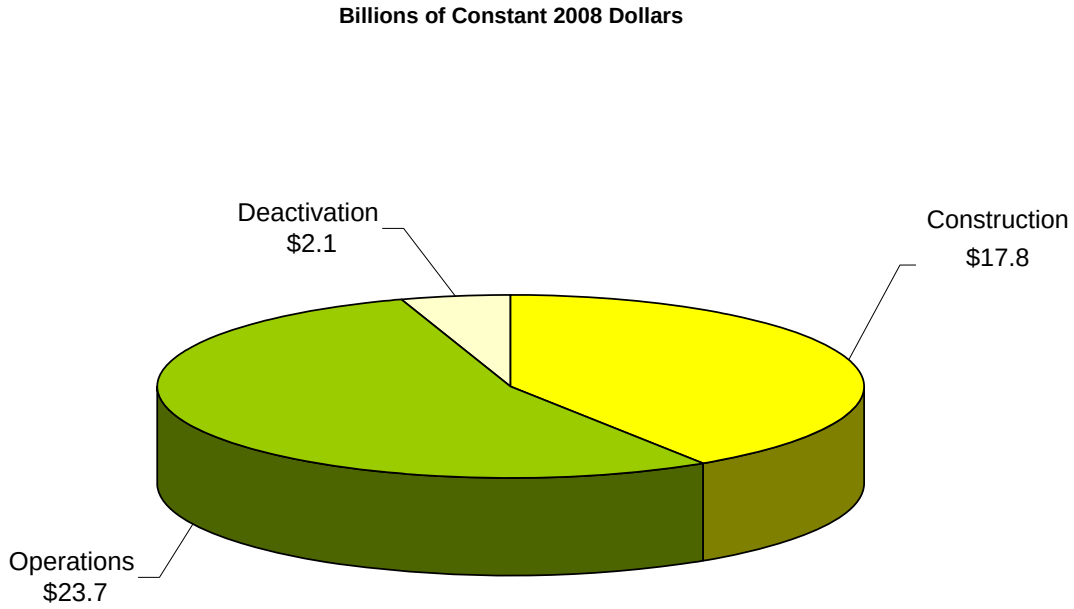
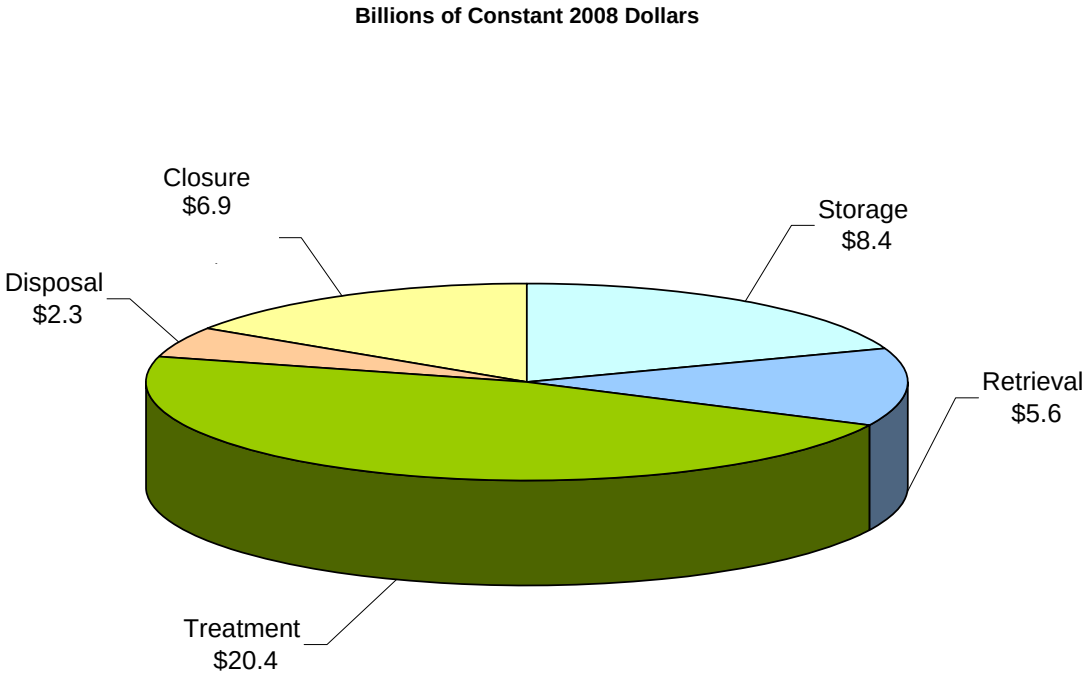


Figure 4–12. Tank Closure Alternative 4 Costs by Cost Bin.



Substantive assumptions that influenced the Alternative 4 cost estimate presented in this report include the following:

- This alternative evaluates retrieval of 99.9 percent of the tank waste and waste treatment using a combination of WTP vitrification and supplemental treatment technologies. A portion of the overall tank waste volume would be pretreated in the WTP and segregated into one of two waste streams: a HLW stream that would be vitrified in the WTP in a facility with a 6 MTG/day capacity and a LAW stream that would vitrified in the WTP with a 30 MTG/day capacity. For this alternative, technetium-99 removal would not occur as part of WTP pretreatment.
- To retrieve 99.9 percent of the tank waste from the SSTs, a second waste retrieval system would be deployed in each tank compared to alternatives retrieving 90 percent or 99 percent of the tank waste. It is assumed that the tank waste would be retrieved using chemical wash systems, and the retrieved waste treated at the WTP or the supplemental treatment facilities.
- This alternative also includes using TRU, bulk vitrification, and cast stone supplemental treatment technologies to treat the portion of the tank waste not treated via the WTP.
- TRU supplemental treatment would be deployed to separately treat a select number of tanks considered to contain only TRU waste. Packaged TRU waste would be interim stored onsite pending shipment and disposal at WIPP.
- The balance of the tank waste (i.e., that not being vitrified in the WTP or treated as TRU) would be directed to the cast stone supplemental treatment facility in the 200 East Area or the bulk vitrification supplemental treatment facility in the 200 West Area. To bound WTP estimated emissions, it is assumed that the waste stream feed for the 200 East Area cast stone facility would be pretreated in the WTP. Pretreatment of the waste stream feed for the 200 West Area bulk vitrification facility is included in the alternative.
- With a 2018 WTP full operations start, the major treatment operations (WTP, cast stone, and bulk vitrification) are projected to be complete in 2043. IHLW would be stored onsite. ILAW from the WTP, cast stone, and bulk vitrification facilities would be disposed onsite at Hanford although the duration of onsite storage and disposal would vary based on the assumed output of ILAW and duration of WTP operations.
- Clean closure of two SST farms, the BX and SX tank farms, are assumed by this alternative. The clean closure of the tank farms includes removal of contaminated soil, tank removal, and backfilling with uncontaminated soil to support future unrestricted land use. Contaminated soil, tank debris, and ancillary equipment that is highly contaminated and does not meet waste acceptance criteria for onsite disposal would be processed through the PPF to remove contamination from the soil, debris, and equipment. The high-activity waste inventory removed at the PPF would be sent to the WTP for processing as a liquid waste stream and the remaining materials would be disposed of onsite.
- This alternative also includes closure of the remaining ten 200 East and 200 West Area SST farms following deactivation. Specifically, this alternative would result in the

landfill closure of these SST farms. Landfill closure would include the construction of a closure cap (modified RCRA C barrier) over these areas followed by maintaining administrative controls of the closed tank system for 100 years (until 2144). The SST farm system ancillary equipment inside the boundary of the closure cap would be remediated or removed to meet landfill closure requirements. Treatment facilities outside of the boundary of the closure cap would be deactivated pending future closure decisions.

The major uncertainties associated with Alternative 4 cost estimate include the following:

- This alternative would complete the RPP mission by approximately 2043 with the exception of the continued storage of IHLW canisters that continues until approximately 2066. Cost estimates projecting current costs this far into the future introduces a higher degree of uncertainty than alternatives with shorter schedules.
- The ability of the retrieval technologies (i.e., modified sluicing system, mobile retrieval system, and vacuum-based retrieval system) to reach 99.9 percent waste retrieval (by volume) effectiveness has not been demonstrated across the range of tank conditions expected in the tank farms. The ability of current technologies to achieve this level of retrieval is unlikely. The technology and associated cost impacts in the event 99.9 percent retrieval effectiveness cannot be achieved are not included in this cost estimate.
- Cost for a secondary waste retrieval system deployment to achieve the 99.9 percent retrieval assumption are included, however, the costs are based on current estimates. As additional experience is gained during the retrieval of tank wastes, more effective and efficient retrieval system designs may be developed, and operations of the systems may be simplified, resulting in more cost effective retrieval of tank waste.
- Although sluicing has been demonstrated on tank waste, the variability between tanks (chemical, radiological, and physical conditions), in-tank equipment and potential unseen debris from past operations activities may impact retrieval effectiveness. The relative impacts resulting from these and other unknown conditions have not been quantified and may affect the tank waste retrieval costs.
- Costs for WRFs required to support SST retrievals are based on early engineering assessments, as designs of the WRFs are not complete. The WRF capacities, integration with the tank farm infrastructure, and schedule for completion may affect the costs of these facilities.
- Annualized steady-state operations costs for the WTP provided in Daniels (2007) were scaled to reflect the WTP capacity assumed by this alternative. Operations cost projections will be refined as the project matures and are likely to vary from the early cost estimates presented here.
- Deactivation cost estimates for one-of-a-kind technologies or unique technology deployments in the early project stages, such as those currently under construction or evaluation to treat tank waste, are typically based on the estimated operations cost. This is true for the deactivation costs presented here and therefore have compounded

uncertainty; the uncertainty associated with the estimated operations cost compounded by the assumption of operations costs as a surrogate for deactivation costs.

- Operating costs for the immobilized waste storage and disposal facilities were scaled from the corresponding cost data based on corresponding number of facilities or years of operation. Future efficiencies because of standardized designs, construction methods, or operating methods are not recognized in the estimates, nor are potential changes in facilities configurations.
- Costs for indefinite onsite storage or future shipping and disposal of IHLW are not included in the estimates.
- Failed HLW melters will be stored onsite and costs for disposal of the HLW melters are not included in the cost estimates.
- The costs for handling, storing, shipping, and disposing contact-handled and remote-handled TRU wastes were not developed to differentiate between the different waste types for this estimate. The costs for these activities may vary because of the different safety, radiation protection, shipping, and disposal requirements because of the different radiation levels in the waste.
- Contaminated soil and equipment removal, packaging, treatment, and disposal costs for clean closing the BX and SX tank farms are based on early estimates that have not been validated through detailed engineering analysis. The cost estimates developed for the design, construction, and operation of the PPF are rough-order-of magnitude estimates developed using surrogate facilities. Clean closure on this scale has not been attempted, and costs would likely change as the project matures.
- Landfill closure of underground tank farms containing waste residual similar to the Hanford tank farms has not been conducted. Estimated costs for landfill closure could vary significantly from the estimated costs.

4.8 TANK CLOSURE ALTERNATIVE 5 – EXPANDED WPT VITRIFICATION WITH SUPPLEMENTAL TECHNOLOGIES, LANDFILL CLOSURE

The detailed cost estimate for Tank Closure Alternative 5 is provided in Appendix H. The cost estimate includes costs to do the following:

- Operate and deactivate the tank farms and associated facilities through completion of waste retrieval
- Construct and operate the WTP and supplemental treatment technologies (i.e., cast stone and bulk vitrification for LAW and TRU packaging for contact-handled and remote-handled TRU waste) through completion of waste treatment of approximately 90 percent of the waste volume
- Store IHLW onsite
- Store packaged TRU waste onsite pending shipment and disposal offsite

- Dispose of ILAW onsite
- Retrieve, de-encapsulate and treat in the WTP the cesium and strontium capsules currently stored in the WESF
- Deactivate waste treatment facilities
- Perform landfill closure of SST farms (i.e., tanks, ancillary equipment, and soils)
- Maintain administrative control over a 100-year period that would extend to 2139.

The major differences between Alternative 3A and Alternative 5 are that under Alternative 5 the WTP LAW capacity would be increased from the current facility configuration to a throughput capacity of 45 MTG/day. However, multiple supplemental treatment technologies would be deployed, resulting in completion of the waste retrieval and treatment mission in 2034 rather than 2040. Alternative 5 would also result in the closure of the SST farms under a landfill configuration; however, the volume of waste remaining in tanks would be greater under this alternative (approximately 10 percent) than under Alternative 3A (approximately 1 percent). These changes would result in costs lower than Alternative 3A because of marginally lower treatment, storage, disposal, and closure costs. Some of the cost savings would be offset by the assumed need to deploy new DST capacity to support accelerated waste retrieval and treatment and the assumed need to deploy a more robust closure barrier (i.e., Hanford Barrier) because of the larger volume of waste remaining in SSTs at the completion of waste retrieval activities.

As presented in Table 4–1, the estimated cost for Alternative 5 is approximately $33.7 billion (excluding disposal costs for final waste forms). Figure 4–13 graphically depicts the costs for Alternative 5 by the TC&WM EIS work scope elements (construction, operations, deactivation). Costs for Alternative 5 by cost bin (storage, retrieval, treatment, disposal, closure) are graphically depicted on Figure 4–14.

Figure 4–13. Tank Closure Alternative 5 Costs by TC&WM EIS Work Scope Elements.

Billions of Constant 2008 Dollars

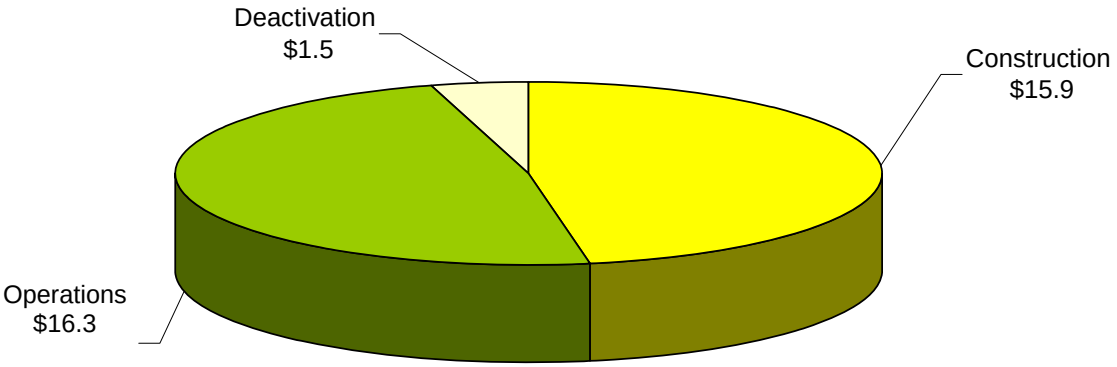
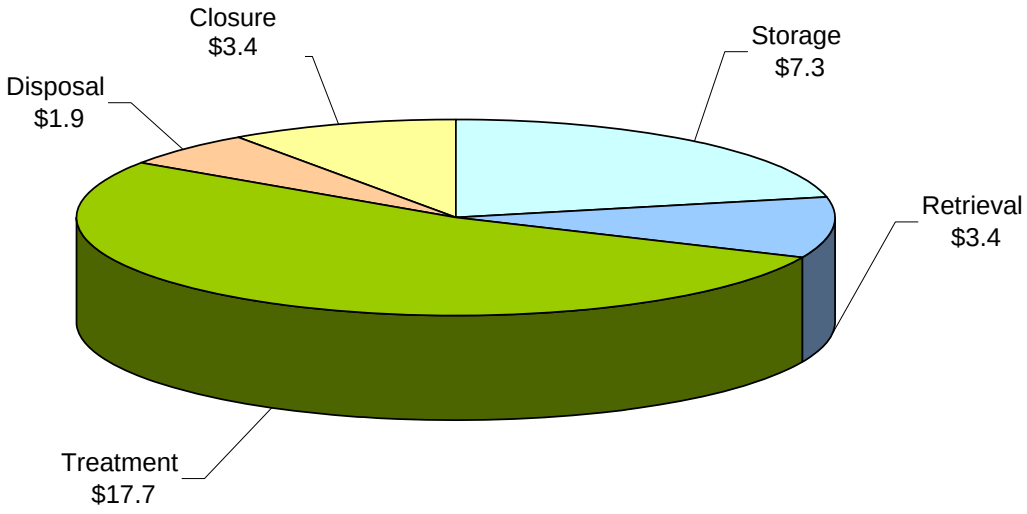


Figure 4–14. Tank Closure Alternative 5 Costs by Cost Bin.

Billions of Constant 2008 Dollars



Substantive assumptions that influenced the Alternative 5 cost estimate presented in this report include the following:

- No technetium-99 removal would occur as part of WTP pretreatment.
- The sulfate removal process would be deployed as part of the WTP pretreatment process to allow higher waste sodium loading in the ILAW glass.
- The supplemental treatment technologies deployed would include TRU, cast stone supplemental treatment, and bulk vitrification.
- The cast stone supplemental treatment facility would be deployed in the 200 East Area and the bulk vitrification supplemental treatment facility would be located in the 200 West Area. The waste stream feed for the 200 East Area cast stone facility would be pretreated in the WTP; a separate pretreatment facility would be deployed in 200 West for the 200 West Area bulk vitrification facility.
- There would be construction and operation of four new DSTs to facilitate waste retrieval operations.
- Landfill closure would include the construction of a more robust closure cap (i.e., Hanford Barrier).

The major uncertainties associated with Alternative 5 cost estimate include the following:

- This alternative will complete the RPP mission by approximately 2034. Cost estimates for projecting current costs this far into the future introduces a lower degree of uncertainty than alternatives with longer schedules.
- Costs for WRFs required to support SST retrievals are based on early engineering assessments, as designs of the WRFs are not complete. The WRF capacities, integration with the tank farm infrastructure, and schedule for completion may affect the costs of these facilities.
- Annualized steady-state operations costs provided in Daniels (2007) were derived from the hot commissioning cost estimates provided in the *Life-Cycle Cost Estimate for Waste Treatment and Immobilization Plant (WTP) Operations* (Abdul and Clendon 2003), but were modified to reflect the revised WTP configuration of two HLW melters and three LAW melters. The derivation of WTP operations cost from projected hot commissioning costs provides an early cost target useful for cost comparison as the project matures, but is not a definitive steady-state operations cost estimate. Operations cost projections will be refined as the project matures and are likely to vary from the early cost estimates presented here.
- Sulfate removal is an example of several pretreatment processes under consideration to enhance the processing of tank waste. These processes are in the earliest stages of assessment for applicability and efficacy and are not expected to reach the bottoms-up estimation stage until the processes have matured to preliminary design. The resultant estimated costs will be dependent upon several current unknowns, including the chosen technology, process efficiency, and deployment location (e.g., within the tank farms, as a separate, stand-alone processing facility or as an add-on unit to WTP) at Hanford.

Given the current stage of process assessment, the future estimated costs are expected to vary significantly from the cost data presented here.

- Operating costs for the immobilized waste storage and disposal facilities were scaled from the corresponding cost data based on corresponding number of facilities or years of operation. Future efficiencies because of standardized designs, construction methods, or operating methods are not recognized in the estimates, nor are potential changes in facilities configurations.
- Costs for indefinite onsite storage or future shipping and disposal of IHLW are not included in the cost estimates.
- Failed HLW melters will be stored onsite and costs for disposal of the HLW melters are not included in the cost estimates.
- The costs for handling, storing, shipping, and disposing contact handled and remote handled TRU wastes were not developed to differentiate between the different waste types for this estimate. The costs for these activities may vary because of the different safety, radiation protection, shipping, and disposal requirements because of the different radiation levels in the waste.
- Deactivation cost estimates for one-of-a-kind technologies or unique technology deployments in the early project stages, such as those currently under construction or evaluation to treat tank waste, are typically based on the estimated operations cost. This is true for the deactivation costs presented here and therefore have compounded uncertainty; the uncertainty associated with the estimated operations cost compounded by the assumption of operations costs as a surrogate for deactivation costs.
- Landfill closure of underground tank farms containing waste residual similar to the Hanford tank farms has not been conducted. Estimated costs for landfill closure could vary significantly from the estimated costs.

4.9 TANK CLOSURE ALTERNATIVE 6A – ALL VITRIFICATION/NO SEPARATION, CLEAN CLOSURE

Two cases, a base and an option case, for Tank Closure Alternative 6A are evaluated. The detailed cost estimate for Tank Closure Alternative 6A – Base Case is provided in Appendix I. The detailed cost estimate for Tank Closure Alternative 6A – Option Case is provided in Appendix J. The cost estimate for both cases includes costs to do the following:

- Operate and deactivate the tank farms and associated facilities through completion of waste retrieval
- Construct and operate the WTP through completion of waste treatment of approximately 99.9 percent of the waste volume
- Store IHLW onsite
- Retrieve, de-encapsulate and treat in the WTP the cesium and strontium capsules currently stored in the WESF

- Deactivate waste treatment facilities
- Perform clean closure of the SST farms.

The major differences between Alternative 6A and other alternatives are that under this alternative all the tank waste will be treated in the WTP under an all HLW vitrification configuration (i.e., deployment of 5 HLW melters; no LAW vitrification capability available) and the SST farms would be clean closed. Under Alternative 6A, additional costs would be incurred to deploy a second retrieval system in each SST to retrieve a higher waste volume from the tanks (99.9 percent compared to 99 percent), to clean close the SST farms, and to operate the tank farm and WTP systems through 2163. Also, this alternative assumes treatment of contaminated soil and debris generated during clean closure of the SST farms.

Total costs of Alternative 6A are higher than the costs for all other alternatives because of the demands placed on the tank farm and WTP systems by the extended alternative schedule. The DST systems, IHLW systems, and WTP would be required to operate for approximately 145 years. This schedule would increase the costs associated with waste storage, waste retrieval, and waste disposal. Further, the costs for clean closing all 12 SST farms is significantly more than the costs associated with any of the other alternatives.

As presented in Table 4–1, the estimated cost for Alternative 6A – Base Case is approximately $240.1 billion (excluding disposal costs for final waste forms). Figure 4–15 graphically depicts the costs for Alternative 6A – Base Case by the TC&WM EIS work scope elements (construction, operations, deactivation). Costs for Alternative 6A – Base Case by cost bin (storage, retrieval, treatment, disposal, closure) are graphically depicted on Figure 4–16.

Figure 4–15. Tank Closure Alternative 6A – Base Case Costs by TC&WM EIS Work Scope Elements.

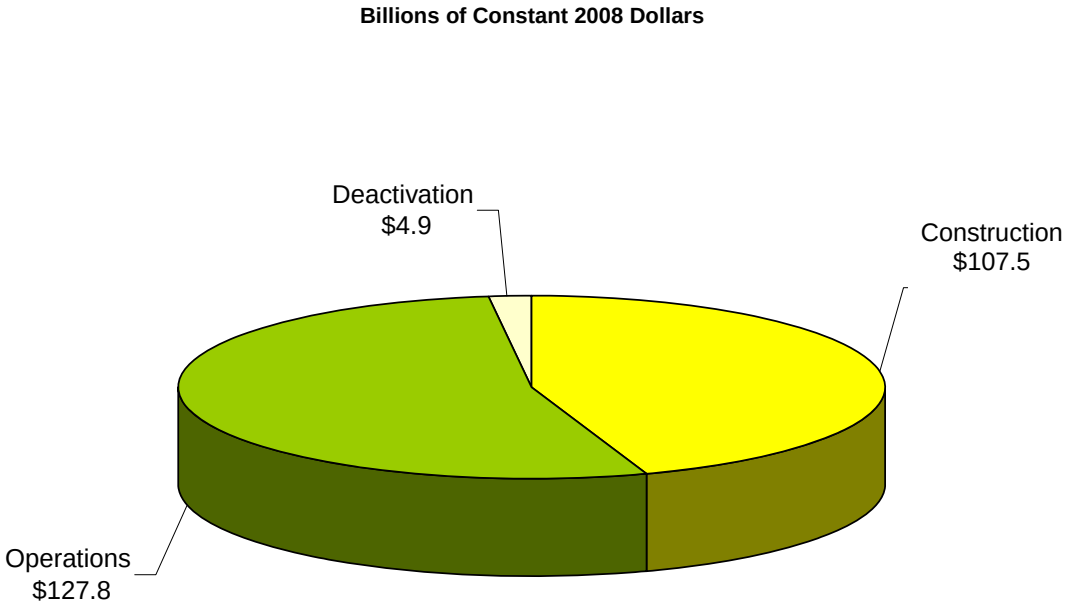
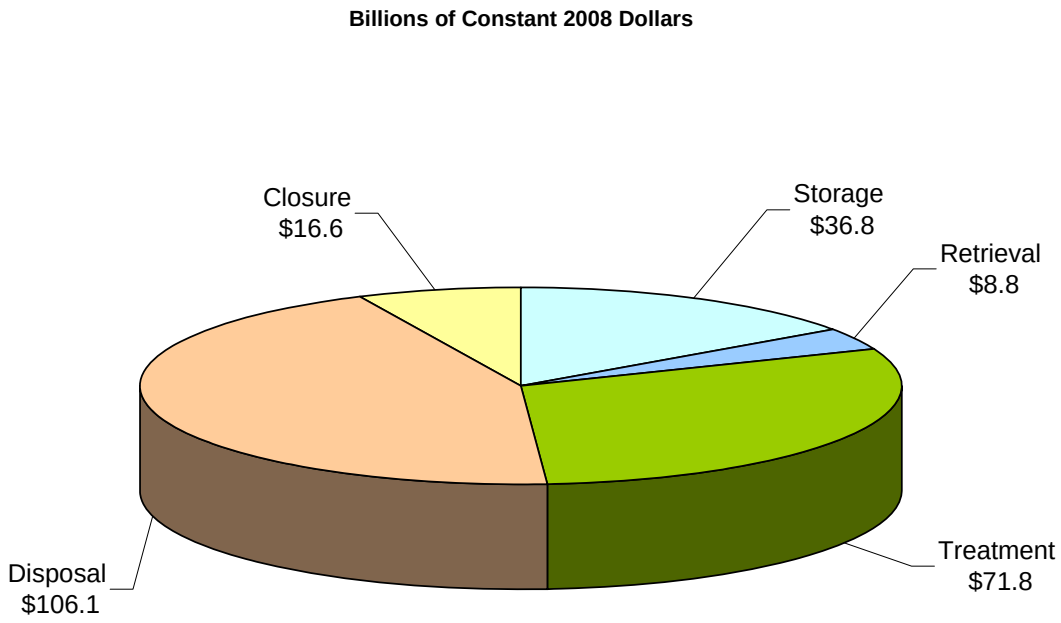


Figure 4–16. Tank Closure Alternative 6A – Base Case Costs by Cost Bin.



The option case includes the remediation and closure of 6 sets of cribs and trenches (B cribs, BX trenches, BY cribs, T cribs, T trenches, and TY cribs). This option increases the costs associated with the base case closure activities. As presented in Table 4−1, the estimated cost for Alternative 6A – Option Case is approximately $252 billion (excluding disposal costs for final waste forms). Figure 4−17 graphically depicts the costs for Alternative 6A – Option Case by the TC&WM EIS work scope elements (construction, operations, deactivation). Costs for Alternative 6A – Option Case by cost bin (storage, retrieval, treatment, disposal, closure) are graphically depicted on Figure 4−18.

Figure 4–17. Tank Closure Alternative 6A – Option Case Costs by TC&WM EIS Work Scope Elements.

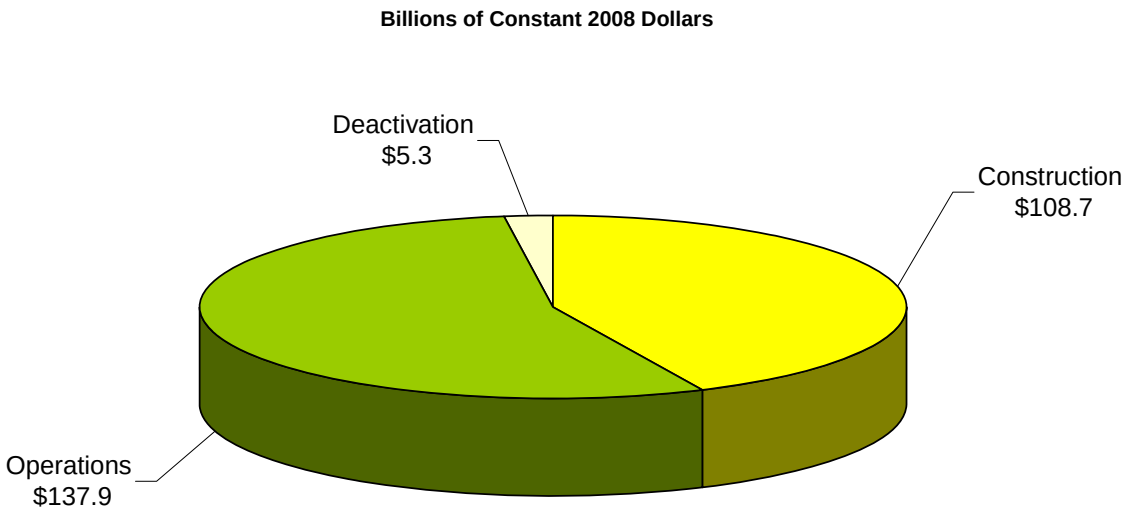
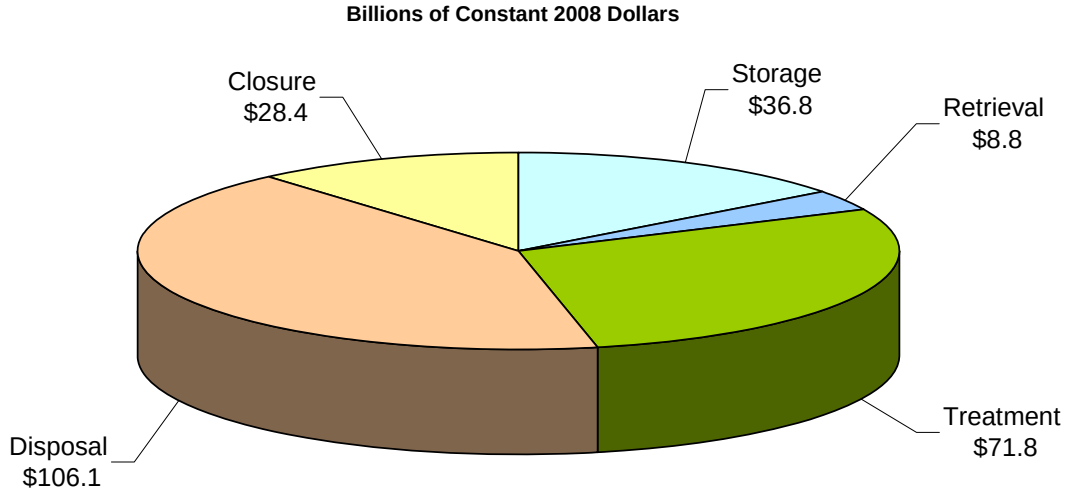


Figure 4–18. Tank Closure Alternative 6A – Option Case Costs by Cost Bin.



Substantive assumptions that influenced the Alternative 6A cost estimate presented in this report include the following:

- This alternative evaluates retrieval of 99.9 percent of the tank waste and waste treatment of all the waste as HLW using the WTP with a throughput capacity of 15 MTG/day.
- For this alternative, technetium-99 removal would not occur as part of WTP pretreatment and no supplemental treatment would be used.

- To retrieve 99.9 percent of the tank waste from the SSTs, a second waste retrieval system would be deployed in each tank. It is assumed that the tank waste would be retrieved using chemical wash systems, and the retrieved waste would be treated at the WTP.
- With a 2018 full WTP operations start, HLW vitrification operations are projected to be complete in 2163 (145 years). This long operating period would exceed existing or assumed facility life cycles. The WTP complex would need to be replaced twice during the duration of the alternative. The IHLW canister shipping/transfer and interim storage facilities would need to be replaced once completely and partially twice. Underground transfer lines would require one replacement. In addition, each of the 28 DSTs currently operating in the tank farms would need to be replaced 3 times (for a total of 84 new DSTs) to support waste feed to the WTP.
- IHLW would be stored onsite.
- All 12 of the 200 East and 200 West Area SST farms would be clean closed following deactivation. Clean closure of the farms includes removal of contaminated soil, tank removal, and backfilling with uncontaminated soil to support future unrestricted land use.

The major uncertainties associated with Alternative 6A cost estimate include the following:

- This alternative will complete the RPP mission by approximately 2163 with the exception of the continued indefinite storage of IHLW canisters. Cost estimates projecting current costs this far into the future introduces a much higher degree of uncertainty when compared with other alternatives with shorter schedules.
- This alternative would replace the WTP, IHLW facilities, and DSTs over the time span of the alternative. The replacement costs for these systems are based on current technologies and approaches that may change in the future.
- The ability of the retrieval technologies (i.e., modified sluicing system, mobile retrieval system, and vacuum-based retrieval system) to reach 99.9 percent waste retrieval (by volume) effectiveness has not been demonstrated across the range of tank conditions expected in the tank farms. The ability of current technologies to achieve this level of retrieval is unlikely. The technology and associated cost impacts in the event 99.9 percent retrieval effectiveness cannot be achieved are not included in this cost estimate.
- Cost for a secondary waste retrieval system deployment to achieve the 99.9 percent retrieval assumption are included; however, the costs are based on current estimates. As additional experience is gained during the retrieval of tank wastes, more effective and efficient retrieval system designs may be developed, and operations of the systems may be simplified, resulting in more cost effective retrieval of tank waste.
- Although sluicing has been demonstrated on tank waste, the variability between tanks (chemical, radiological, and physical conditions), in-tank equipment, and potential unseen debris from past operations activities may impact retrieval effectiveness. The relative impacts resulting from these and other unknown conditions have not been quantified and may affect the tank waste retrieval costs.

- Annualized steady-state operations costs for the WTP provided in Daniels (2007) were scaled to reflect the WTP capacity assumed by this alternative. This estimating method introduces additional uncertainty to the preliminary operating costs developed in Daniels (2007). Operations cost projections will be refined as the project matures and are likely to vary from the early cost estimates presented here.
- Deactivation cost estimates for one-of-a-kind technologies or unique technology deployments in the early project stages, such as those currently under construction or evaluation to treat tank waste, are typically based on the estimated operations cost. This is true for the deactivation costs presented here and therefore have compounded uncertainty; the uncertainty associated with the estimated operations cost compounded by the assumption of operations costs as a surrogate for deactivation costs. This alternative also requires deactivation of replacement facilities that further compounds the uncertainty because the number of facilities being deactivated would be increased.
- Operating costs for the IHLW storage facilities were scaled from the corresponding cost data based on corresponding number of facilities or years of operation. Future efficiencies because of standardized designs, construction methods, or operating methods are not recognized in the estimates, nor are potential changes in facilities configurations.
- Costs for indefinite onsite storage or future shipping and disposal of IHLW are not included in the estimates.
- Failed melters will be stored onsite and costs for disposal of the melters are not included in the cost estimates. The number of failed melters requiring storage onsite is based on early engineering projections. A slight change in melter failure frequency could substantially affect the costs for failed melter storage.
- Clean closure of underground tank farms containing radioactive mixed wastes, contaminated soils, and contaminated ancillary facilities on the scale envisioned in this alternative has never been attempted. Numerous technical challenges are presented by such an approach that will affect the estimated costs. Actual costs for clean closure could vary significantly from the estimated costs.

4.10 TANK CLOSURE ALTERNATIVE 6B – ALL VITRIFICATION WITH SEPARATIONS, CLEAN CLOSURE

Two cases, a base and an option case, for Tank Closure Alternative 6B are evaluated. The detailed cost estimate for Tank Closure Alternative 6B – Base Case is provided in Appendix K. The detailed cost estimate for Tank Closure Alternative 6B – Option Case is provided in Appendix L. The cost estimate for both cases includes costs to do the following:

- Operate and deactivate the tank farms and associated facilities through completion of waste retrieval
- Construct and operate the WTP through completion of waste treatment of approximately 99.9 percent of the waste volume
- Store IHLW, ILAW (managed as IHLW), and HLW boxes onsite

- Retrieve, de-encapsulate and treat in the WTP the cesium and strontium capsules currently stored in the WESF
- Deactivate waste treatment facilities and tank farms
- Perform clean closure of SST farms (i.e., tanks, ancillary equipment and soils).

As presented in Table 4–1, the estimated cost for Alternative 6B – Base Case is approximately $54.8 billion (excluding disposal costs for final waste forms). Figure 4–19 graphically depicts the costs for Alternative 6B – Base Case by the TC&WM EIS work scope elements (construction, operations, deactivation). Costs for Alternative 6B – Base Case by cost bin (storage, retrieval, treatment, disposal, closure) are graphically depicted on Figure 4–20.

Figure 4–19. Tank Closure Alternative 6B – Base Case Costs by TC&WM EIS Work Scope Elements.

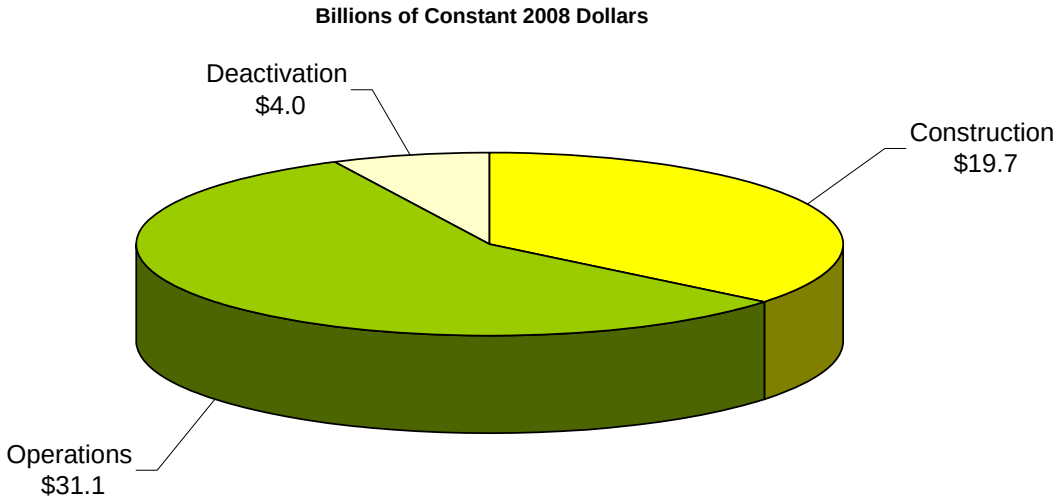
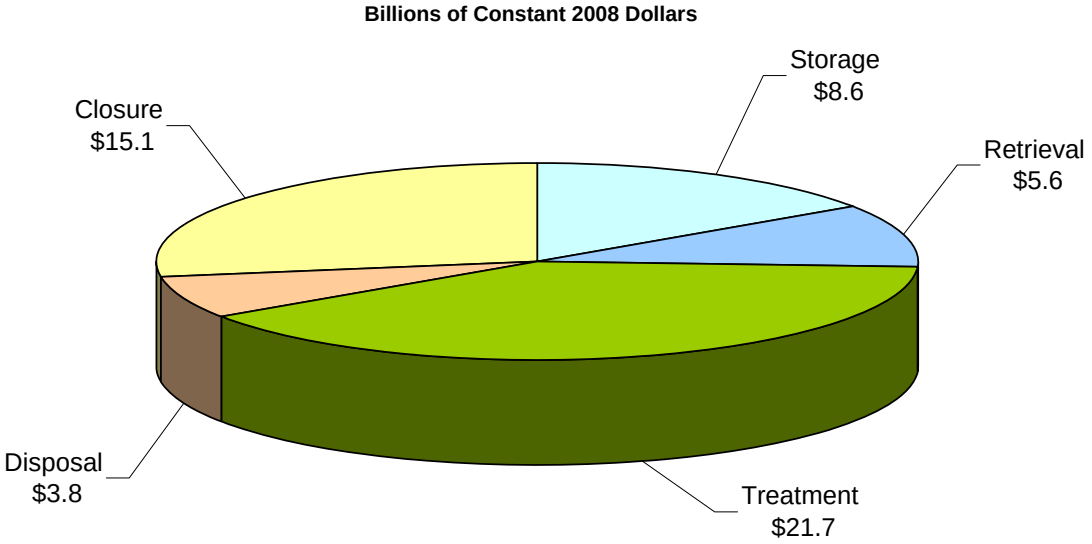


Figure 4–20. Tank Closure Alternative 6B – Base Case Costs by Cost Bin.



The option case includes the remediation and closure of 6 sets of cribs and trenches (B cribs, BX trenches, BY cribs, T cribs, T trenches, TX trenches, and TY cribs). (Note: T and TX trenches are considered one set). This option increases the costs associated with the base case closure activities. As presented in Table 4–1, the estimated cost for Alternative 6B – Option Case is approximately $66.6 billion (excluding disposal costs for final waste forms). Figure 4–21 graphically depicts the costs for Alternative 6B – Option Case by the TC&WM EIS work scope elements (construction, operations, deactivation). Costs for Alternative 6B – Option Case by cost bin (storage, retrieval, treatment, disposal, closure) are graphically depicted on Figure 4–22.

Figure 4–21. Tank Closure Alternative 6B – Option Case Costs by TC&WM EIS Work Scope Elements.

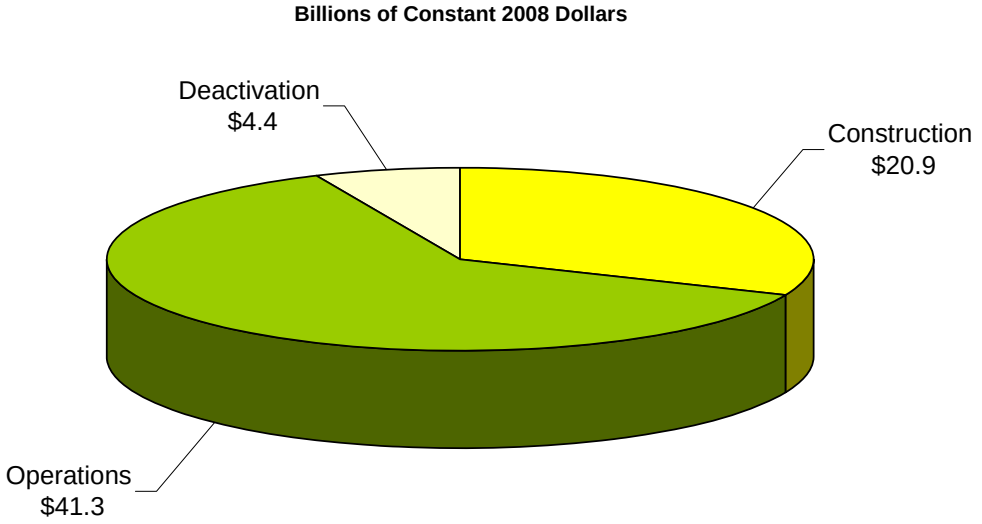
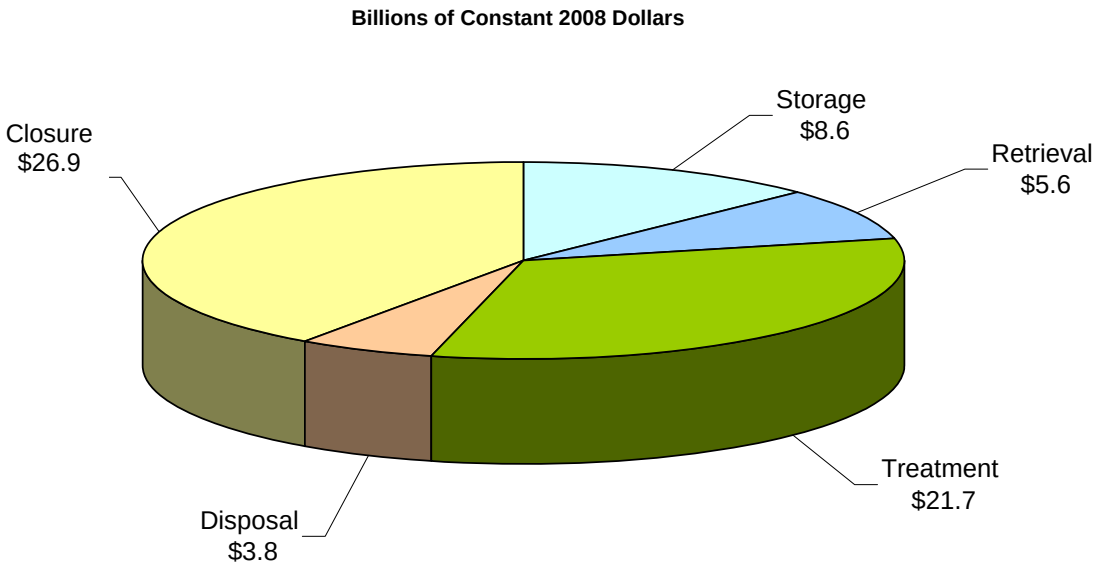


Figure 4–22. Tank Closure Alternative 6B – Option Case Costs by Cost Bin.



Substantive assumptions that influenced the Alternative 6B cost estimate presented in this report include the following:

- This alternative evaluates retrieval of 99.9 percent of the tank waste and waste treatment of HLW using the WTP with a throughput capacity of 6 MTG/day and LAW with a throughput capacity of 90 MTG/day.
- For this alternative, technetium-99 removal would not occur as part of WTP pretreatment and no supplemental treatment would be used.
- To retrieve 99.9 percent of the tank waste from the SSTs, a second waste retrieval system would be deployed in each tank. It is assumed that the tank waste would be retrieved using chemical wash systems, and the retrieved waste would be treated at the WTP.
- With a 2018 WTP operations start, the WTP treatment operations are projected to be complete in 2043.
- IHLW and ILAW would be stored onsite.
- All 12 of the 200 East and 200 West Area SST farms would be clean closed following deactivation. Clean closure of the farms includes removal of contaminated soil, tank removal, and backfilling with uncontaminated soil to support future unrestricted land use.

The uncertainties for Alternative 6B cost estimate are similar to the uncertainties of Alternative 6A cost estimate with the exception of this alternative treats waste as HLW and LAW but both waste forms are managed as HLW and disposed at undetermined off-site location. Alternative 6B also conducts clean closure on the 12 SST farms and, in the option case, removes the 6 sets of cribs and trenches.

4.11 TANK CLOSURE ALTERNATIVE 6C – ALL VITRIFICATION WITH SEPARATIONS, LANDFILL CLOSURE

The detailed cost estimate for Tank Closure Alternative 6C is provided in Appendix M. The cost estimate includes costs to do the following:

- Operate and deactivate the tank farms and associated facilities through completion of waste retrieval
- Construct and operate the WTP through completion of waste treatment of approximately 99 percent of the waste volume
- Store IHLW onsite and retrievably store ILAW (managed as IHLW) onsite until the end of the administrative control period.
- Retrieve, de-encapsulate and treat in the WTP the cesium and strontium capsules currently stored in the WESF.
- Deactivate waste treatment facilities and tank farms
- Perform landfill closure of SST farms (i.e., tanks, ancillary equipment, and soils).

As presented in Table 4−1, the estimated cost for Alternative 6C is approximately $40.7 billion (excluding disposal costs for final waste forms). Figure 4−23 graphically depicts the costs for Alternative 6C by the TC&WM EIS work scope elements (construction, operations, deactivation). Costs for Alternative 6C by cost bin (storage, retrieval, treatment, disposal, closure) are graphically depicted on Figure 4−24.

Figure 4–23. Tank Closure Alternative 6C Costs by TC&WM EIS Work Scope Elements.

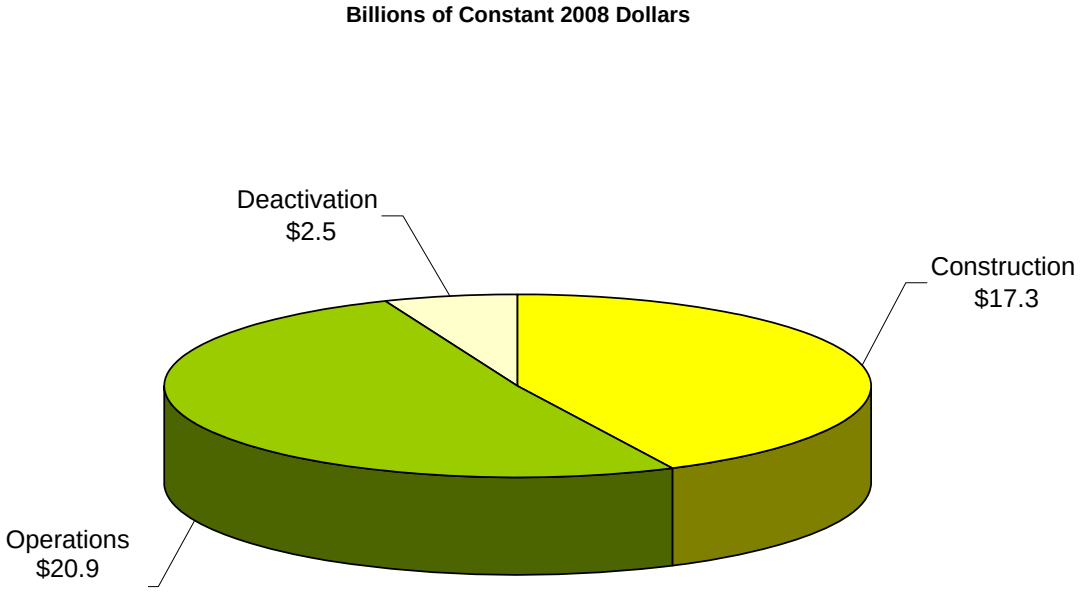
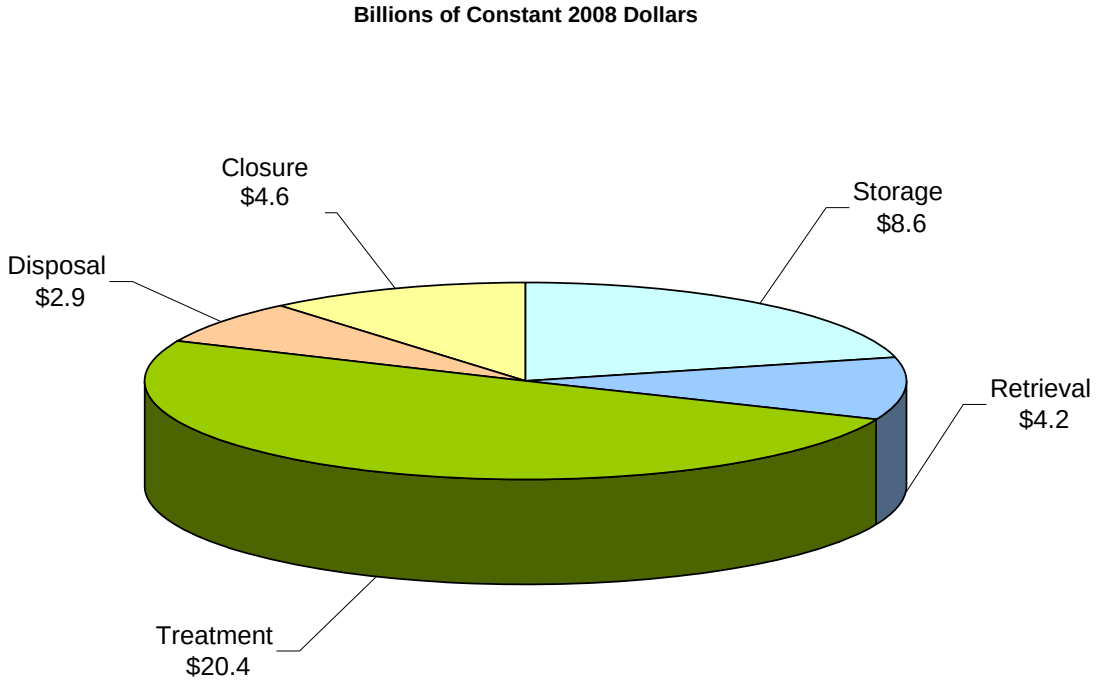


Figure 4–24. Tank Closure Alternative 6C Costs by Cost Bin.



Substantive assumptions that influenced the Alternative 6C cost estimate presented in this report include the following:

- This alternative evaluates retrieval of 99 percent of the tank waste and waste treatment of HLW using the WTP with an HLW throughput capacity of 6 MTG/day and a LAW throughput capacity of 90 MTG/day.
- For this alternative, technetium-99 removal would not occur as part of WTP pretreatment and no supplemental treatment would be used.
- With a 2018 full operations start, the WTP treatment operations are projected to be complete in 2034.
- IHLW would be stored onsite.
- This alternative includes landfill closure of the twelve 200 East and 200 West Area SST farms following deactivation.
- Treatment facilities outside of the boundary of the closure cap would be deactivated pending future closure decisions.

The cost estimate uncertainties for Alternative 6C are identical to the cost estimate uncertainties of Alternative 2B with the exception this alternative includes uncertainties associated with retrievably storing ILAW, managed as IHLW, at Hanford.

4.12 WASTE MANAGEMENT ALTERNATIVE 1 – NO ACTION

The detailed cost estimate for Waste Management Alternative 1 is provided in Appendix N. The estimate includes costs to operate the low-level burial grounds through 2035 and deactivate the IDF, followed by a 100-year administrative control period that would extend from 2036 through 2135 (see Section 2.0). The administrative control costs are based on the No Action alternative scope defined in the TC&WM EIS. As presented in Table 4–2, the total estimated cost of this alternative is approximately $470 million.

The following assumptions substantively influenced the Waste Management Alternative 1 cost estimate presented in this report:

- Storage and treatment of LLW, MLLW and TRU waste at the CWC to process waste for disposal in 218-W-5 Trenches 31 and 34 would continue until 2035.
- Construction of the IDF would cease at the end of 2008.
- Administrative controls would be implemented for 100 years after operations cease (2036-2135).

The major uncertainty associated with Waste Management Alternative 1 is that the alternative could not be implemented without substantial regulatory relief from applicable state and federal environmental protection regulations.

There would be no costs associated with disposal of final waste forms under this alternative.

4.13 WASTE MANAGEMENT ALTERNATIVE 2 – DISPOSAL IN IDF 200-EAST

The detailed cost estimates for Waste Management Alternative 2 are provided in Appendices O, P, and Q. Three separate appendices are provided for Waste Management Alternative 2 to present the various costs for the three disposal groups analyzed. The base costs for each of the appendices are the same, only the costs associated with the unique features of each disposal group are different. The base configuration includes costs to expand, operate, and deactivate the T-Plant Complex, the CWC, and two expansions of the WRAP complex. As presented in Table 4–2, the total estimated base cost of this alternative is approximately $2.4 billion.

The activities under the disposal groups are essentially the same, only the operational completion dates and disposal capacities vary between groups. Common activities under the disposal groups include:

- Continued disposal of LLW and MLLW in 218-W-5 Trenches 31 & 34 until filled in 2050.
- Construction, operation, deactivation, closure, and post-closure monitoring of IDF in 200-East Area only for tank, onsite-generated non-CERCLA. FFTF, waste management, and offsite-received LLW/MLLW.
- Construction, operation, deactivation, closure, and post-closure monitoring of the RPPDF for disposal of lightly contaminated equipment and soils as a result of clean closure activities.

- Closure of IDF and RPPDF includes installation of Modified RCRA Subtitle C barriers to reduce water infiltration and potential for intrusion.

Table 4–4 provides a summary of the costs associated with the disposal groups. Cost are presented for construction, operation, closure and transportation in conjunction with the primary cost drivers, operational completion date, IDF capacity, and RPPDF capacity. Costs associated with disposal of the waste forms are covered in Section 5.0.

Table 4–4.Summary Cost Estimates for Waste Management Alternative 2 Disposal Groups.

Group Feature	Disposal Group 1	Disposal Group 2	Disposal Group 3
Operations Completion	2050	2100	2165
IDF Capacity (m^3)	1,200,000	425,000	425,000
RPPDF Capacity (m^3)	1,030,000	8,330,000	8,330,000
Work Element	**Cost ($K)[a]**	**Cost ($K)[a]**	**Cost ($K)[a]**
Construction	118,930	459,250	459,250
Operations	649,870	5,268,900	9,465,320
Deactivation	--	--	--
Closure	946,240	1,128,880	1,128,880
Transportation[b]	521,500	521,500	521,500
Total ($K)[c]	**2,236,540**	**7,378,530**	**11,574,950**

IDF = Integrated Disposal Facility.
LLW = low-level waste.
MLLW = mixed low-level waste.
RPPDF = River Protection Project Disposal Facility.

[a]All costs are in calendar year 2008 dollars.
[b]Costs associated with transportation of offsite LLW and MLLW to Hanford for disposal. Quantity of waste, generation location, and transportation distance is the same for each disposal group.
[c]Costs for disposal of the final waste forms are presented separately in Section 5.0.

4.14 WASTE MANAGEMENT ALTERNATIVE 3 – DISPOSAL IN IDF 200-EAST & 200-WEST AREAS

The detailed cost estimates for Waste Management Alternative 3 are provided in Appendices R, S, and T. As with Waste Management Alternative 2, three separate appendices are provided for Waste Management Alternative 3 to present the various costs for the three disposal groups analyzed. The base costs for each of the appendices are the same, only the costs associated with the unique features of each disposal group are different. The base configuration includes costs to expand, operate, and deactivate the T-Plant Complex, the CWC, and two expansions of the WRAP complex. As presented in Table 4–2, the total estimated base cost of this alternative is approximately $2.4 billion.

The activities under the disposal groups are essentially the same, only the operational completion dates and disposal capacities vary between groups. Common activities under the disposal groups include:

- Continued disposal of LLW and MLLW in 218-W-5 Trenches 31 & 34 until filled in 2050.
- Construction, operation, deactivation, closure, and post-closure monitoring of two IDFs. The 200-East Area IDF receives tank waste only. The 200-West Area IDF receives onsite-generated non-CERCLA. FFTF, waste management, and offsite-received LLW/MLLW.
- Construction, operation, deactivation, closure, and post-closure monitoring of the RPPDF for disposal of lightly contaminated equipment and soils as a result of clean closure activities.
- Closure of the two IDFs and RRPDF includes installation of Modified RCRA Subtitle C barriers to reduce water infiltration and potential for intrusion.

Table 4–5 provides a summary of the costs associated with the disposal groups. Costs are presented for construction, operation, closure and transportation in conjunction with the primary cost drivers, operational completion date, IDF capacity, and RPPDF capacity. Costs associated with disposal of the waste forms are covered in Section 5.0.

Table 4–5.Summary Cost Estimates for Waste Management Alternative 3 Disposal Groups.

Group Feature	Disposal Group 1	Disposal Group 2	Disposal Group 3
200-East IDF Completion Date	2050	2100	2165
200-West IDF Completion Date	2050	2050	2050
RPPDF Completion Date	2050	2100	2165
IDF Capacity (m^3)	1,200,000 (IDF East) 90,000 (IDF West)	340,000 (IDF East) 90,000 (IDF West)	340,000 (IDF East) 90,000 (IDF West)
RPPDF Capacity (m^3)	1,030,000	8,330,000	8,330,000
Work Element	**Cost ($K)[a]**	**Cost ($K)[a]**	**Cost ($K)[a]**
Construction	118,460	459,720	459,720
Operations	646,990	5,242,040	9,399,810
Deactivation	--	--	--
Closure	1,386,420	1,570,310	1,570,310
Transportation[b]	521,500	521,500	521,500
Total ($K)[c]	**2,673,370**	**7,793,570**	**11,951,340**

IDF = Integrated Disposal Facility.
LLW = low-level waste.
MLLW = mixed low-level waste.
RPPDF = River Protection Project Disposal Facility.

[a]All costs are in calendar year 2008 dollars.

[b]Costs associated with transportation of offsite LLW and MLLW to Hanford for disposal. Quantity of waste, generation location, and transportation distance is the same for each disposal group.

[c]Costs for disposal of the final waste forms are presented separately in Section 5.0.

4.15 FFTF ALTERNATIVE 1 – NO ACTION

The detailed cost estimate for FFTF Alternative 1 is provided in Appendix U. The estimate includes costs to deactivate the FFTF complex and support buildings, followed by a 100-year administrative control period that would extend from 2008 through 2107. The administrative control costs are based on the No Action alternative scope defined in the TC&WM EIS. As presented in Table 4–3, the total estimated cost of this alternative is approximately $493 million.

The following assumptions substantively influenced the FFTF Alternative 1 cost estimate presented in this report:

- Deactivation activities for the FFTF complex and support buildings, as described in DOE/EA-1547F (2006) will be conducted from January 2007 through December 2016. Deactivation activities include the removal and packaging of the four RH Special Components for storage in the 400 Area, as described in DOE (1995), dated March 31, 2006. Note: this assumption applies to all three FFTF Alternatives.
- Administrative controls would be implemented for 100 years after deactivation activities are completed (2008-2107).

Costs associated with disposal of wastes generated during deactivation activities are presented in Section 5.0.

4.16 FFTF ALTERNATIVE 2 – ENTOMBMENT

The detailed cost estimates for FFTF Alternative 2 are provided in Appendices V and W. Two separate appendices are provided for FFTF Alternative 2 to present the costs for the two options (Hanford and Idaho) analyzed. The activities under the two options are essentially the same and include:

- Decommissioning the FFTF complex.
- Dismantling above grade structures associated with the main reactor containment building and buildings 491E and 491W.
- Consolidation of demolition waste in the below-grade spaces or disposed at IDF.
- Treatment and disposition of remote-handled special components. For the Hanford option, treatment occurs in a new Hanford facility specifically constructed for this purpose. For the Idaho option, treatment occurs at Argonne National Laboratory – West and the treated special components are returned to Hanford for disposal at IDF.
- Conversion of bulk sodium to liquid caustic for use in the WTP. Under the Hanford option, a new facility is constructed. Under the Idaho option, the bulk sodium is shipped to the existing ANL-W Sodium Processing Facility and returned to Hanford after conversion
- Installation of Modified RCRA Subtitle C barriers to reduce water infiltration and potential for intrusion.

As presented in Table 4–3, the total estimated cost for the Hanford option is approximately $289 million. The total estimated cost for the Idaho option is approximately $259 million. The

cost difference is largely a function of the need to construct Hanford facilities for dispositioning the remote-handled special components and converting bulk sodium to sodium hydroxide. The Idaho option utilizes existing facilities with modifications, as necessary, to address the same scope of work. Costs associated with disposal of the waste forms are presented in Section 5.0.

4.17 FFTF ALTERNATIVE 3 – REMOVAL

The detailed cost estimates for FFTF Alternative 3 are provided in Appendices X and Y. Two separate appendices are provided for FFTF Alternative 3 to present the costs for the two options (Hanford and Idaho) analyzed. Similar to FFTF Alternative 2, the activities under the two options are essentially the same and include:

- Decommissioning the FFTF complex.
- Dismantling above grade structures associated with the main reactor containment building and buildings 491E and 491W.
- The reactor vessel is filled with grout, removed, packaged, and transported to the IDF for disposal. All other radioactively contaminated equipment and hazardous materials are removed for disposal at IDF.
- Treatment and disposition of contact-handled and remote-handled special components. For the Hanford option, treatment of the remote-handled special components occurs in a new Hanford facility specifically constructed for this purpose. For the Idaho option, treatment occurs at Argonne National Laboratory – West and the treated special components are returned to Hanford for disposal at IDF.
- Conversion of bulk sodium to liquid caustic for use in the WTP. Under the Hanford option, a new facility is constructed. Under the Idaho option, the bulk sodium is shipped to the existing ANL-W Sodium Processing Facility and returned to Hanford after conversion
- A barrier is not needed and the site is contoured and revegetated. Post-closure monitoring occurs for 100 years following completion of revegetation.

As presented in Table 4–3, the total estimated cost for the Hanford option is approximately $297 million. The total estimated cost for the Idaho option is approximately $267 million. The cost difference is largely a function of the need to construct Hanford facilities for dispositioning the remote-handled special components and converting bulk sodium to sodium hydroxide. The Idaho option utilizes existing facilities with modifications, as necessary, to address the same scope of work. Costs associated with disposal of the waste forms are presented in Section 5.0.

5.0 DISPOSAL

This section provides the cost estimate for disposal of post-treatment waste forms (i.e., IHLW, ILAW, TRU waste) generated under each of the alternatives. These costs have been segregated because the scaled data sets provided by SAIC do not include resource estimates associated with waste disposal of the final waste forms. Disposal, when referenced in Table 4–1, refers to tasks and costs associated with construction, operation and deactivation of facilities that support disposal (e.g., interim storage, packaging) and not the final disposal costs for the waste forms themselves. The following sections present the summary cost estimates for the respective alternatives.

5.1 TANK CLOSURE DISPOSAL COSTS

These alternatives do not assume final disposal of IHLW on site. However, the number of storage facilities needed to store all the IHLW is close to the number of canister storage facilities analyzed under Tank Closure Alternative 2B. As indicated in the Administration's fiscal year 2010 budget request, the Administration intends to terminate the Yucca Mountain program—development of the site as a geologic repository for the disposal of HLW and SNF—while developing nuclear waste disposal alternatives. Notwithstanding the decision to terminate the Yucca Mountain program, DOE remains committed to meeting its obligations to manage and ultimately dispose of HLW and SNF. The Administration intends to convene a blue ribbon panel of experts to evaluate alternative approaches for meeting these obligations. The panel will provide the opportunity for a meaningful dialogue on how best to address this challenging issue and will provide recommendations that will form the basis for working with Congress to revise the statutory framework for managing and disposing of HLW and SNF.

Table 5–1 presents partial costs for disposal of the waste forms as a result of waste processing and tank farm closure under the Tank Closure Alternatives. It does not include costs for offsite disposal of HLW or IHLW. The cost is a function of the quantity of waste generated for disposal, which is highly dependent upon the assumptions for management of the waste products and the closure endpoint of the alternative. Table 5–2 provides the quantity of each waste type included in the total disposal cost.

Table 5–1. Total Cost of Waste Form Disposal by Alternative.

Alternative	Total Cost ($B)*
1 – No Action	--
2A – Existing WTP Vitrification, No Closure	**0.3**
2B – Expanded WTP Vitrification, Landfill Closure	**0.8**
3A – Existing WTP Vitrification with Bulk Vitrification, Landfill Closure	**1.3**
3B – Existing WTP Vitrification with Cast Stone, Landfill Closure	**1.5**
3C – Existing WTP Vitrification with Steam Reforming, Landfill Closure	**1.5**
4 – Existing WTP Vitrification with Supplemental Technologies, Selective Clean Closure, Landfill Closure	**2.0**
5 – Expanded WTP Vitrification with Supplemental Technologies, Landfill Closure	**0.8**
6A – All Vitrification / No Separations, Clean Closure (Base Case)	**2.8**
6A – All Vitrification / No Separations, Clean Closure (Option Case)	**9.2**
6B – All Vitrification with Separations, Clean Closure (Base Case)	**2.8**
6B – All Vitrification with Separations, Clean Closure (Option Case)	**9.1**
6C – All Vitrification with Separations, Landfill Closure	**0.6**

WTP = Waste Treatment Plant.

*All costs are in calendar year 2008 dollars.

Although the total disposal cost ranges from approximately $0.3 to $9.2 billion dollars, the majority of the disposal cost is dominated by disposal of contaminated soils. As presented in Table 5–3, the disposal cost contribution of contaminated soils in the RPPDF is 50 percent or greater except for three alternatives that implement supplemental treatment technologies (Alternatives 3A, 3B, and 3C) and the alternative with no closure (Alternative 2A). The dominance of Contaminated Soil Disposal is a function of the large volumes to be disposed onsite in the RPPDF.

For the Clean Closure Alternatives (Alternatives 6A and 6B), the tremendous quantities of treated contaminated soil are a strong contributor to the overall disposal cost. In fact, in Alternatives 6A – Option Case and 6B – Option Case, the disposal cost associated with the contaminated soils is greater than 95 percent of the total disposal cost. This contribution is better seen in the graphical depiction of Figure 5–1.

Figure 5–1. Percentage of Disposal Cost by Disposed Waste Form.

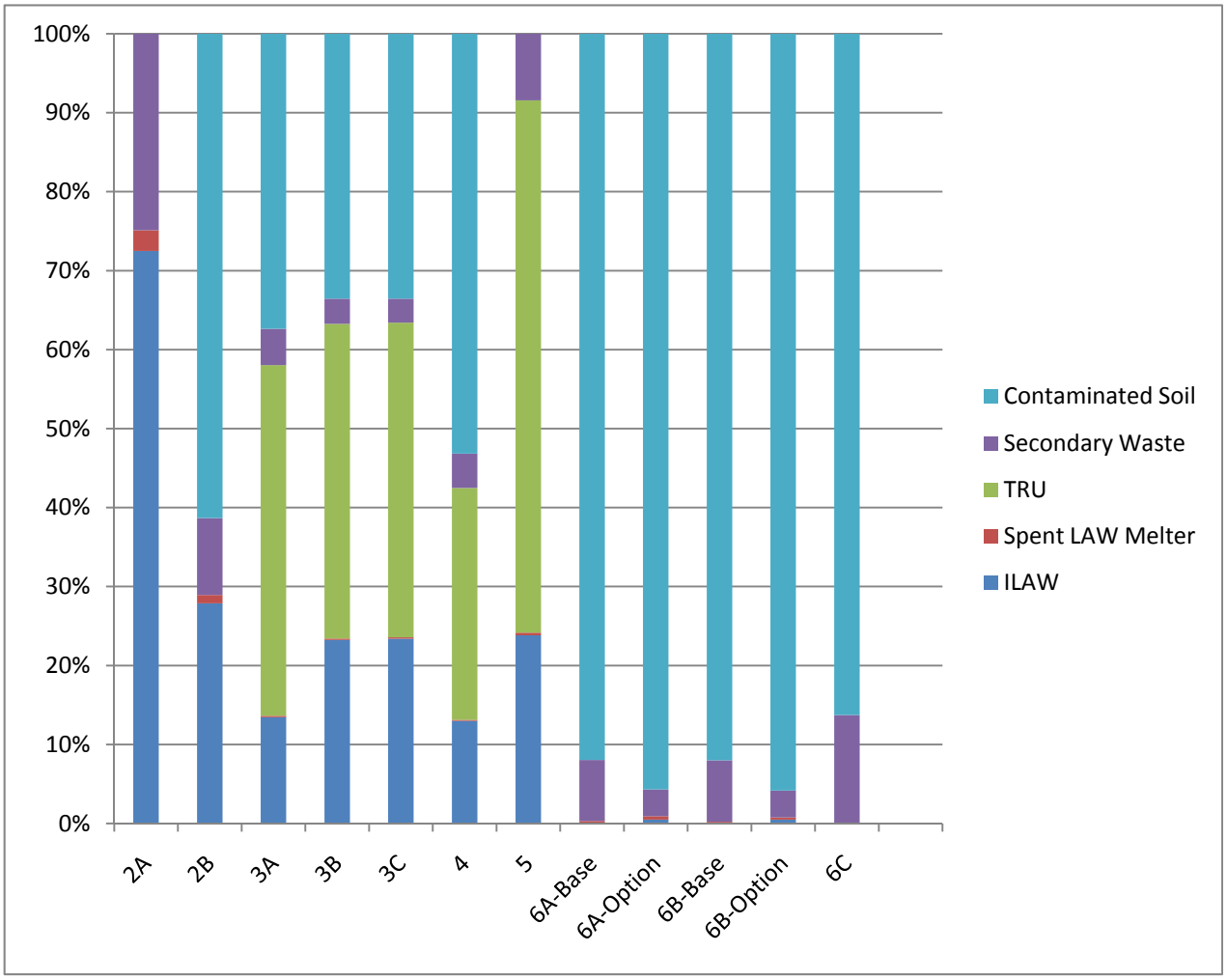


Table 5–2. Waste Forms Contributing to the Total Disposal Cost.

Alternative	Total Cost[a] ($B)	Closure Endpoint	ILAW[b] (m^3)	LAW Melters (quantity)	TRU (m^3)	Secondary Waste (m^3)	Contaminated Soils (m^3)
2A	0.3	None	212,890	30	--	73,070	--
2B	0.8	Landfill	212,890	31	--	74,480	468,220
3A	1.3	Landfill	168,520	9	3,640	57,570	468,220
3B	1.5	Landfill	298,560	9	3,640	44,550	468,220
3C	1.5	Landfill	326,700	9	3,640	42,310	468,220
4	2.6	Clean & Landfill	248,140	10	3,670	82,980	1,015,420
5	0.8	Landfill	178,250	10	3,300	63,130	--
6A (Base)	2.8	Clean	1,540[c]	25[d]	--	203,050	2,410,500
6A (Option)	9.2	Clean	42,210[c]	146[d]	--	290,850	8,233,500
6B (Base)	2.8	Clean	1,540[c]	16[d]	--	204,190	2,410,500
6B (Option)	9.1	Clean	42,210[c]	93[d]	--	292,260	8,233,500
6C	0.6	Landfill	--[e]	--	--	74,480	468,220

ILAW = immobilized low-activity waste.
LAW = low-activity waste.
PPF = Pre-Processing Facility.
TRU = transuranic (waste).
WTP = Waste Treatment Plant.

[a] All costs are in calendar year 2008 dollars.

[b] ILAW is the summation of the product waste form for LAW Vitrification, bulk vitrification, cast stone, steam reforming and PPF.

[c] Quantity of ILAW produced from operation of the PPF only.

[d] The quantity of LAW melters from PPF only. All WTP melters are managed as HLW.

[e] Under this alternative, the ILAW produced by WTP is managed as IHLW. Disposal costs for IHLW wastes are not included in the total cost.

Table 5–3. Contribution of Tank Closure Disposed Waste Forms to the Total Disposal Cost.

Waste Form	2A	2B	3A	3B	3C	4	5	6A		6B		6C
								Base	Option	Base	Option	
Estimated Cost for Disposed Waste Forms[a] ($K)[b]												
ILAW[c]	226,490	226,490	179,290	345,170	347,570	263,990	189,640	1,640[d]	44,910[d]	1,640[d]	44,910[d]	--[e]
Spent LAW Melters	8,190	8,460	2,460	2,460	2,460	2,730	2,730	6,820[f]	39,860[f]	4,370[f]	25,390[f]	--[e]
TRU	--	--	591,840	591,840	591,840	596,720	536,560	--	--	--	--	--
Secondary Waste	77,740	79,240	61,250	47,400	45,010	88,280	67,160	216,050	304,460	217,260	310,960	79,240
Contaminated Soils disposed of in RPPDF	--	498,130	498,130	498,130	498,130	1,080,290	--	2,564,770	8,760,440	2,564,770	8,760,440	498,130
Total	**312,420**	**812,320**	**1,332,960**	**1,485,000**	**1,485,010**	**2,032,000**	**796,090**	**2,789,280**	**9,154,680**	**2,788,040**	**9,141,710**	**577,370**
Percentage of Total Cost for Disposed Waste Forms (%)												
ILAW	72.5	27.9	13.5	23.2	23.4	13.0	23.8	0.1	0.5	0.1	0.5	--
Spent LAW Melters	2.6	1.0	0.2	0.2	0.2	0.1	0.3	0.2	0.4	0.2	0.3	--
TRU	--	--	44.4	39.9	39.9	29.4	67.4	--	--	--	--	--
Secondary Waste	24.9	9.8	4.6	3.2	3.0	4.3	8.4	7.7	3.4	7.8	3.4	13.7
Contaminated Soils	--	61.3	37.4	33.5	33.5	53.2	--	92.0	95.7	92.0	95.8	86.3
Total[g]	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

[a] Costs correspond to waste quantities presented in Table 5–2.
[b] All costs are in calendar year 2008 dollars.
[c] Immobilized low-activity waste (ILAW) is the summation of the disposal costs for low-activity waste (LAW) vitrification, bulk vitrification, cast stone, steam reforming and/or Pre-Processing Facility (PPF) and sulfate waste form (Alternative 5 only).
[d] The disposal cost is for the ILAW produced from operation of the PPF only.
[e] Under this alternative, the spent LAW melters and ILAW produced by the Waste Treatment Plant (WTP) are managed as high-level waste (HLW), but do not have a defined disposal pathway. Disposal costs for wastes without a defined pathway are not included in the total cost.
[f] The disposal cost represents the LAW melters from PPF only. All WTP melters are managed as HLW.
[g] Totals may not sum to 100 because of rounding.

5.2 WASTE MANAGEMENT DISPOSAL COSTS

The Waste Management Alternatives are constructed to receive waste forms from tank waste treatment and onsite-generated non-CERCLA, FFTF, and offsite-received LLW/MLLW. The disposal costs associated with tank waste treatment and FFTF are presented under Sections 5.1 and 5.3, respectively. Table 5–4 presents the disposal cost of offsite-generated LLW/MLLW, onsite-generated, non-CERCLA, and secondary wastes from disposal operations. Disposal costs are only presented for Waste Management Alternatives 2 and 3. Waste Management Alternative 1 – No Action does not receive any waste for disposal. Disposal cost estimates do not differentiate between onsite and offsite waste generators or the source of funds used to pay the disposal costs.

Table 5–4.Disposal Cost Estimates for Waste Management Alternatives.

Waste Category[a]	WM-1[b]	WM-2[c]	WM-3[d]
Offsite-Generated Waste Stream (m^3)	--	82,000	82,000
Onsite, Non-CERCLA, Non-Tank Waste (m^3)	--	5,300	5,300
Secondary Waste (m^3)	--	3,000	3,000
Disposal Cost	**Cost ($K)**	**Cost ($K)**	**Cost ($K)**
Total ($K)[e]	**--**	**96,080**	**96,080**

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980,* Public Law 96-150, 94 Stat. 2767, Title 26, 42 USC 9601 et seq.
FFTF = Fast Flux Test Facility.
IDF = Integrated Disposal Facility.
WM = Waste Management.

[a]Disposal costs associated with waste generated from tank waste treatment or FFTF are captured in Tables 5–1 and 5–5.
[b]The No Action case does not receive waste for disposal.
[c]Waste is disposed in the 200-East IDF under this alternative.
[d] Waste is disposed in both the 200-East IDF and the 200-West IDF under this alternative.
[e]All costs are in calendar year 2008 dollars.

5.3 FFTF DISPOSAL COSTS

Table 5–5 presents the cost of disposal of FFTF waste for each of the alternatives. Because the disposal costs are a function of the scope of the alternative (i.e., quantity of waste) and the type of waste, disposal volumes by waste type are also provided in Table 5–5.

Table 5–5. Disposal Cost Estimates for FFTF Alternatives.

Solid Waste Category	FFTF 1 No Action[a]	FFTF 2 Entombment[b] Hanford and Idaho	FFTF 3 Removal[b] Hanford and Idaho
Low-Level Waste (ft^3)	6.00E+04	5.05E+03	2.65E+04
Mixed Low-Level Waste (ft^3)	2.00E+03	2.36E+04	9.83E+03
Mixed TRU (ft^3)	--	--	--
Hazardous Waste (ft^3)	1.40E+04	--	1.97E+03
Non-Hazardous Waste (ft^3)	--	1.63E+04	1.63E+04
Special Waste	--	--	--
Disposal Cost	**Cost ($K)[c]**	**Cost ($K)[c]**	**Cost ($K)[c]**
Total ($K)	**2,060**	**880**	**1,090**

FFTF = Fast Flux Test Facility.
SAIC = Science Applications International Corporation.
TRU = transuranic (waste).

[a]Waste volumes are secondary solid waste only per SAIC FFTF Data Scaling Package.

[b]Waste volumes are a summation of primary and secondary solid waste per SAIC FFTF Data Scaling Package.

[c]All costs are in calendar year 2008 dollars.

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6.0 REFERENCES

40 CFR 1502.23, "Cost-benefit analysis," *Code of Federal Regulations*, as amended.

71 FR 5655, 2006, "Notice of Intent to Prepare the Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA," *Federal Register*, February 6.

Abdul, W., R. Clendon, 2003, *Life-Cycle Cost Estimate for Waste Treatment and Immobilization Plant (WTP) Operations*, Rev. 0, U.S. Department of Energy, Richland, Washington.

Burns & Roe, 2003, *Final Report Independent Cost Estimate of the Fast Flux Test Facility (FFTF) Closure Project at Hanford, Richland, Washington*, prepared for the U.S. Department of Energy, Office of Engineering and Construction Management, by Burns and Roe Enterprises, Inc., Oradell, New Jersey.

CEES, 2007, "Tank Closure and Waste Management EIS," (Communication Record, D. Nichols, January 24), Columbia Energy & Environmental Services, Inc., Richland, Washington.

Chapin, D., 2006, *Response to New or Changed Data Form 261*, December 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

Daniels, J., 2007, *Response to New or Changed Data Form 263*, Attachment 2, January 9, U.S. Department of Energy, Office of River Protection, Richland, Washington.

DOE/EA-1547F, 2006, *Environmental Assessment, Sodium Residuals Reaction/Removal and Other Deactivation Work Activities, Fast Flux Test Facility (FFTF) Project, Hanford Site, Richland, Washington*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/ORP-2003-02, 2003, *Inventory and Source Term Data Package*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

DOE/ORP-2003-03, 2003, *Worker and Public Safety Data Package*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

DOE/ORP-2003-04, 2003, *Waste Disposal Data Package*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

DOE/ORP-2003-05, 2003, *Tank System Closure and Facility Decontamination and Decommissioning Data Package*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

DOE/ORP-2003-06, 2003, *Waste Retrieval and Storage Data Package*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

DOE/ORP-2003-07, 2003, *Waste Treatment and Supplemental Technology*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

DOE/ORP-2003-08, 2003, *No Action Baseline Tank Farm Operations and Waste Treatment Data Package*, Rev. 0, U.S. Department of Energy, Office of River Protection, Richland, Washington.

DOE/ORP-2003-09, 2003, *Inventory and Assessment Guidance Data Package*, U.S. Department of Energy, Office of River Protection, Richland, Washington, April 17.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Gannon, B., 2007, "Revised TC&WM EIS Data Sets," (e-mail to D. Nichols and C. Henderson, Columbia Energy & Environmental Services, Inc., July 24), Science Applications International Corporation, Germantown, Maryland.

Higgins, G., 2006a, *Response to New or Changed Data Form 259,* Attachment Capital Costs/EIS RFI-02, December 7, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Higgins, G., 2006b, *Response to New or Changed Data Form 260*, December 7, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Kimmel, R., 2007, "Steam Reforming CD-2 Performance Baseline," (Communication Record, February 1), U.S. DOE-Idaho, Idaho Falls, Idaho.

Magwood, J., 2001, *A Report to Congress on Electrometallurgical Treatment Waste Forms*, U.S. Department of Energy, Office of Nuclear Energy, Washington, D.C.

National Environmental Policy Act of 1969, 42 USC 4321 et seq.

Nichols, D., 2006, "Year of Dollars for DOE/ORP-2003-14, Rev. 2," (Communication Record, December 6), Columbia Energy & Environmental Services, Inc., Richland, Washington.

Nichols, D., 2007, "Issues Associated with Preparation of DOE/ORP-2003-14, Rev. 2 (Resolution with DOE-ORP and SAIC)," (meeting minutes, January 23), Columbia Energy & Environmental Services, Inc., Richland, Washington.

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

WAC 197-11, "SEPA rules," Section 450, "Cost-benefit analysis," *Washington Administrative Code*, as amended.