PNNL-13901

Pacific Northwest
National Laboratory
Operated by Battelle for the
U.S. Department of Energy

Summary of High Level Waste Tank Lay-Up Activities Supporting the Tanks Focus Area, Fiscal Years 2001-2002

M. Elmore
C. Henderson*

May 2002

*Jacobs Engineering Group, Inc.

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RL01830

DISCLAIMER

PACIFIC NORTHWEST NATIONAL LABORATORY
operated by
BATTELLE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC06-76RL01830

Printed in the United States of America

Available to DOE and DOE contractors from the
Office of Scientific and Technical Information,
P.O. Box 62, Oak Ridge, TN 37831-0062;
ph: (865) 576-8401
fax: (865) 576-5728
email: reports@adonis.osti.gov

Available to the public from the National Technical Information Service,
U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161
ph: (800) 553-6847
fax: (703) 605-6900
email: orders@ntis.fedworld.gov
online ordering: http://www.ntis.gov/ordering.htm


This document was printed on recycled paper.
(8/00)

PNNL-13901

Summary of High Level Waste Tank Lay-Up Activities Supporting the Tanks Focus Area, Fiscal Years 2001-2002

May 2002

Prepared for
Tanks Focus Area and
the U.S. Department of Energy
under Contract DE-AC06-76RL01830

Jacobs Engineering Group, Inc., and
Pacific Northwest National Laboratory
Richland, Washington 99352

CONTENTS

1.0 INTRODUCTION 1
2.0 BACKGROUND 1
3.0 SUPPORT TO WVDP 1
4.0 EXTENSION TO OTHER U. S. DEPARTMENT OF ENERGY TANK SITES 2
5.0 CONCLUSIONS AND RECOMMENDATIONS 2
6.0 ANNOTATED BIBLIOGRAPHY 2
7.0 REFERENCES 15

ACRONYMS

BBI	best basis inventory
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DOE/ID	DOE Idaho Field Office
DWPF	Defense Waste Processing Facility
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
EM	DOE Environmental Management Program
FFA	Federal Facilities Agreement
FSAR	final safety analysis report
FY	fiscal year
HLW	high-level waste
HWMA	*Hazardous Waste Management Act*
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LLLW	liquid low-level waste
LLW	low-level waste
MOU	Memorandum of Understanding
MUST	miscellaneous underground storage tank
ORNL	Oak Ridge National Laboratory
ORP	DOE Office of River Protection
ORR	Oak Ridge Reservation
PNNL	Pacific Northwest National Laboratory
RCRA	*Resource Conservation and Recovery Act*
ROD	Record of Decision
RPP	River Protection Project
SEIS	supplemental environmental impact statement
SRS	DOE Savannah River Site
TDEC	Tennessee Department of Environmental Conservation
TFA	tanks focus area
TFF	tank farm facility
TRU	transuranic
TTG	tank technology guide
TWRS	tank waste remediation system
WAC	waste acceptance criteria
WVDP	West Valley Demonstration Project
WVMA	West Valley Management Area
WVNS	West Valley Nuclear Services
WVNW	West Valley Nuclear Wastes

1.0 INTRODUCTION

This report compiles and summarizes the activities and reports completed in support of the Tanks Focus Area (TFA) under Technical Task Plan RL30WT21 (Subtask A), *Post-Retrieval and Pre-Closure HLW Tank Lay-Up*, from its inception through March 2002. This report presents the chronology and evolution of the task, and provides electronic links to reports where greater detail may be found. In addition, an annotated bibliography of relevant documents, collected during this task, is provided.

2.0 BACKGROUND

The TFA recognized that, for a number of sites, there would likely be an extended period of time between waste retrieval and tank closure due to the issues and uncertainties associated with making final closure decisions. The TFA also recognized the need to develop a strategy for placing tanks that no longer contained any retrievable waste into a safe, stable, and minimum maintenance condition until final closure could occur. This state of pre-final closure (otherwise known as interim closure, operational closure, etc.) was termed tank lay-up. The TFA identified a particular need for this strategy at the West Valley Demonstration Project (WVDP) since the site was nearing the end of its waste retrieval phase. Early in fiscal year (FY) 2001, TFA funded a task through the Pacific Northwest National Laboratory (PNNL) in collaboration with Jacobs Engineering to assist WVDP in tank lay-up planning.

Following completion of the WVDP support task, the TFA reviewed and redirected the task to determine what each of the sites had already done on tank lay-up, then facilitate intersite communication of lessons-learned from these activities. The sites would be visited to review lay-up progress, then periodic, structured dialogue would be set up among the sites, and a virtual library of lay-up related literature was to be established.

By February 2002, each of the four major waste tanks sites [Hanford, Idaho National Environmental and Engineering Laboratory (INEEL), Oak Ridge Reservation (ORR), and Savannah River Site (SRS)] had been visited and evaluated for tank closure status.

In April 2002, following completion of the visits to the major tank sites, the TFA requested the orderly closure of this task.

3.0 SUPPORT TO WVDP

The primary objective of the overall task was to develop and evaluate conceptual strategies for the lay-up of two high-level waste (HLW) storage tanks at WVDP. Working with key staff from West Valley Nuclear Services (WVNS), requirements were developed for laying up the tanks for a 20-year period in a safe and stable condition with minimum capital and operating costs. Results are detailed in Letter Report # 1 (Jacobs, 2001a).

Several tank lay-up options were identified and evaluated for potential application alone, or in combination with one another. In addition, the principal information needs for a final decision on the preferred lay-up strategy were identified. Results are detailed in Letter Report #2

(Jacobs, 2001b). A methodology was then developed to use the tank lay-up requirements as evaluation criteria to down select from the identified lay-up options and arrive at a preferred option (Jacobs, 2001c). Utilizing a team of technical specialists, weighting factors were assigned to the evaluation criteria, and a preferred tank lay-up option was selected and presented to the WVNS staff (Jacobs, 2001d).

4.0 EXTENSION TO OTHER U. S. DEPARTMENT OF ENERGY TANK SITES

A proposal was generated to extend the WVDP tank lay-up strategy development methodology to the other U. S. Department of Energy (DOE) tank sites (JEG-01-005, 2001), and a preliminary assessment was made of the sites' lay-up requirements and considerations (JEG-01-023, 2001).

Visits were made to the major tank sites (Hanford, INEEL, ORR, and SRS) to review the tank lay-up progress, and to determine interest in initiating intersite communication on tank lay-up activities (JEG-02-011). This was the final activity in support of this task before its termination.

5.0 CONCLUSIONS AND RECOMMENDATIONS

As of the date of this report, there is still a wealth of important and useful information on tank closure activities at each of the sites that has not been communicated or made accessible to all the tank sites. Currently, because its tank closure program is maturing, Hanford has the most to gain from what has been tried at other sites. Successful and unsuccessful waste retrieval and tank closure technologies, regulatory and land use strategies, closure costs, and changes to authorization bases are just some of the topics that would be of interest to all tank sites.

Whether as part of a future TFA revival of tank lay-up activities or not, consideration should be given to ways to improve the intersite communication on tank lay-up activities. One way to do this might be to establish a Tank Interim (or Operational) Closure Working Group or incorporate the interim closure concept into an existing tank closure entity. This working group should consider establishing a web-based virtual reference library and stocking it with programmatic, technical, and regulatory tank closure documentation from all the tank sites. In addition, this working group might consider establishing periodic, structured, intersite videoconferences and rotating site meetings.

6.0 ANNOTATED BIBLIOGRAPHY

The following are key documents referenced in the appendices. A brief summary of each document has been provided, and an acronym list may be found at the end of the bibliography.

1. DOE/EIS-0189, 1996, *Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement*, U.S. Department of Energy and Washington State Department of Ecology, Washington, D.C. and Olympia, Washington.

   The Tank Waste Remediation System (TWRS) Environmental Impact Statement (EIS) analyzes the potential environmental consequences related to TWRS alternatives for

management and disposal of radioactive, hazardous and mixed waste, including Cs/Sr capsules, 177 HLW tanks and 60 miscellaneous underground storage tanks (MUSTs).

2. DOE/EM-0449, 1999, *SRS Tank Closure, a Tanks Focus Area Innovative Technology Summary Report*, U.S. Department of Energy Office of Environmental Management, Washington, D.C.

   Summary-level document that describes the closure of Tanks 17 and 20 at the Savannah River Site using grout stabilization.

3. DOE/OR/01-1135&D2, 1993, *Federal Facility Agreement Plans and Schedules for Liquid Low-Level Radioactive Waste Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, U.S. Department of Energy Office of Environmental Management, Washington, D.C.

   This document describes the strategy for meeting the Federal Facility Agreement (FFA) requirements at Oak Ridge National Laboratory (ORNL), summarizes the progress made to date, and revises plans and schedules that were submitted in March 1992.

4. DOE/OR/01-1159&D1, 1997, *Waste Characterization Data Manual for the Inactive Liquid low-Level Waste Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, U.S. Department of Energy Office of Environmental Management, Washington, D.C.

   This report contains the results of an analysis of the contents of liquid low-level waste (LLLW) tanks that were removed from service per the ORNL FFA.

5. DOE/OR/01-1721&D3, 1999, *Engineering Evaluation/Cost Analysis for the Bethel Valley Main Plant Inactive Liquid Low-Level Radioactive Waste Tanks,* U.S. DOE Office of Environmental Management, Washington, D.C.

   This document provides an engineering evaluation and cost analysis for removing tank contents and either removing or stabilizing the tanks in place. This evaluation and analysis develops, evaluates, and recommends a preferred alternative. These tanks range in size from 700 gallons to 4000 gallons.

6. DOE/OR/01-1725&D1, 1998, *Treatability Study Report on the Gunite and Associated Tanks Waste Removal*, U.S. Department of Energy Office of Environmental Management, Washington, D.C.

   This report describes the results of a treatability study conducted on waste removal from the Gunite and Associated Tanks Operable Unit at ORNL. The treatability study on waste removal included the use of a full-scale radioactive tank cleaning system. The study was planned so that the equipment used, if successful, could be transitioned into the remediation without the need to remobilize.

7. DOE/OR/01-1813&D1, 1999, *Action Memorandum for the Bethel Valley Main Plant Inactive Liquid Low-Level Radioactive Waste Tanks*, U.S. Department of Energy Office of Environmental Management, Washington, D.C.

   This document lists the activities that are included in remediation of the 27 tanks identified, including excavation to expose tank shells/manholes or installation of new risers, removal of liquids and solids, packaging liquids and solids not meeting the on-site waste acceptance criteria (WAC) for disposition, isolation of piping, vents, support connections, etc.

8. DOE/OR/01-1821&D1, 1999, *Removal Action Work Plan for the Bethel Valley Main Plant Inactive Liquid Low-Level Radioactive Waste Tanks*, U.S. Department of Energy Office of Environmental Management, Washington, D.C.

   This work plan describes the actions that will be taken to remove waste from 11 ORR tanks and stabilization of the tank shells by grouting them in place.

9. DOE/OR/01-1833&D2, 1999, *Action Memorandum Addendum for the Bethel Valley Main Plant Inactive Liquid Low-Level Radioactive Waste Tanks*, U.S. Department of Energy Office of Environmental Management, Washington, D.C.

   This document adds 16 tanks to Reference 8, above, at ORR.

10. DOE/OR/01-1842&D1, 1999, *Addendum to the Removal Action Work Plan for the Bethel Valley Main Plant Inactive Liquid Low-Level Radioactive Waste Tanks*, U.S. Department of Energy Office of Environmental Management, Washington, D.C.

    This work plan addendum (to Reference 8, above, at ORR) provides sufficient detail of activities to be conducted to identify regulatory, safety, and logistical issues and to resolve these issues prior to field implementation. The scope of this addendum is sludge removal and in-place stabilization.

11. DOE/OR/02-1591&D3, 1997, *Record of Decision for Interim Action: Sludge Removal from the Gunite and Associated Tanks Operable Unit, Waste Area Grouping 1*, U.S. Department of Energy Office of Environmental Management, Washington, D.C.

    This Record of Decision (ROD) presents the selected interim remedial action for removing mixed transuranic (TRU) waste sludge from eight tanks in the Gunite and Associated Tanks Operable Unit at ORNL. The objective of this interim action is to reduce the potential for on- and off-site risk from tank contents.

12. DOE/ORP-2000-06, 2001, *River Protection Project – Project Management Plan*, Rev. 2, U.S. Department of Energy, Office of River Protection, Richland, Washington.

    This project management plan describes how the Office of River Protection (ORP) manages the River Protection Project (RPP). Specifically, it summarizes the project

scope, schedule, and cost, describes the ORP organization and responsibilities, describes how ORP will manage, control and integrate the project and its prime contractors, and identifies other documents that further define the project and management systems.

13. DOE/ORP-2000-10, 2001, *River Protection Project Mission Analysis and Requirements Report*, Rev. 1, U.S. Department of Energy, Office of River Protection, Richland, Washington.

    This report describes the RPP mission, the top-level functions that must be conducted to accomplish the mission and the requirements that must be met to achieve these functions. RPP participants will use this report to develop lower-level functions and requirements necessary to conduct work. This report describes the initial state, desired outcome and establishes top-level functions and requirements to reach the end state.

14. HLW-2001-00040, 2001, *Savannah River Site High Level Waste System Plan*, Rev. 12, Savannah River Operations Office, Aiken, South Carolina.

    This HLW system plan documents the operating strategy of the HLW system at SRS to receive, store, treat and dispose of high-level waste. Included is a comparison of scope and funding for the different production cases, a review of the SRS HLW track record, a discussion of key process issues facing the HLW system and recognition of Defense Nuclear Facilities Safety Board (DNFSB) recommendation 2001-1 (03/15/2001).

15. HNF-SD-WM-SAR-067, 1999, *Hanford Tank Waste Remediation System Final Safety Analysis Report*, Rev. 2, Volumes I and II, Lockheed Martin Hanford Corporation, Richland, Washington.

    The Hanford Final Safety Analysis Report (FSAR) documents the results of the safety analyses that establish and evaluate adequacy of the safety basis for Hanford facilities and operations that support the safe, interim storage of tank waste. The FSAR also establishes the envelope within which the TWRS facilities and operations can continue to operate.

16. PNNL-13651, 2001 *Technical Review of Retrieval and Closure Plans for the INEEL INTEC Tank Farm Facility*, UC-721, Pacific Northwest National Laboratory, Richland, Washington.

    This report documents the conclusions of a technical review of retrieval and closure plans for the INEEL Idaho Nuclear Technology and Engineering Center (INTEC) tank farm. The review focused on evaluation of the technical feasibility and appropriateness of the approach selected by INEEL (using a wash ball for residual waste removal and cleaning followed by grout pouring) and the technology gaps that could be addressed through utilization of technologies and performance used at other DOE sites and the private sector.

17. SRS, 2000, *Savannah River Site Closure Plan and Performance Assessment for F- and H-Area High Level Waste Tank Systems*, Preliminary Draft (Rev. 2), Savannah River Operations Office, Aiken, South Carolina.

This plan establishes the general protocol for which DOE intends to close SRS Site F-Area and H-Area HLW tank systems. This plan describes the environmental setting for the HLW tanks and the human and environmental receptors potentially affected by tank closures. In establishing the performance objectives for HLW system closure, DOE has assumed that the residual waste material remaining in the tanks will not be managed as HLW. Per DOE Order 435.1, DOE will demonstrate the residual waste is incidental to reprocessing.

18. DOE/EIS-0217, 1995, *Savannah River Site, Waste Management, Final Environmental Impact Statement*, 2 volumes, U.S. Department of Energy Savannah River Operations Office, Aiken, South Carolina.

The purpose of this EIS is to help DOE decide how to manage radioactive (HLW, LLW, TRU), hazardous and mixed waste stored at SRS.

19. DOE/EIS-0222F, 1999, *Final Hanford Comprehensive Land Use Plan Environmental Impact Statement*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

This document analyzes potential environmental impacts associated with establishing future land use objectives for Hanford.

20. DOE/EIS-0287D, 1999, *Idaho High-Level Waste and Facilities Disposition Draft Environmental Impact Statement*, U.S. Department of Energy, Washington, D.C.

This EIS describes technologies and methods DOE is considering for management of HLW and related wastes and the disposition of HLW generation, storage, and treatment facilities. The document also provides environmental consequences and regulatory issues surrounding the various management alternatives under consideration at INEEL.

21. DOE/EIS-0303D, 2000, *High Level Waste Tank Closure, Draft Environmental Impact Statement*, U.S. Department of Energy, Savannah River Operations Office, Aiken, South Carolina.

This draft EIS discusses three alternatives (clean and stabilize tanks, clean and remove tanks, and no action alternative). It also considers three options for tank stabilization (fill with grout (preferred), fill with sand, fill with salt stone).

22. DOE-ID, 1991, *Federal Facility Agreement and Consent Order and Action Plan*, U.S. Department of Energy, Idaho Field Office, U.S. Environmental Protection Agency, Region 10, Idaho Department of Health and Welfare, Idaho Falls, Idaho.

In 1992, DOE and the Idaho Department of Health and Welfare signed a consent order to resolve a Notice of Noncompliance issued by the U.S. Environmental Protection Agency (EPA) Region 10. This Consent Order addresses concerns regarding the *Resource Conservation Recovery Act* (RCRA) secondary containment requirements for the INEEL HLW tanks by prescribing dates by which the tanks must be removed from service.

23. DOE/OR-1014, 1992, *Federal Facility Agreement for the Oak Ridge Reservation*, U.S. Department of Energy Oak Ridge Operations Office, Environmental Protection Agency, and the Tennessee Department of Environmental and Conservation, U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, Tennessee.

The Parties to this Agreement are the EPA, the Tennessee Department of Environmental Conservation (TDEC), and the DOE. The terms of the Agreement apply to and are binding upon the EPA, TDEC, and DOE, their respective agents, employees, and response action contractors and upon all subsequent owners, operators, and lessees of the DOE for the Site. It is a binding agreement that ensures the environmental impacts associated with past and present activities at the Site are thoroughly investigated and that appropriate remedial action is taken as necessary to protect the public health, welfare, and the environment.

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

The Hanford Federal Facility Agreement and Consent Order, or HHFACO, is an agreement for achieving compliance with *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) remedial action provisions and with RCRA treatment, storage, and disposal unit regulations and corrective action provisions. More specifically, the Tri-Party Agreement: 1) defines and ranks CERCLA and RCRA cleanup commitments, 2) establishes responsibilities, 3) provides a basis for budgeting, and 4) reflects a concerted goal of achieving full regulatory compliance and remediation, with enforceable milestones in an aggressive manner. The HFFACO is a legally binding agreement consisting of: 1) The "Legal Agreement" itself which describes the roles, responsibilities and authority of the three agencies, or "Parties", in the cleanup, compliance and permitting processes. It also sets up dispute resolution processes and describes how the agreement will be enforced, and 2) The "Action Plan" to implement the cleanup and permitting efforts which includes milestones (in Appendix D) for initiating and completing specific work and procedures the three agencies will follow.

25. MOU, 1996, *Memorandum of Understanding: Required Percent of Waste Retrieval*, U.S. Department of Energy and Washington State Department of Ecology, Richland, Washington.

This Memorandum of Understanding (MOU) states that a minimum of 99% of the waste must be retrieved from Hanford HLW tanks.

26. NYSERDA, 1980, *Cooperative Agreement between the U.S. Department of Energy and the New York State Energy Research and Development Authority*, New York State Energy Research and Development Authority, Albany, New York.

This agreement includes, but is not limited to the use of the facilities by DOE for the WVDP, the guarantee for technical assistance from DOE in securing license amendments, and a guarantee of joint submittal of an NRC license amendment, providing DOE with exclusive possession of the Project Premises and facilities necessary to conduct the WVDP.

27. WSRC-OS-94-42, 1993, *Federal Facility Agreement for the Savannah River Site*, Administrative Document Number 89-05-FF, U.S. Department of Energy and South Carolina Department of Health and Environmental Control, Aiken, South Carolina.

This is an agreement between EPA Region IV, DOE, and the South Carolina Department of Health and Environmental Control. This agreement establishes requirements for remediation of SRS. It states that HLW tanks must meet structural integrity requirements or be removed from service.

28. DOE/ID-XXXXX, 2001, *Tier I Closure Plan for the Idaho Nuclear Engineering and Technology Center Tank Farm Facility at the INEEL*, Rev. 0 Draft, U.S. Department of Energy, Idaho Operations Office, Idaho Falls, Idaho.

This document describes and documents the Tier I closure plan methodology used at INEEL to comply with the requirements of DOE Order 435.1 and additional requirements under RCRA.

29. DOE/ID-10802, 2001, *Idaho Hazardous Waste Management Act/Resource Conservation and Recovery Act Closure Plan for Idaho Nuclear Technology and Engineering Center Tanks WM-182 and WM-183*, Rev. 1, U.S. Department of Energy, Idaho Operations Office, Idaho Falls, Idaho.

This document outlines the conceptual closure plan approach for tank closure at INEEL to comply with both the requirements of DOE Order 435.1 and HWMA/RCRA requirements.

30. DOE/ORP-2001-18, 2001, *Single-Shell Tank Closure Plan*, Appendix F, "Complex-Wide Closure Progress and Issues," Rev. 0 Draft, U.S. Department of Energy, Office of River Protection, Richland, Washington.

The purpose of this appendix is to provide a comparative overview of tank closure issues at five sites in the DOE complex. Information on tank waste characteristics and generation, storage tank descriptions, and plans and regulatory drivers for tank closure are included. Much of the information is summarized from the Tanks Focus Area *Multiyear Program Plan FY01-FY05* (PNNL-13339).

31. INEEL/EXT-99-01066, 2000, *Idaho Nuclear Technology and Engineering Center Tank Farm Facility Conceptual DOE and HWMA/RCRA Closure Approach (FINAL)*, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho.

This document outlines the conceptual approach for closure of the INTEC tank farm facility (TFF) located at the INEEL. The conceptual approach uses SRS documentation as the foundation for development of closure documentation.

32. INEEL/EXT-2001-XX, 2000, *Performance Assessment for the Tank Farm Facility at the Idaho National Engineering and Environmental Laboratory*, Draft, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho.

This report documents the projected radiological dose impacts associated with closure of the TFF at the INTEC at INEEL. This assessment was conducted to support the DOE/ID Tier 1 Closure Plan for the TFF.

33. DOE/EIS-0226-D, 1996, *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure of Long-Term Management of Facilities at the Western New York Nuclear Service Center*, U.S. Department of Energy, New York State Energy Research and Development Authority, New York.

This document analyzes alternatives of no action, complete removal and off-site disposal, complete removal and on-site storage, in-place stabilization and on-site disposal and discontinues operations.

34. Fussner, R. J., 2001, communication record of personal communication with Robert J. Fussner, West Valley Nuclear Services Company, Inc., West Valley, New York.

This memorandum discusses the regulatory implications of West Valley HLW lay-up options.

35. Wallon, D. V., 2001, communication record of personal communication with Doug V. Wallon, West Valley Nuclear Services Company, Inc., West Valley, New York.

This communication record discusses the presence of a “bathtub ring” of dried solids on the walls and internal structures of tank 8D-2.

36. WVDP-141, 1992, *Resource Conservation and Recovery Act Closure Plan for the High Level Waste Process Tanks: Tanks 8D-1 & 2*, West Valley Nuclear Services Company, Inc., West Valley, New York.

This plan describes potential closure concepts for two high-level mixed waste tanks. It is intended to meet the RCRA/State of New York hazardous waste requirements only.

37. WVNW, 1987, *Stipulation of Compromise with the Coalition on West Valley Nuclear Wastes*, U.S. District Court, Western District of New York.

This Stipulation of Compromise is an agreement between DOE and the entity Coalition on West Valley Nuclear Wastes (WVNW), resulting from litigation relating to on-site disposal of low-level radioactive waste generated by implementation of the WVDP. The agreement sets forth the stipulation agreement that related to the scope of the WVDP EIS.

38. *West Valley Demonstration Project Act*, 42 USC 2021a, et seq.

The WVDP Act authorized DOE to demonstrate that liquid from the reprocessing of spent nuclear fuel could be safely managed.

39. Chang, J.Y., D.C. Meess, S.M. Barnes, and F.W. Damerow, 1998, *Corrosion Monitoring and Control for Tanks 8D-1, 8D-2 and the Vitrification Melter*, Volume 1, The Fifth Annual Technical Review Meeting at West Valley, New York, September 21-22.

This report documents issues that were discussed and recommendations to continue to mitigate HLW tank external corrosion. Corrosion rate was monitored and four recommendations were documented.

40. Chang, J.Y., D.C. Meess, and S.M. Barnes, 1999, *Corrosion Monitoring and Control for Tanks 8D-1, 8D-2 and the Vitrification Melter*, Volume 2, The Sixth Annual Technical Review Meeting at West Valley, New York, September 21-22.

This report continues to document issues that were discussed and recommendations to continue to mitigate HLW tank external corrosion. Corrosion rate was monitored and four recommendations were documented.

41. EML-609, 2000, *West Valley Demonstration Project Waste Management Area #3 – Closure Alternative I*, Environmental Measurements Laboratory, New York, New York.

West Valley Management Area (WVMA) identified five potential closure alternatives. This report focuses on HLW storage area (tanks 8D-1 and 8D-1), closure alternative I (complete removal of all structures, systems, components and release of the area for unrestricted use).

42. Meess, D.C. and J.Y. Chang, 1997, *Corrosion Monitoring and Control for Tanks 8D-1 & 8D-2*, The Fourth Annual Technical Review Meeting at West Valley, New York, September 8-9.

This report documents issues that were discussed and recommendations to continue to mitigate HLW tank external corrosion. Testing and corrosion mitigation methods are discussed.

43. SCFA, 1994, *Subsurface Contaminants Focus Area, Fact Sheet on Close-Coupled Jet Grout Barrier.*

The web access page is located at: http://www.envnet.org/scfa/archive/stc/jetgrout.htm, accessed on March 21, 2001. As of May 16, 2002, this web site was not available.

This fact sheet describes the use of close-coupled jet grout barriers injected beneath an existing waste site to form a relatively impermeable barrier.

44. SCFA, 1997, *Subsurface Contaminants Focus Area, Fact Sheet on Viscous Liquid Barrier.*

The web access page is located at: http://www.envnet.org/scfa/prodlines/stcr/factsheets/visliq.htm, accessed on March 21, 2001. As of May 16, 2002, the web site is not available.

This Fact Sheet describes viscous liquid barriers as inert liquids that increase their viscosity after being injected into the soil, forming an impermeable barrier. The fact sheet lists a successful demonstration at Brookhaven National Laboratory in FY 97.

45. USEPA, 1999, *United States Environmental Protection Agency, Innovative Freeze Barrier Installation at ORNL*, access page located at: http://www.epa.gov/tio/products/newsltrs/ttrend/tt0299.htm, accessed on March 21, 2001.

This report discusses the successful application of a cryogenic freeze barrier that was installed to isolate a settling pond adjacent to en experimental reactor at ORNL.

46. Williams, A.C., 2001, *Expectations for High-Level Waste (HLW) Removal from the Waste Tank Farm* (letter to Robert Campbell, President, West Valley Nuclear Services Company, February 7), West Valley Demonstration Project, Ohio Field Office, U.S. Department of Energy, West Valley, New York.

This letter documents expectations from DOE-Ohio Field Office to West Valley Nuclear Services on removal of HLW from the West Valley tank farm. These expectations include residue removal of HLW until 10 CFR 61 limits are not exceeded and the West Valley Management Area (WVMA) performance assessment can be satisfied. It also discusses the expectation on removal of fixed contamination.

47. WVNS-DC-065, 1995, *Design Criteria – Inert Gas System for HLW Tanks 8D-1 and 8D-2 Vaults*, West Valley Nuclear Services, West Valley, New York.

This document provides design criteria for an inert gas supply system to reduce the rate of external corrosion of two HLW tanks.

48. 60 FR 18589, 1995, "Record of Decision for the Defense Waste Processing Facility at the Savannah River Site, Aiken, South Carolina," *Federal Register*, April 12.

This ROD states that DOE has determined that the best method for immobilizing high-level waste at Savannah River is to complete construction, startup testing and operation of their Defense Waste Processing Facility (DWPF), as designed, including safety modifications.

49. 60 FR 55249, 1995, "Record of Decision for Savannah River Site Waste Management," *Federal Register*, October 30.

DOE determined, within this ROD, that the most appropriate method for managing low-level radioactive, low-level mixed, and TRU wastes at Savannah River is to implement a moderate treatment configuration alternative, consisting of operation of existing facilities, new recycling initiatives, consolidated incineration facility operation, LLW volume reduction and operation of a mobile sort facility.

50. 62 FR 8693, 1997, "Record of Decision for the Tank Waste Remediation System, Hanford Site, Richland, Washington," *Federal Register*, February 26.

This ROD was issued by DOE to adopt a comprehensive land use plan for Hanford to facilitate decision-making about the site's uses and facilities over at least the next 50 years.

51. 64 FR 61615, 1999, "Record of Decision for the Hanford Comprehensive Land-Use Plan Environmental Impact Statement, *Federal Register*, November 12, 1999.

This ROD addresses actions by DOE to manage and dispose of radioactive, hazardous and mixed wastes within the TWRS program at Hanford.

52. BBI, 2001, *Best Basis Inventory*, access page located at: http://twins.pnl.gov:8001/twins.htm, as of May 2001.

This inventory report provides the best basis inventory of Hanford HLW tanks, on an individual tank basis.

53. Cory, W. N., 1998, "Second Modification to Consent Order," Idaho Department of Health and Welfare, Division of Environmental Quality, Boise, Idaho.

The Consent Order, developed by the state, requires DOE-Idaho Operations Office to cease use of the five pillar and panel vault tanks by 2009 and to cease use of the remaining six tanks by 2015. An August 1998 modification to the Consent Order accelerated these dates to 2003 and 2012, respectively.

54. DOE/EIS-0082S, 1994, *Final Supplemental Environmental Impact Statement - Defense Waste Processing Facility*, U.S. Department of Energy, Savannah River Operations Office, Aiken, South Carolina.

DOE prepared this SEIS to examine the impacts of completing construction and operating the DWPF at SRS. This document assisted DOE in deciding how to proceed with the DWPF project, given changes since 1982.

55. DOE/EM-0362, 1998, *Accelerating Cleanup: Paths to Closure*, U.S. Department of Energy, Washington, D.C.

The Hanford Site underwent a concerted effort between 1994 and 1996 to accelerate the cleanup of the Site. These efforts are reflected in the current Site Baseline. This document describes the current Site Baseline and suggests strategies for further improvements in scope, schedule, and cost. The Environmental Management program (EM) decided to change the name of the draft "strategy" and the document describing it in response to a series of stakeholder concerns, including the practicality of achieving widespread cleanup by 2006. Also, EM was concerned that calling the document a "plan" could be misconstrued to be a proposal by DOE or a decision-making document. The change in name, however, does not diminish the 2006 vision. To that end, *Paths to Closure* retains a focus on 2006, which serves as a point in time around which objectives and goals are established.

56. DOE/RL-00-01, 1994, *Recommendation 93-5 Implementation Plan*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Recommendation 93-5 noted that there was insufficient information to ensure Hanford wastes could be safely stored, associated operations could be conducted safely and future disposal data requirements could be met. As a result, a characterization and safety strategy evolved.

57. DOE/RL-97-57, Draft, *Accelerating Cleanup Paths to Closure Hanford Site,* U.S. Department of Energy, Richland Operations Office, Richland, Washington.

This draft document is a vision for 2006 that includes a baseline and the results that could be achieved if the site's stretch and breakthrough goals are achieved.

58. DOE/RL-89-16, 2001, *Single-Shell Tank Closure Work Plan (Draft)*, Jacobs Engineering Group Inc., Richland, Washington.

This document provides an overlay of closure strategy, with ongoing TWRS activities. The purpose of the document is to provide a description of the ongoing work and the integration process in support of closure and is intended to provide a roadmap for closure of single-shell tanks.

59. HLW-TEC-950027, 1995, *FY-96 High-level Waste Management Technology Program Plan*, Westinghouse Savannah River Company, Aiken, South Carolina.

The Federal Facility Compliance Act requires a site treatment plan for treating and disposing of mixed wastes. The SRS Site Treatment Plan identifies the DWPF as the preferred treatment option for treating liquid HLW.

60. HNF-EP-0182-155, 2001, *Waste Tank Summary Report for Month Ending February 28, 2001*, CH2M HILL Hanford Group, Inc., Richland, Washington.

This report is the official record of radioactive waste stored in underground tanks in the 200-Area at Hanford. This report provides data on each of the 177 large underground storage tanks and 60 smaller MUSTs. It is updated on a monthly basis.

61. Kelly, K. B., 1999, *Third Modification to Consent Order* (letter to B. Bowhan, U.S. Department of Energy, Idaho Operations Office), State of Idaho, Office of Attorney General, Boise, Idaho.

The Settlement Agreement (formally known as the Settlement Agreement between the Governor of Idaho [Philip E. Batt], DOE, and the Navy [Kelly 1999]) required all high-level liquid waste to be calcined by June 1998, with the remaining sodium-bearing waste calcined by 2012. By 2009, a ROD must be issued that establishes a date for completion of the calcine treatment. (Other treatment alternatives for sodium-bearing waste may be employed to meet the intent of this agreement, in accordance with the HLW EIS that is currently being finalized [DOE/EIS-0287D]). By 2035, DOE must remove all spent fuel from the site and have all HLW road-ready for shipment and disposal at a repository.

62. PNNL-13339, 1999, *Tanks Focus Area (TFA) Multiyear Program Plan FY01-FY05*, Pacific Northwest National Laboratory, Richland, Washington.

The web address for this report is http://www.tanks.org/ttgdoc/2084b-all.pdf. This multiyear program plan reflected the TFA's plan for the next five fiscal years (FY01-FY05). Most of the planning emphasis is on FY01 and FY02. During this period, the TFA planned major work in seven key areas: 1) safe waste storage, 2) waste mobilization and retrieval, 3) conditioning, transfer, and retrieval-pretreatment integration, 4) interim storage, 5) waste pretreatment, 6) waste immobilization, and, 7) closure.

63. WHC-EP-0566, 1993, *Underground Storage Tank-integrated Demonstration Participant Site Characteristic Summary*, Westinghouse Hanford Company, Richland, Washington.

This summary provides a description of calcine waste within high level waste tanks at the INEEL INTEC. It describes the tank waste at INTEC as different from the waste at the other DOE tank sites; the waste is extremely acidic, with a pH of less than 1, and is characterized by large concentrations of nitrates and dissolved metals such as aluminum, potassium, and sodium with small concentrations of sulfates, chlorides, and heavy metals such as chromium and nickel. The liquid waste has a density of 1.1 to 1.3 g/cm^3.

7.0 REFERENCES

Jacobs, 2001a, *Functions and Requirements for WVDP Tank Lay-up,* Contract No. TTPRL30WT21A, Milestone No. A.1-1, (Letter Report #1 to Michael Terry, Safety Technology Integration Manager, Tanks Focus Area, PNNL, March 15), Jacobs Engineering Group Inc., Richland, Washington.

Jacobs, 2001b, *West Valley High-Level Waste Tank Lay-Up Strategies*, 01-003-0416, Contract No. TTPRL30WT21A, Milestone No. A.2-1, (Letter Report #2 to Michael Terry, safety Technology Integration Manager, Tanks Focus Area, PNNL, April 16), Jacobs Engineering Group Inc., Richland, Washington.

Jacobs, 2001c, *Decision Plan for West Valley High-Level Tank Lay-Up,* 01-006-0525, Contract No. TTPRL30WT21A, Milestone No. A.3-1, (Letter Report #4 to Michael Terry, Safety Technology Integration Manager, Tanks Focus Area, PNNL, May 25), Jacobs Engineering Group Inc., Richland, Washington.

Jacobs, 2001d, *Final Report West Valley High-Level Waste Tank Lay-Up, 01-009-0629,* Contract No. TTPRL30WT21A, Milestone No. A.4-1, (Letter Report to Monte Elmore, Principal Investigator, PNNL, June 29), Jacobs Engineering Group, Inc., Richland, Washington.

JEG-01-023, 2001, Contract No. TTPRL30WT21A, Milestone No. B.2-1, and Considerations For Generic High-Level Waste Tank Lay-Up," (Letter Report to Monte Elmore, Principal Investigator, PNNL, September 26, 2001), Jacobs Engineering Group, Inc., Richland, Washington.

JEG-01-005, 2001, *Post-Retrieval and Pre-Closure High-Level Radioactive Liquid Waste Tank Lay-Up Strategies-Part II Implementation Plan* (Letter Report #3), Jacobs Engineering Group, Inc., Richland, Washington.

JEG-02-011, 2002, *Review of Tank Lay-Up Status At U.S. Department of Energy Radioactive Waste Tank Sites*, Jacobs Engineering Group, Inc., Richland, Washington.