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Title/Desc:

HANFORD SITE SODIUM MGMT PLAN

COMPLETE

ENGINEERING CHANGE NOTICE

Page 1 of 3

1. ECN No 616250

Proj.
ECN

2. ECN Category (mark one) Supplemental ☐ Direct Revision ☒ Change ECN ☐ Temporary ☐ Standby ☐ Supersedure ☐ Cancel/Void ☐	3. Originator's Name, Organization, MSIN, and Telephone No. S. Guttenberg/18200/N2-53/ 376-9910 5. Project Title/No./Work Order No. Hanford Site Sodium Management Plan 8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-FF-MP-001, Revision 0	3a. USQ Required? [X] Yes [] No 6. Bldg./Sys./Fac. No. 4710/FFTF 9. Related ECN No(s). 	4. Date 9/26/95 7. Approval Designator N/A 10. Related PO No. N/A
11a. Modification Work [] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	11b. Work Package No. N/A	11c. Modification Work Complete N/A Cog. Engineer Signature & Date	11d. Restored to Original Condition (Temp. or Standby ECN only) N/A Cog. Engineer Signature & Date
12. Description of Change The attached document encompasses an update to the Hanford Site Sodium Management Plan, Revision 0.			
13a. Justification (mark one) Criteria Change ☒ Design Improvement ☐ Environmental ☐ Facility Deactivation ☐ As-Found ☐ Facilitate Const ☐ Const. Error/Omission ☐ Design Error/Omission ☐			
13b. Justification Details There are multiple changes so the complete document is being reissued.			
14. Distribution (include name, MSIN, and no. of copies) See the attached.		RELEASE STAMP OFFICIAL RELEASE 43 BY WHO DATE SEP 26 1995 Sta 77	

ENGINEERING CHANGE NOTICE

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1. ECN (use no. from pg. 1)

616250

15. Design Verification Required

☐ Yes
☒ No

16. Cost Impact

ENGINEERING

 Additional ☐ \$
 Savings ☐ \$

CONSTRUCTION

 Additional ☐ \$
 Savings ☐ \$

17. Schedule Impact (days)

 Improvement ☐
 Delay ☐

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	☐	Seismic/Stress Analysis	☐	Tank Calibration Manual	☐
Functional Design Criteria	☐	Stress/Design Report	☐	Health Physics Procedure	☐
Operating Specification	☐	Interface Control Drawing	☐	Spares Multiple Unit Listing	☐
Criticality Specification	☐	Calibration Procedure	☐	Test Procedures/Specification	☐
Conceptual Design Report	☐	Installation Procedure	☐	Component Index	☐
Equipment Spec.	☐	Maintenance Procedure	☐	ASME Coded Item	☐
Const. Spec.	☐	Engineering Procedure	☐	Human Factor Consideration	☐
Procurement Spec.	☐	Operating Instruction	☐	Computer Software	☐
Vendor Information	☐	Operating Procedure	☐	Electric Circuit Schedule	☐
OM Manual	☐	Operational Safety Requirement	☐	ICRS Procedure	☐
FSAR/SAR	☐	IEFD Drawing	☐	Process Control Manual/Plan	☐
Safety Equipment List	☐	Cell Arrangement Drawing	☐	Process Flow Chart	☐
Radiation Work Permit	☐	Essential Material Specification	☐	Purchase Requisition	☐
Environmental Impact Statement	☐	Fac. Proc. Samp. Schedule	☐	Tickler File	☐
Environmental Report	☐	Inspection Plan	☐		☐
Environmental Permit	☐	Inventory Adjustment Request	☐		☐

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision

Document Number/Revision

Document Number Revision

20. Approvals

Signature	Date	Signature	Date
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		Signature or a Control Number that tracks the Approval Signature	
		<u>ADDITIONAL</u>	

APPENDIX B

UNREVIEWED SAFETY QUESTION SCREENING FORM

REFERENCE ITEM # WHC-SD-FF-MP-001, REV. 1 (ECN # NOT YET DETERMINED)

TITLE HANFORD SITE SODIUM MANAGEMENT PLAN

QUESTIONS

Does the referenced item:

- A. Make PROPOSED CHANGES to the facility or procedures which differ from conditions described in the FSAR? N/A NO ☒ Yes/Maybe

Basis: This plan is a project planning document. It discusses changes to the plant which are years from implementation and are obviously outside the bounds of the FSAR. The key words in this question are "make proposed changes...." This document makes no changes, and any changes discussed in this document will be implemented by documents which will receive an appropriate USO. Actually, the USO process should not be applied to such planning and budget documents, but this is being done procedurally because the ECN is the method of change approval for the plan.

- B. Describe an event or condition (DISCOVERY) which differs from those described in the FSAR? N/A ☒ NO Yes/Maybe

Basis:

- C. Describe tests or experiments which differ from those described in the FSAR? N/A ☒ NO Yes/Maybe

Basis:

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(print name)

Signature

Date 9/20/95

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(print name)

Signature

Date 9/20/95

RELEASE AUTHORIZATION

Document Number: WHC-SD-FF-MP-001, Rev. 1

Document Title: Hanford Site Sodium Management Plan

Release Date: 9/25/95

**This document was reviewed following the
procedures described in WHC-CM-3-4 and is:**

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Chris Willingham

C. WILLINGHAM

9/25/95

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SUPPORTING DOCUMENT

1. Total Pages ^{NSA} 6648 9/20/95

2. Title

Hanford Site Sodium Management Plan

3. Number

WHC-SD-FF-MP-001

4. Rev No.

1

5. Key Words

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Sodium
Sodium Management Plan
Sodium Reaction Facility
Hallam
SRE

6. Author

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Signature

Organization/Charge Code 18200/B181A

7. Abstract

The Hanford Site Sodium Management Plan, Revision 1, provides changes to the major elements and management strategy to ensure an integrated and coordinated approach for disposition of the more than 350,000 gallons of sodium and related sodium facilities located at the DOE's Hanford Site.

8.

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DATE SEP 26 1995

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Hanford Site
Sodium Management Plan

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HANFORD SITE SODIUM MANAGEMENT PLAN

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List of Acronyms

ADM	Action Description Memorandum
AMSF	Alkali Metal Storage Facility
ANL-West	Argonne National Laboratory-West
CAA	Clear Air Act
CRADA	Cooperative Research and Development Agreement
CRCTA	Composite Reactor Components Test Activity
CSTF	Containment Systems Test Facility
CWC	Central Waste Complex
CY	Calendar Year
DOE	U.S. Department of Energy
DOH	U.S. Department of Health
DOT	U.S. Department of Transportation
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FFTF	Fast Flux Test Facility
HEPA	High-Efficiency Particulate Air
HTSF	High Temperature Sodium Facility
LM	LM Manufacturing of Marysville, Washington
LMFBR	Liquid Metal Fast Breeder Reactor
MHD	Magnetohydrodynamics
NaK	Sodium-Potassium alloy
NE	Nuclear Energy
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Agency
NOC	Notice of Construction
NOI	Notice of Intent
PAL	Prototype Applications Loop
PUREX	Plutonium Uranium Extraction Facility
RCRA	Resource Conservation and Recovery Act of 1976
RL	U.S. Department of Energy, Richland Operations Office
SAM	South Alkali Metal
SEPA	State Environmental Policy Act
SHTL	Small Heat Transfer Loop
SRE	Sodium Reactor Experiment
SRF	Sodium Reaction Facility
SSF	Sodium Storage Facility
TSD	Treatment Storage and Disposal
TTL	Thermal Transient Loop
TWRS	Tank Waste Remediation System
WAC	Washington Administrative Code
WAC	Washington Administrative Code
WHC	Westinghouse Hanford Company
WVN	Water Vapor Nitrogen

HANFORD SITE SODIUM MANAGEMENT PLAN

1.0 EXECUTIVE SUMMARY

The Hanford Site Sodium Management Plan provides the major elements and management strategy to ensure an integrated and coordinated approach for disposition of the more than 350,000 gallons of sodium and related sodium facilities located at the Department of Energy's (DOE) Hanford Site. The sodium, in both a used and unused form, and both radioactive and non-radioactive, is stored in safe configurations within the Fast Flux Test Facility (FFTF) at the 400 Area, and in various containers, tanks and dormant test loops located in the 100, 200 and 300 Areas at Hanford. These sodium inventories will be dispositioned (e.g., excessed or converted to a form suitable for reuse or disposal). The associated facilities will be turned over to the building landlord, an alternate sponsor, or taken to a safe and low maintenance cost shutdown condition suitable for turnover to the Hanford Environmental Restoration Contractor pending final disposition.

This Sodium Management Plan provides baseline planning, cost, and schedule estimates for sodium disposition activities and facility deactivations. These estimates form the bases for development of detailed planning, costs and schedules necessary to develop the multi-year budgetary planning requirements. Funding and management activities for the Hanford Site sodium fall under the purview of three separate Westinghouse Hanford Company (WHC) programs: the FFTF Transition Project for the FFTF sodium and facility, the Nuclear Energy (NE) Legacy Program for the non-radioactive NE Legacy sodium and facilities, and the Solid Waste Disposal Program for the radioactive NE Legacy sodium and facilities and the Hanford waste sodium inventory. Another key element of the Sodium Management Plan is to show the inter-relationship between these various sodium inventories and the associated impact on the selection of the preferred disposition alternative.

A major component in the safe disposition of these facilities is to ensure compliance with applicable regulations. This Sodium Management Plan will provide the framework for discussions with the Washington State Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA) on the regulatory activities/issues identified herein. This plan is a vital element for ensuring that all involved stakeholders, including WHC, the U.S. Department of Energy, Richland Operations Office (RL), the U.S. Department of Energy-Headquarters (HQ), Washington State regulators, and public entities, understand the activities being planned and to ensure that the disposition of this immense sodium legacy is a cohesive effort by all relevant parties.

As applicable, the summary level schedules to complete disposition of the Hanford sodium and associated facilities are provided in Section 9.0. Rough order of magnitude costs are also provided in Section 9.0.

2.0 BACKGROUND

The U.S. DOE Hanford Reservation located near Richland, Washington (see Figure 1), accommodates the largest radioactive inventory of metallic sodium in the United States. Research and development activities supporting the DOE NE Programs associated with the Liquid Metal Fast Breeder Reactor (LMFBR) have been ongoing at the Hanford Site for more than twenty years. More than 350,000 gallons of sodium were procured in support of the LMFBR Program. This sodium, both radioactive and non-radioactive, is located in safe configurations within the FFTF located in the 400 Area, and in various containers, tanks and dormant test loops located in the 100, 200 and 300 Areas of the Hanford Site. Table 1 contains a summary of the Hanford bulk sodium inventory and its current location. There are also small quantities of sodium-potassium eutectic alloy, commonly known as NaK, located within some of these facilities which also will be addressed by this Sodium Management Plan. Ultimately, these sodium inventories will be dispositioned (e.g., excessed or converted to a form suitable for reuse or disposal). The associated facilities will be turned over to the building landlord, an alternate sponsor, or taken to a safe and low maintenance cost shutdown condition suitable for turnover to the Hanford Environmental Restoration Contractor pending final disposition.

The largest inventory of Hanford sodium consists of approximately 260,000 gallons of bulk sodium coolant which is contained within various systems within the FFTF complex. This inventory has varying degrees of radioactivity, ranging from the highest radionuclide content in the Reactor Vessel and Primary Heat Transport System to small quantities of tritium in the Secondary Heat Transport System. The December 15, 1993, shutdown directive by DOE (References 1 and 2) requires draining of the FFTF sodium, and subsequent disposition of this substantial sodium inventory to a form suitable for an alternative use or disposal. The *FFTF Transition Project Plan* (Reference 3), provides a detailed description of the FFTF transition activities. The regulatory activities, Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) milestones, and associated sodium disposition activities delineated in the *FFTF Transition Project Plan* are included within this document, including a status on progress achieved to date.

The NE Legacy sodium inventory at Hanford consists of approximately 54,000 gallons of non-radioactive sodium currently stored in a safe configuration in containers, tanks, and dormant test loops in the 100, 200, and 300 Areas, and approximately 41,000 gallons of slightly radioactive sodium safely stored in drums and tanks located in the 200 West Area. The NE Legacy Program was initiated in 1991, following the initial decision to shut down the FFTF and its associated facilities, to address this inventory and related NE facilities. A WHC document, *Compilation of Hanford Site Nuclear Energy Program Nonreactor Facilities, Legacy Documentation* (Reference 4), was prepared providing a compilation of the nonreactor research facilities that had supported previous NE Program activities associated with development of the LMFBR. Table 2 provides a list of the 29 facilities included within the compilation document (324 Building was later removed from this compilation).

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Figure 1. Hanford Reservation Area Map

TABLE 1
HANFORD SODIUM INVENTORY
FFTF SODIUM INVENTORY

Facility/System	Configuration	Sodium Volume (gallons)
Secondary Systems	Tanks/Piping	66,000
Primary System	Reactor vessel/Piping	140,000
Interim Decay Storage	Vessel/Piping	23,000
Fuel Storage Facility	Vessel/Piping	31,000
TOTAL		260,000

NE LEGACY NONRADIOACTIVE SODIUM FACILITIES

Facility	Configuration	Sodium Volumes (gallons)
1720-DR	1 Tank	4,600
221-T	2 Tanks/2 Delivery Lines	215
335	3 Tanks/2 Loops	160
335-A	1 Tank/Loop	670
337 Highbay	1 Tank/Loop	2,800
3718-M	1 Tank	42,000
TOTAL		50,445

NE LEGACY RADIOACTIVE SODIUM FACILITIES

Facility	Configuration	Sodium Volume (gallons)
2727-W	Tanks	34,300
SAM Storage Modules	158 Drums	7,065
TOTAL		41,365

NaK INVENTORIES

Facility/System	Configuration	NaK Volume (gallons)
335	Cold Trap	2
337 Highbay	Cold Trap	110
FFTF	3 Loops	600
TOTAL		712

This document was used as the first step in the development and implementation of the overall strategy for ultimate disposition of these legacy facilities. This Sodium Management Plan will address the nine NE Legacy facilities that contain sodium and NaK. The remaining nineteen non-sodium NE Legacy facilities will not be addressed in this document.

NE Legacy disposition activities were initiated in 1993 and are ongoing within the 1995 Fiscal Year Work Plans. Engineering studies were completed to determine the preferred method for specific alkali metal facility disposition (See References 5, 6 and 7). Significant progress has been made since the first issuance of the Sodium Management Plan, including: disposition of miscellaneous chemical inventories within these facilities, approval of a *National Environmental Policy Act of 1969* (NEPA) Environmental Assessment for disposition of the alkali metal loops and a Categorical Exclusion for disposition of the nonradioactive sodium located at 1720-DR and 3718-M, establishment of a Cooperative Research and Development Agreement (CRADA) between RL, WHC, and LM Manufacturing of Marysville, Washington (LM), and actual removal of the first sodium test loop. The NE Legacy Program continues to provide landlord/occupancy funding for appropriate facilities and to conduct routine surveillances. The Solid Waste Program is exploring contingency disposition options utilizing the private sector or the sodium reaction facility at Argonne National Laboratory-West for conversion of the NE Legacy radioactive sodium for reuse or disposal.

As the first engineering studies were initiated in early 1993, a potential concern of the regulatory status of the NE Legacy sodium and facilities was expressed by WHC to RL. If no further programmatic need was identified, and the federal excessing process for the sodium was unsuccessful, some or all of the sodium inventory could be subject to regulation under the *Resource Conservation and Recovery Act of 1976* (RCRA). Sodium metal exhibits the characteristics of corrosivity, reactivity, and ignitability; therefore, waste sodium is regulated pursuant to RCRA, as implemented by the Washington State Department of Ecology under the *Washington Administrative Code* (WAC) 173-303, "Dangerous Waste Regulations."

In May 1993, RL and WHC made a presentation to Ecology to inform them of the Hanford Site sodium management status. The FFTF was in hot standby, and while not addressed specifically at that time, it was recognized that shutdown of the FFTF could play a key role in the disposition of some or all of the NE Legacy sodium inventory and that the relatively large inventory of FFTF sodium could dwarf the potential environmental and technical issues surrounding disposition of the NE Legacy facilities.

With the exception of approximately 4,000 gallons of waste sodium and packing materials currently stored in the RCRA compliant Low-Level Radioactive Alkali Metal Waste Storage modules, the Hanford sodium inventory is managed as product material. An on-site use of the FFTF sodium has been identified by the Tank Waste Remediation System (TWRS) and is documented in the technical baselines for both the TWRS and FFTF Programs. Milestones have been established in the Tri-Party Agreement (Reference 8) for the deactivation of FFTF, including management and disposition of the FFTF sodium. The NE Legacy bulk non-radioactive sodium was placed on the Federal Excessing list in 1993

TABLE 2
NE LEGACY FACILITIES

FACILITIES UNDERGOING RCRA CLOSURE

1. 105-DR Large Sodium Fire Facility
2. 4843 Alkali Metal Storage Facility
3. 3718-F Alkali Metal Treatment and Storage Facility

SODIUM TEST LOOPS/STORAGE FACILITIES

4. 1720-DR - Sodium Storage Building - Bulk Sodium Storage
5. 213-K - Sodium Storage Building - Bulk Sodium Storage⁽¹⁾
6. 221-T - Containment System Test Facility - Test Loop
7. 2727-W - Contaminated Sodium Storage Building - Bulk Sodium Storage
8. 2727-WA - Contaminated Sodium Storage Building - Bulk Sodium Storage⁽²⁾
9. 335 Building - Small Heat Transfer Loop (SHTL), Prototype Application Loop (PAL) - Bulk Sodium Storage and Test Loops
10. 335-A Building - Thermal Transient Loop (TTL) - Bulk Sodium Storage and Test Loop
11. 337 Highbay Building - High Temperature Sodium Facility (HTSF) and Composite Reactor Components Test Activity (CRCTA) - Bulk Sodium Storage and Test Loop
12. 3718-M - Sodium Storage Building - Bulk Sodium

NON-SODIUM NE LEGACY FACILITIES

13. 2101-M Storage Building - FFTF Core Component Storage
14. 306-E Building - FFTF Core Components Assembly
15. 308 Building - FFTF Fuel Fabrication and Storage
16. 309 Building - Interim Examination and Maintenance Cell Mockup
17. 321 Building - Hydraulic and Mechanical Testing
18. 323 Building - Metals Creep Laboratory
19. 324 Building - Chemical Engineering Laboratory⁽³⁾
20. 325 Building - Shielded Laboratories
21. 326 Building - Hot Cells and Materials Testing Laboratory
22. 327 Building - Post Irradiation Test Laboratory
23. 3715 Storage Building - Archived and New Material Storage
24. 3717-C Building - FFTF Archive and Surveillance Material Samples
25. 3718-C Building - 308 Building Operations Support
26. 3728 Test Article Storage Vault - FFTF Test Articles Storage
27. 3765 Office Building
28. 300 Area Lay Down - Clinch River Breeder Reactor Project Equipment
29. 427/4862 Building - Fuels and Materials Examination Facility

⁽¹⁾Sodium removed from the 213-K Facility was sold and shipped off-site on April 7, 1994.

⁽²⁾The drums have been relocated to the South Alkali Metal Storage Modules.

⁽³⁾324 was removed from this listing, since it was later determined not to be a part of the NE Legacy Program.

for procurement by the private sector as directed by RL (Reference 9). Multiple buyers placed bids for procurement of this inventory over a multi-year period. On April 7, 1994, the first shipment from the NE Legacy sodium inventory, consisting of 78 drums, was transferred off-site to a buyer. The remaining sodium is housed in tanks and piping systems requiring repackaging prior to off-site sales. The surplus material from the test loops (i.e., piping, instrumentation, etc.) will be provided to LM under the terms of a CRADA that was established between RL, WHC, and LM.

Until mid-December of 1993, when the FFTF shutdown directive was received, a portion of the NE Legacy radioactive sodium inventory was being considered for possible use in the proposed FFTF Steam Generator Test Facility. This was one of the potential future missions that was included in the marketing initiative to find international support and funding for the continued operation of the FFTF. Currently, a potential on-site use for the NE Legacy radioactive sodium has been identified in the TWRS evaluation of the FFTF sodium which indicates this sodium inventory can also be used, converted to sodium hydroxide, for use in the TWRS pretreatment process. Contingency disposition options are also being explored, as discussed in Section 7.2.

A meeting was held on August 31, 1995, to provide Ecology a status on the Hanford sodium disposition activities since the last update meeting provided on April 7, 1994, and to discuss preparation of this revision to the Sodium Management Plan.

3.0 PURPOSE AND OBJECTIVES

3.1 PURPOSE

This Sodium Management Plan provides the WHC recommended approach to safely and effectively manage the disposition of these sodium inventories and facilities in a quality manner while ensuring safety and environmental compliance.

3.2 OBJECTIVES

The primary objective of the Sodium Management Plan is to identify the major elements of the sodium disposition and facility deactivation activities. Regulatory issues and uncertainties associated with the sodium disposition and facility deactivations will be identified and, to the extent possible, resolved. The FFTF Transition Project Plan provides the bases for development of a resource loaded shutdown cost and schedule for the transition of the FFTF to a safe shutdown state suitable for turnover to the Hanford Environmental Restoration Contractor. Likewise, this Sodium Management Plan will form the bases for the development of detailed workscope definition and associated detailed cost and schedule estimates for the NE Legacy Program sodium and disposition of its associated facilities.

The activities addressed herein are believed to provide the optimum approach that will allow available resources to be most effectively applied to complete the sodium disposition activities. This Sodium Management Plan will provide the framework for discussions with Ecology and the EPA regarding applicable regulatory requirements and/or potential Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Action Plan milestones and target dates to achieve compliance.

The DOE's objective was to achieve shut down of the FFTF in approximately five years. However, as the FFTF Transition Project Summary Schedule (Section 9.0, Figure 15) indicates, the FFTF Transition Project will require approximately seven years. The conversion of the bulk sodium coolant to a stabilized form is an independent activity that will require approximately four years for construction of the reaction facility and processing of the sodium at the appropriate time (Section 7.1.3.1). The objective for the NE Legacy facilities is to complete bulk sodium disposition and associated facility deactivation activities in approximately six years (Section 9.0, Figure 17). These schedules reflect aggressive and success oriented planning. Institutional and regulatory barriers, limited and/or lack of adequate funding, delays in resolving key technical and operational challenges (applicable primarily to FFTF), and potential erosion of experienced FFTF staff and sodium technology personnel during this period could impact these projected schedules.

This Sodium Management Plan will be maintained as a "living document" and updated as major changes occur until the sodium has been dispositioned and the associated facilities have been turned over to the building landlord, another program or deactivated. This plan will provide the bases to ensure that the programs within WHC, as well as DOE and interested stakeholders understand the tasks at hand and to ensure that no duplication of efforts within the WHC organization occurs.

4.0 PROGRAM MANAGEMENT

The FFTF shutdown activities are planned, directed, and monitored by the FFTF Transition Project Office. The FFTF transition activities include preparation of environmental and regulatory documents, reactor defueling (now complete), fuel offload to dry cask storage, sodium drain and reaction, management of sodium and NaK residuals, shut down of the auxiliary systems, and preparation of appropriate turnover documentation. The NE Legacy Program, which provides management oversight of the non-radioactive sodium and facilities, is also under the purview of the FFTF Transition Project organization. The current NE Legacy Program activities supporting the non-radioactive sodium disposition and associated facility deactivations include: providing landlord/occupancy funding for appropriate legacy facilities, conducting routine surveillances, preparation of engineering studies to determine the preferred method for specific facility disposition, providing documentation to support sodium test loop disposition, and coordinating sodium and facility disposition field activities.

Management of the NE Legacy radioactive sodium inventory is provided by the Solid Waste Disposal Program. This Program is responsible for surveillance and monitoring of the radioactive sodium inventory which is stored in the 2727-W facility and the South Alkali Metal Storage Modules in the Central Waste Complex.

Funding for the Hanford Site sodium is provided by three separate Westinghouse Hanford Company (WHC) programs: the FFTF Transition Project for the FFTF sodium and facility, the Nuclear Energy Legacy Program for the non-radioactive NE Legacy sodium and facilities, and the Solid Waste Disposal Program for the radioactive NE Legacy sodium inventory and facilities.

5.0 DESCRIPTION OF HANFORD SODIUM FACILITIES

The Hanford sodium inventory, disposition planning, facility deactivations, and associated regulatory issues will be discussed in three separate categories: the FFTF sodium and reactor complex, the NE Legacy radioactive sodium and the NE Legacy non-radioactive sodium. Table 1 provides a summary of the various sodium locations, facilities, and configurations (e.g., tank storage, drums, test loops, and reactor complex). The following sections provide a brief history and description of the status and sodium inventories in each of these sodium facilities.

5.1 FFTF SODIUM AND REACTOR COMPLEX

The FFTF is a liquid metal-cooled test reactor located at the Hanford Site's 400 Area (Figure 2). At the DOE's direction, reactor operations ceased in April 1992, maintaining the sodium systems in a molten state, while retaining restart capability. A marketing effort was initiated to find international support and funding for the continued operation of the FFTF. Following this effort, an independent review team evaluated the business potential for the FFTF and concluded that there was no combination of compatible missions for the FFTF with a reasonable probability of making the facility financially viable in the foreseeable future. Subsequently, in a December 15, 1993, memorandum, the DOE notified WHC to immediately initiate shutdown of the reactor. The memorandum also provided a goal to accomplish the shutdown effort in approximately five years.

The transition to shutdown will require the offload, storage and disposition of the 260,000 gallons of bulk sodium coolant contained within various systems throughout the FFTF. The sodium provides decay heat removal from the reactor's irradiated fuel components which are located in two sodium-filled storage vessels within the facility. The sodium will be maintained in a molten state until the irradiated fuel components are removed from their sodium storage locations and transferred to dry storage. Minor plant modifications and construction of a new sodium storage facility closely coupled to the FFTF complex, are necessary to support sodium drain operations. The sodium will be drained to tanks located in the Sodium Storage Facility by pressure transfer, and then allowed to freeze. Details of the new Sodium Storage Facility are provided in Section 7.1.2. In addition to the sodium, approximately 600 gallons of NaK is present that is used for cooling of auxiliary systems and components. Current planning indicates that the NaK will be transferred to the bulk sodium and the piping inerted or removed.

Due to the complexity of the piping systems and sodium components, an estimated 4,000 gallons of sodium residuals will remain within the FFTF systems following the sodium drain. Some NaK residuals may also remain in the facility. An inert gas atmosphere will be maintained to minimize any chemical reactions during the surveillance and maintenance period.

A new Sodium Reaction Facility for conversion of the sodium to a stable form will be designed, constructed, and operated adjacent to the Sodium Storage Facility. Current planning is to convert the sodium to a sodium hydroxide

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Figure 2 FFTF Complex

solution for use by the TWRS Program to treat the defense waste stored on the Hanford Site, or will be converted to an acceptable non-RCRA regulated material for disposal on-site.

5.2 NE LEGACY RADIOACTIVE SODIUM

The NE Legacy radioactive sodium inventory is comprised of two separate inventories of reactor grade sodium containing very low levels of radiological contamination. These sodium inventories were shipped to Hanford from the Hallam Nuclear Power Facility in Hallam, Nebraska, and the Sodium Reactor Experiment (SRE) at Rockwell International, in Canoga Park, California, in 1967 and 1975, respectively. Both of these reactor facilities were undergoing shutdown and it was anticipated that these sodium inventories might be used by the Hanford Site's FFTF or related testing activities.

In 1984, three of the five Hallam tanks were transported to FFTF and 31,000 gallons of the Hallam sodium was loaded into the FFTF Fuel Storage Facility. The two empty tanks and one half-filled tank were returned to the 2727-W Building where they are currently located. Later, considerations were given to packaging and transporting the sodium to Idaho for conversion to sodium hydroxide at the Idaho National Engineering Laboratory. This sodium hydroxide would have been returned to Hanford for use at the Plutonium Uranium Extraction Facility (PUREX). With shutdown of PUREX, this potential use vanished. In 1987, a hold on any excessing process was placed on the Hallam sodium as additional coolant for the FFTF in anticipation of the Power Addition project to convert waste heat from the FFTF into electricity using steam generators. Until December, 1993, the Hallam sodium was being considered for use in the FFTF Steam Generator Test Facility.

A potential on-site use of the Hallam and SRE sodium in concert with the FFTF sodium inventory has been identified by the TWRS Program and is discussed in Section 7.2.1.

5.2.1 South Alkali Metal Storage Modules

The South Alkali Metal (SAM) Storage Modules in the 200 West Central Waste Complex (CWC) are used to store 158 85-gallon drums containing approximately 58,000 pounds (7,065 gallons) of frozen, slightly contaminated SRE sodium that was stored at 2727-WA prior to February, 1995 (Figure 3). In 1975, the sodium-filled 55-gallon drums were inerted with a nitrogen blanket prior to sealing and transported to Hanford. In February, 1995, these 55-gallon drums were overpacked into 85-gallon drums for transfer from 2727-WA to the SAM Storage Modules.

There are currently eight self-contained, metal modules located near 16th Street and Dayton Avenue which house the SRE sodium. As outlined in Reference 10, the SAM Storage Modules (1 through 8) meet the requirements for the storage of waste reactive metal under WAC 173-303, specifically, 173-303-630(b). Though stored at the CWC, this inventory continues to be managed as product as discussed in Section 7.2.2.

Figure 3. South Alkali Metal Storage Modules

The SAM storage modules are similar in construction to the pre-engineered Low Flashpoint Mixed Waste modules. All are approximately 24 ft by 9 ft by 8 ft high, and are capable of storing 85-gallon 17-E steel overpack drums and/or boxes. The asphalt pad below each module is designed to facilitate rainwater run off. As described in *Hazard Classification for Project W-312, Mixed Waste Storage*, WHC-SD-W312-HC-001, Rev. 0 (WHC 1993a), the modules are elevated 4 inches above the pad. Even in extreme weather, water intrusion into the modules is prevented by vents louvered or arranged to curb rain or snow entry. The vents are in accordance with UFC 80-310.a7. Each module has a spill-containment reservoir (approximately 750 gallon capacity) under the flooring. The spill-containment reservoirs are in accordance with *Uniform Building Code* 902 (UBC 1991), UFC 79.15, 80.301, Section 1 and 2, 29 CFR 1910, "Occupational Safety and Health Standards," Section 1910.106, "Flammable and Combustible Liquids," Title 29, *Code of Federal Regulations*, as amended, and exceed the requirements mandated in WAC 173-303. The flooring in these modules is epoxy-coated steel grates. The modules have 2-hour fire rated walls and 1.5-hour fire rated doors.

The separation distance between the modules complies with National Fire Protection Agency (NFPA) 80A. The modules employ convective ventilation with roof and wall vents. Complying with NFPA 68, the explosion-relief panels are designed to open at 20 psi and provide a venting area of 1 ft² for each 50 ft³ of interior space. The doors are designed to withstand internal pressures up to 100 psi. Each module is grounded to prevent the effects of static or lightning effects and tied down on each corner to prevent wind damage. No electrical service is required. A 30-lb Type D fire extinguisher is mounted on the module exterior. All extinguishing equipment is hand operated.

5.2.2 2727-W Hallam Sodium Storage Building

The 2727-W Building is currently used to store the five 16,000 gallon capacity stainless steel tanks containing approximately 276,000 pounds (34,300 gallons) of slightly contaminated metallic sodium. The tanks are maintained with an active nitrogen blanket. The 2727-W building is a prefabricated Butler-type steel building as shown in Figure 4. When the Hallam tanks were received on-site in 1967 they were placed on one of the UO₃ storage slabs and the building was later erected over the tanks in 1967. The building floor consists of a concrete slab surrounded by gravel. The building contains two ionization type fire detectors that alarm at the Central Fire Station servicing the 100 and 200 Areas. Building lighting is provided by incandescent vapor-tight fixtures. The tanks are well grounded. On-site fire protection is provided by two 300-pound capacity Met-L-X fire extinguishers. Additional piping was installed to measure the pressure of the nitrogen atmosphere in the tanks. The tanks are routinely monitored to ensure the nitrogen blanket is maintained. Due to the highly reactive nature of sodium when exposed to water, the building has no water or steam service. A Hallam tank is shown in Figure 5.

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Figure 4. 2727-W Building

Figure 5. Hallam Sodium Storage Tanks

5.3 NE LEGACY NON-RADIOACTIVE SODIUM

The NE Legacy non-radioactive sodium inventory is located within seven facilities situated in the 100, 200 and 300 Areas of the Hanford Site (e.g., 1720-DR, 221-T, 213-K (sodium disposition completed), 335, 335-A, 337 Highbay, and 3718-M). These facilities supported the U.S. DOE NE Programs at the Hanford Site over the past 25 years in development of the Liquid Metal Fast Breeder Reactor Program. Activities at these facilities included development, testing and evaluation of sodium equipment and components in a high temperature sodium environment, conducting liquid metal pool and aerosol spray fires within a containment vessel for development and testing of air cleaning equipment to provide aerosol behavior data, demonstrating FFTF fuel handling equipment, developing and verifying numerous computer codes, and providing storage of bulk sodium for support of these activities.

5.3.1 1720-DR Sodium Storage Building

The 1720-DR facility is located in the 100 Area next to the 105-DR reactor (Figure 6). The building is a sheet metal Butler-type building (16 ft by 24 ft) with a concrete floor that is set in the ground approximately three feet. The concrete floor and walls support a steel liner to provide sodium containment should the storage tank leak sodium when the contents are molten. Approximately 4,600 gallons of sodium that was procured in the early 1970's for testing construction materials in the 105-DR Large Sodium Fire Facility is stored in the facility in a 6,000 gallon storage tank (Figure 7). The sodium, frozen in this tank since purchase, has never been used. No services such as heating, ventilation and electricity are provided for this building.

5.3.2 213-K Sodium Storage

The 213-K Facility was used in the early days of the Hanford Site for the storage of plutonium prior to shipment off-site. The facility is located on the south side of Gable Mountain and consists of a concrete encased building that extends into the mountain approximately 50 feet. Since 1982 a portion of the facility was used to store approximately 3,900 gallons of unused sodium in 55-gallon drums. This sodium was originally purchased for use in the FFTF closed loops, which were never activated. The sodium was recently sold and is no longer on the Hanford Site, as discussed in Section 7.3.2.

5.3.3 221-T Containment Systems Test Facility

The Containment Systems Test Facility (CSTF) is located in the head end of the T Plant in the 200 West Area. The CSTF was originally designed and constructed during 1964 and 1965 to conduct various tests in support of light water reactors. In 1975, the facility was converted to sodium testing to support LMFBF Programs. The primary feature of the facility is a large reaction vessel (67 feet high and 25 feet in diameter) in which experiments simulating aerosol generation in reactor containment systems were conducted. These testing activities included aerosol generation resulting from both molten sodium pool and spray fires within the containment vessel and were used

Figure 6. 1720-DR Storage Building

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Figure 7 1720-DR Sodium Storage Tank

to develop and test air cleaning equipment and provide aerosol behavior data to support development of computer modeling codes. Currently, there are approximately 215 gallons of bulk sodium stored within two tanks at the facility and approximately 220 feet of 1/2-inch and 2-inch diameter stainless steel sodium wetted delivery piping. The tanks were used to supply sodium for pool sodium and aerosol spray fires (Figure 8).

Sodium testing was terminated in 1980 and the sodium delivery system was shut down. A surveillance program is maintained on the sodium. The CSTF is located in a radiologically controlled area due to fixed contamination located beneath surface coatings on the walls and floor from earlier fuel processing operations. The CSTF sodium tanks and delivery piping were never used for radiological material and are expected to be free of contamination. Sodium samples will be taken during removal and analyzed to confirm that the sodium meets the Hanford unconditional radioactive release limits prior to the sodium being shipped off-site to a buyer.

5.3.4 335 Building

The 335 Building, constructed in 1968, houses sodium test loops used to study properties of sodium heat transport systems and investigate behavior of mechanical components to be operated in a sodium environment (Figure 9). Currently there are two test loops, the Prototype Applications Loop (PAL) (Figure 10) and the Small Heat Transfer Loop (SHTL), and a small portable sodium-wetting station in the facility. The sodium-wetting station was also used to test items in a sodium environment at high temperatures. These test loops and the wetting station were shut down in 1977 and the sodium was either transferred to a loop storage tank or allowed to freeze within the loop piping.

The PAL and SHTL contain approximately 160 gallons of sodium and the sodium wetting station contains sodium residuals. The SHTL has a 90 gallon storage tank containing approximately 75 gallons of sodium. The PAL was not designed to be drained, therefore approximately 13 gallons of sodium is frozen in the piping system. The PAL vessel contains approximately 100 gallons of sodium. There are approximately two gallons of NaK contained in the cooling system for the PAL cold trap.

As of this writing (September 1995), the SHTL piping has been isolated, sectioned into three parts each within the existing loop steel framing modules, loaded into shipping boxes, and was shipped on September 20, 1995, to LM Manufacturing under the terms of the Cooperative Research and Development Agreement (CRADA) discussed in Sections 7.3 and 9.3. The storage tank containing bulk sodium has been isolated for future drain and excess of the sodium metal, and subsequent cleaning of the tank for recycle. The parts of the loop (two vapor traps and the cold trap) not sent to LM Manufacturing are being treated as waste according to applicable regulations.

5.3.5 335-A Building

The Thermal Transient Loop (TTL) was originally contained in the 335-A and the 336 Buildings. The loop was shut down in 1977. The portion of the TTL that was contained in the 336 Building was removed to allow turnover of this

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Figure 8. Containment Systems Test Facility at 221-T

Figure 9. 335 and 335-A Buildings Loop Layout

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Figure 10. Prototype Applications Loop

facility. The inter-connecting piping between the 336 and 335-A Buildings and the 335-A portion of the TTL remain (Figure 9). This loop was used primarily to test and qualify small valves for use in the FFTF. The loop contains a 1050 gallon sodium dump tank that contains approximately 670 gallons of sodium and is located in a pit area within the 335-A Building. The control panel for the test loop is located in the 335 Building.

5.3.6 337 Highbay Building

The High Temperature Sodium Facility (HTSF) and the Composite Reactor Components Test Activity (CRCTA) are housed in the 337 Highbay Building (Figure 11). The HTSF and CRCTA systems are connected to the 50,000 gallon sodium storage tank contained in the 3718-M Building (discussed in Section 5.3.7). The CRCTA is a one-third size sector of the FFTF reactor vessel which allowed full size reactor vessel components to be tested at actual reactor conditions except for the neutron flux environment. In addition to supporting the development of the LMFBR programs and engineering studies, the facility was used as a training facility for the FFTF Operators prior to FFTF becoming operational. The HTSF houses a cold trap which contains approximately 110 gallons of NaK in the cold trap's cooling system. There also is a cooling system that contained approximately 200 gallons of oil coolant. This oil system provided the interface between the NaK and a cooling water system. The oil was drained from the oil cooling system and excessed in late CY 1994. The sodium in the CRCTA and HTSF was drained to the extent practicable to the tank in 3718-M in 1977. However there are approximately 2,800 gallons of residual sodium that remain in the CRCTA, the cold trap, and in undrainable portions of the HTSF piping system.

Several missions were being considered for this facility, including testing of steam generator modules and equipment in support of the Advanced Liquid Metal Reactor Program. However, these missions did not materialize. The 337 Highbay is used today to support WHC Waste Management, Pacific Northwest Laboratory (PNL) activities and robotics testing. The presence of the sodium systems does not interfere with these activities.

5.3.7 3718-M Sodium Storage Building

The 3718-M Building is a concrete structure with a steel liner that is located adjacent to the 337 Highbay Building. The building contains the HTSF sodium storage tank (Figure 12). This 50,000 gallon capacity tank is located mostly below grade and contains approximately 42,000 gallons of frozen sodium. Inter-connecting piping is routed between the tank and the HTSF. The sodium in this tank was used in high temperature service and was maintained at a very high purity with the HTSF cold trap. A static nitrogen atmosphere is maintained in the tank.

5.4 HANFORD RCRA MANAGED WASTE SODIUM

There are three NE Legacy facilities that are planned to undergo RCRA closure: 3718-F Alkali Metal Treatment and Storage Facility, 105-DR Large Sodium Fire Facility, and the 4843 Alkali Metal Storage Facility (AMSF). Closure plans

Figure 11. 337 Highway Building

Figure 12. 3718-M/337 Layout

have been submitted for each of these facilities. The 4843 AMSF is included herein, because it is the only facility which stored an inventory of sodium when Revision 0 of this document was published.

The 4843 AMSF is a fully insulated, bolted steel building that was used to store alkali metal wastes. The sodium inventory which was in the 4843 AMSF is included within this Sodium Management Plan to provide a complete inventory of the Hanford sodium. The facility is currently being appropriately managed as a RCRA interim status storage unit but with a reduced semi-annual inspection frequency. The reduced inspection frequency was approved by Ecology following removal of all the waste from the building and completion of a satisfactory radiation survey which resulted in the reclassification of the building. The maximum total waste volume stored in the facility was an estimated 4,000 gallons (including packing material), based on the inventory including forty-nine 55-gallon drums, three 30-gallon drums, four 5-gallon cans, one U.S. Department of Transportation (DOT) 7-A container, and sealed piping and components.

A RCRA interim status compliance assessment (Tri-Party Agreement Milestone M-21-00) was submitted prior to March 31, 1989. A closure plan (Reference 11) was submitted to Ecology and EPA in June, 1991, which satisfied Tri-Party Agreement Milestone M-20-14. The closure plan states that before the first activity of closure, all waste will be removed from the 4843 AMSF. Waste removal was completed in May, 1995. Sampling of the AMSF to EPA SW-846 protocols, as required by the Data Quality Objectives agreed to by Ecology, RL, and WHC has been completed. The closure plan is under revision to include the analytical data from the sampling campaign and other changes agreed to through the Tri-Party Agreement process. The mixed waste from the 4843 facility is stored at the Hanford Central Waste Complex in the Low-Level Radioactive Alkali Metal Waste Storage modules. These modules provide RCRA compliant storage at the Central Waste Complex for the 4843 inventory. The storage modules are portable self-contained metal containers approximately 9 feet wide by 24 feet long and 8 feet-10 inches high. Each module has a steel grating floor, a sump, explosion panels and Class D fire extinguishers. The modules are located in the 200 West Area south of the 2403 Buildings.

6.0 SURPLUS CHEMICAL RECYCLING PROCESS

On June 9, 1993, RL directed WHC (Reference 9) to place the bulk NE Legacy sodium on the Federal Facilities Excess Process. This process advertises the sodium to a list of on-site and off-site government agencies. If a favorable response is received, the sodium is transferred to the interested agency. If no favorable response is received, the Recycle group initiates sale of the sodium in the private sector. If the response to this sale is positive, the sodium is sold.

6.1 NE LEGACY NON-RADIOACTIVE SODIUM/FACILITIES

The NE Legacy non-radioactive sodium is the first inventory that has gone through this excessing process. After receiving no expression of interest from any on-site or off-site government agencies, this sodium was placed on the Federal Excessing list in 1993 for procurement by the private sector. Three firm bids were received for this sodium inventory extending over a multi-year period.

The analytical results from sodium samples taken just prior to shutdown of each of the test loops in the 335, 335-A, and 337 have been reviewed to determine if the sodium meets the current requirements as specified by the potential sodium buyers. All of these samples met the current requirements. Therefore, new samples are not planned, except for the CSTF sodium system in the 221-T Building. The CSTF sodium will be sampled during removal and analyzed for radioactivity as part of the release criteria for the bulk sodium from the Radiological Control Area where it is currently located.

On April 7, 1994, the first shipment from the NE Legacy sodium inventory, consisting of 78 drums (31,845 pounds of sodium), was transferred off-site to a buyer. The remaining sodium is housed in tanks and test loops requiring significant effort to repackage prior to off-site sale. This will involve the necessary equipment and facility modifications that will be required to heat the various sodium storage tanks for transfer of the melted sodium to acceptable Department of Transportation (DOT) containers or transport vehicles. As indicated in the Section 9.0, Figure 17, this process is estimated to be completed in Fiscal Year 2001 and is contingent upon the availability of limited funding and resources. The buyers are aware of the time constraints associated with the sodium availability, and are agreeable to these conditions for the sale.

A small quantity of NaK that was readily available in a 30-gallon drum, (previously stored as product in the 4843 AMSF) was sold and shipped off-site to a buyer on March 4, 1994. The remainder of the NaK inventory from the 335 and 337 Highbay Buildings will also be placed through the excessing process as it becomes available. It currently is contained within the test loops and will require removal and repackaging prior to off-site sale.

The test loops will be provided to LM Manufacturing of Marysville, Washington (LM), under the terms of the Cooperative Research and Development Act (CRADA). In accordance with these terms, WHC provides surplus material from Hanford,

particularly excess FFTF components, plus the sodium piping and electrical and control equipment from the retired sodium test loops that are being dismantled by the NE Legacy program. In return, DOE receives a stock option in LM, and DOE/WHC receive royalties on MHD units sold by LM.

6.2 FFTF SODIUM

A potential on-site use for the 260,000 gallons of FFTF sodium has been identified and is documented in the project technical baselines for both the FFTF and Tank Waste Remediation System (TWRS) programs. In order to reduce the costs associated with both the FFTF Transition Project and the TWRS waste processing, the nearly 900 metric tons of FFTF sodium can be converted to sodium hydroxide and then utilized in the planned caustic washing (enhanced sludge washing) waste pretreatment process. Therefore, this inventory of sodium will not undergo the excessing process.

6.3 NE LEGACY RADIOACTIVE SODIUM

The Hallam and SRE sodium has also been identified by the TWRS Program for potential use in the TWRS waste pretreatment program as described in Section 7.1. As a contingency to use through the TWRS Program, the Solid Waste Program is exploring the potential benefits of disposition by the private sector or the Argonne National Laboratory-West (ANL-West) sodium reaction facility located in Idaho Falls, Idaho. If cost/schedule benefits are found to exist, these options will be further explored.

7.0 FACILITY DISPOSITION

The following sections discuss the disposition planning related to each inventory of Hanford sodium and the associated facility deactivation activities. Section 8.0 identifies the activities required to ensure compliance with applicable environmental regulations is maintained.

7.1 FFTF SODIUM

As discussed in Section 6, a site integrated approach has been established for the 260,000 gallons of FFTF sodium coolant and is documented by the project technical baselines for both the FFTF and TWRS programs (Reference 12). In order to reduce the costs associated with both the FFTF Transition Project and the TWRS waste processing, the nearly 900 metric tons of FFTF sodium can be converted to sodium hydroxide and then used in the planned caustic washing (enhanced sludge washing) waste pretreatment process. In addition to reducing costs, this would result in a major waste minimization and chemical recycling achievement. This planned use of the FFTF sodium is contingent upon finalization of the pretreatment process in accordance with the TWRS Tri-Party Agreement Milestone M-50-03 and FFTF Milestone M-81-02-T01. If the planned use of the sodium for the TWRS program does not materialize, the sodium would be converted to a stable form suitable for land disposal at Hanford. In either case, a Sodium Reaction Facility (SRF) will be built adjacent to the Sodium Storage Facility which is currently under construction at the FFTF complex.

Tri-Party Agreement milestones and target dates have been established in M-81-00 and M-20-00 for the FFTF transition activities that will result in an expeditious and cost efficient transition of the FFTF to a radiologically and environmentally safe shutdown condition. These milestones include management of the sodium and sodium residuals that will remain within the plant systems following the sodium drain, and construction of the Sodium Storage Facility and Sodium Reaction Facility, described in the following sections. The milestones are discussed in greater detail in Section 8.

7.1.1 Sodium Storage Facility

The Sodium Storage Facility is being constructed adjacent to the FFTF Complex for sodium offload (Figure 13). This facility will ultimately house the FFTF primary, secondary, Interim Decay Storage and Fuel Storage Facility sodium. The sodium will be stored in solid form, under an inert cover gas until the Sodium Reaction Facility is available for final disposition of the sodium. The facility was designed in compliance with the Resource Conservation and Recovery Act (RCRA) and WAC 173-303 storage requirements.

The Sodium Storage Facility will consist of three 80,000-gallon tanks and one 52,000-gallon tank, within a concrete building that will provide radiological shielding and weather protection. These tanks were originally built for the Clinch River Breeder Reactor Project, and have been stored in an outdoor laydown yard near the Hanford 300 Area since 1985. The tanks were inspected,

Figure 13. FFTF Sodium Storage Facility

and modifications and pressure testing were recently completed. An existing concrete pad, which was originally meant to serve as the mounting location for the Closed Loop Three and Four Dump Heat Exchanger equipment, has been removed. Based on the conceptual design, the building structure is 90 ft by 91 ft, and approximately 32 feet high, with a 60 ft by 60 ft by 10 ft high penthouse on the roof to house the support equipment.

A secondary containment sump will be provided that is capable of containing the contents of two of the 80,000-gallon tanks. The storage tanks, piping, and heating equipment will be capable of heating and maintaining the sodium at a temperature between 350°F and 400°F. An inert gas blanket will be maintained over the sodium. Each of the tanks will be provided with overpressure protection that will not allow air backflow into the tank after release. Vented gases would be directed through a high-efficiency particulate air (HEPA) filter.

To offload the sodium from the FFTF, piping will be provided from the FFTF systems to the new Sodium Storage Facility. Insulation and trace heat will be added to this piping header in order to maintain a 300°F to 400°F temperature during the sodium transfer. The tanks will be inerted prior to transfer of the sodium and an inert gas blanket will be maintained over the sodium during storage. Argon will be routed from the FFTF to the storage facility. It is planned to use the existing closed loop tunnels for the pipe routing.

The current planning for disposition of the FFTF NaK systems is to drain the NaK and transfer it into the bulk sodium. The total NaK inventory is a small fraction of a percent of the sodium volume, and sodium properties (e.g., freezing point) will not be measurably affected by the presence of this small quantity of NaK. An evaluation was also completed by TWRS (Reference 13) that confirmed this mixing will not impact use of the sodium for the TWRS pretreatment process.

7.1.2 Sodium Residuals

Following the drain of the sodium and NaK systems, it is expected that approximately 4,000 gallons of residual sodium will remain in the main portions of the plant piping and equipment. Some NaK residuals may also remain in the NaK piping. Additional indeterminate quantities of sodium will remain in other portions of the plant systems, especially in complex small diameter piping systems. The sodium residuals will be maintained under an inert gas atmosphere to minimize chemical reactions during the anticipated long term surveillance and maintenance period pending final disposition. Current planning indicates that the NaK will be transferred to the bulk sodium and the piping inerted or removed.

7.1.3 Sodium Reaction Facility

The Sodium Reaction Facility will be constructed adjacent to the Sodium Storage Facility, as shown in Figure 13. The timing for the design and construction of the SRF is dependent upon the outcome of Tri-Party Agreement Milestones M-50-03 and M-81-02-T01. The purpose of the M-50-03 milestone is

to determine the high level waste sludge pretreatment process for the Hanford Tank Waste Remediation System (TWRS). This evaluation will confirm whether the current baseline of sodium hydroxide will be used. The TWRS milestone completion date is March 31, 1998.

If the FFTF sodium is converted to sodium hydroxide to pretreat sludge waste in the TWRS, construction of the Sodium Reaction Facility can be delayed to 2004, or later. Caustic washing of TWRS waste sludge with sodium hydroxide is not planned to occur before 2008. However, if a decision is made to convert the sodium to a form suitable for disposal as a solid waste at Hanford, planning for the project could proceed in 1998. Sodium is classified as a hazardous substance and must be reacted to a stable material for disposal or be converted to a chemical form that can be used as feedstock in some different process.

7.1.3.1 Process Description

The sodium reaction process utilized by ANL-West forms the basis for the FFTF Sodium Reaction Facility. For planning purposes, pending operational verification of the Idaho unit, the same processing facility will be constructed at FFTF. The process consists of injecting molten sodium metal and water into a reaction vessel partially filled with 40% to 50% sodium hydroxide at a temperature of about 240°F. The reaction produces more sodium hydroxide and hydrogen gas. The gas is swept out of the vessel by a nitrogen cover gas purge and maintained at sufficient dilution that it is not flammable when mixed with air. The sodium hydroxide can be pumped into rail or road tank cars for transport to the tank farms.

If the desired end product is sodium sulfate, sodium and sulfuric acid are reacted in two stages to produce sodium sulfate and hydrogen gas. The hydrogen is diluted and vented as in the hydroxide process. The sulfate slurry is transferred through a filter and the solution is returned to the reaction chamber. The sulfate salt is dried and the water that is removed in the drying process is recycled into the reaction chamber. The dry sulfate is suitable for burial. The radioactive contaminants in the sodium are expected to be carried through the process to the solid sulfate phase, except for tritium which will be exhausted through an appropriate ventilation system within acceptable discharge concentration limits.

All of the Hanford sodium metal, including the Hallam and SRE sodium, could be processed by either the hydroxide or the sulfate process in approximately two years assuming a plant efficiency of 70% at 30 gallons/hour throughput. Other non-RCRA regulated waste forms could also be selected (e.g., sodium borate) and would likely be comparable in cost.

7.1.3.2 Facility Description

Detailed layout of the facility will await complete determination of the ANL-West final design. The Idaho facility is being upgraded to produce sodium carbonate from its current sodium hydroxide capability. While baseline planning for the FFTF facility does not include conversion to sodium

carbonate, the sodium hydroxide reaction portion of the FFTF Sodium Reaction Facility will be modeled closely after the corresponding part of the Idaho facility. Since the facility will have a relatively short lifetime, construction is expected to be as inexpensive as possible, consistent with safety and environmental requirements. Locating the system adjacent to the Sodium Storage Facility will reduce construction and operation costs through the sharing of utility hookups and operational integration. To reduce costs, two surplus tanks from the terminated Clinch River Breeder Reactor Project will be retained for holding the sodium hydroxide produced by the conversion process. Other potential cost reduction options such as relocating portions of the ANL-W equipment to FFTF and using existing on-site buildings for location of the reaction facility will be explored.

Keeping the two buildings as separate sub-projects will allow minimum interference with the earlier construction of the Sodium Storage Facility, and allow costs for the construction projects to be spread out over several years. If the sodium sulfate process is to be used, equipment for the packaging of the sulfate will be needed. This would include personnel and facility protection from dust and residual radioactivity. Temporary storage of filled containers, as well as new supplies, a control room and minimal maintenance space will be needed. The building must allow truck access for shipping the packaged reaction product, for materials delivery, and for emergency vehicles.

7.1.3.3 Packaging and Transportation

Regardless of which conversion process is selected for FFTF and legacy radioactive sodium, a packaging and transportation protocol will need to be developed. The requirements will differ significantly depending on whether sodium hydroxide for use by Tank Farms, or sodium sulfate for burial, is selected. However, in neither case does the operation fall outside of developed and proven techniques.

7.1.3.4 Environmental/Safety Requirements

The radioactive components discharged from the process will be monitored to assure regulatory compliance. Likewise any radiological or chemical contamination as well as radiation levels will be monitored for personnel safety.

7.1.3.5 Schedule

The Sodium Reaction Facility schedule is dependent upon the outcome of the Tri-Party Agreement Milestone M-50-03. The milestone will determine the high level waste sludge pretreatment process for the Tank Waste Remediation System at Hanford. The earliest estimated date to begin sludge washing is FY 2008. If a decision is made to convert FFTF sodium into a pretreatment feed stock for TWRS, action to fund the design and construction of the Sodium Reaction Facility can be delayed to FY 2004, or later. However, if a decision is made to convert the sodium to a form suitable for disposal as a solid waste, design activities could be initiated as early as October 1, 1998.

7.2 NE LEGACY RADIOACTIVE SODIUM

The Hallam and SRE sodium has also been identified by the TWRS Program for potential use for high level waste tank sludge pretreatment as described in Section 7.1. Two alternate disposition options are also being evaluated, including private sector conversion to create a product for disposal or reuse; and off-site treatment at the ANL-West. These evaluations are planned to be completed in conjunction with the TWRS decision point (Tri-Party Agreement Milestone M-50-03) on the high level waste tank pretreatment process by March, 1998. If the option to treat the Hallam/SRE sodium at the FFTF Sodium Reaction Facility is employed, this sodium inventory will follow the same disposition path as the FFTF sodium inventory discussed in Section 7.1 of this plan.

Sodium conversion by the private sector is being pursued on a limited basis. Initial contracting efforts in FY 1994 showed interest from several commercial firms, but funding limitations prevented bid and potential award of a contract. Funding scenarios are being explored which will allow a revitalization of the contracting effort. If cost/schedule benefits are found to exist, use of the private sector will be further explored. Conversion at the ANL-West Sodium Reaction Facility will be evaluated in order to determine the feasibility/cost of shipment and treatment at ANL-West in comparison with other conversion options. If cost/schedule benefits are found to exist, use of this facility will be further explored.

The following sections discuss the storage options being considered in the event that no credible use for the sodium is found and the sodium must be managed as radioactive mixed waste.

7.2.1 Hallam Sodium/2727-W

The preferred storage option for the Hallam sodium is to leave it in its current configuration within the 2727-W facility. The sodium has been safely maintained in this facility for the past 27 years. Continued storage at 2727-W poses no technical, environmental, or personnel safety concerns. The sodium is stored in the tanks within the facility in solid form. As such, there are no credible container breach scenarios that can be postulated where a spill or fire could possibly occur. An active nitrogen blanket is maintained on the tanks and Solid Waste Operations conducts routine surveillances of the facility and sodium inventory. Two 300 pound Met-L-X fire suppression tanks are available in the incredible event a fire were to occur, and the fire alarm system relays to the 200 Area West dispatcher for prompt emergency response.

Two options were considered for providing RCRA compliant storage: enlarging the FFTF Sodium Storage Facility to house this sodium or providing a new storage facility in the Central Waste Complex. The first option of storage at FFTF was discarded as not being a cost effective alternative. The added cost to the FFTF facility was estimated at several millions of dollars to accommodate the Hallam inventory. The second option considered was providing a new storage facility at the Central Waste Complex. Since no funding has been identified for this activity, it is estimated that it would require four

to five years to obtain the funding necessary to design and construct the facility. Since the sodium is being managed as a product for use by the TWRS program, and no safety concerns are associated with its current storage location, construction of a new facility is not prudent.

Leaving the Hallam sodium in its current safe storage configuration is the preferred alternative. This provides the lowest cost option and would allow available funding to be applied more effectively towards higher priority waste management activities. Note, that continued storage in 2727-W is also compatible with the off-site sodium conversion options, should these alternatives materialize.

7.2.2 SRE Sodium/South Alkali Metal (SAM) Storage Modules

The SAM Storage Modules are described in Section 5.2.1. These modules meet the requirements for storage of reactive metal under WAC 173-303. Therefore, no further action is required for the storage of the SRE inventory regardless of the disposition option selected.

7.3 NE LEGACY NON-RADIOACTIVE SODIUM

Removal of the sodium from each of the different facilities and/or test loops presents unique opportunities and challenges. The sodium is housed in tanks and test loops requiring significant effort to repackage prior to off-site sale. This will involve the necessary equipment and facility modifications that will be required to heat the various sodium storage tanks for transfer to acceptable DOT containers or transport vehicles. As indicated in the Section 9.0, Figure 17, NE Legacy Summary Schedule, this process is estimated to be completed in Fiscal Year 2001. Actual dismantlement work began on schedule in early Calendar Year 1995, and is progressing well.

Priority will be given to test loop removal to support the aims of the Cooperative Research and Development Agreement (CRADA) between DOE-RL, WHC, and LM Manufacturing of Marysville, WA (LM). LM is developing magnetohydrodynamic (MHD) generators using a liquid metal as the moving conductor. Under the terms of the CRADA, WHC provides surplus material from Hanford, particularly excess FFTF components, plus the sodium piping and electrical and control equipment from the retired sodium test loops that are being dismantled by the NE Legacies program. In return, DOE receives a stock option in LM, and DOE/WHC receive royalties on MHD units sold by LM. The program priorities and order of tasks has been significantly revised to accommodate the terms of the CRADA.

While each facility represents its own unique features and challenges, there are many common activities, including:

- Piping from systems where the sodium has been drained will be isolated from the loop dump tank, vapor traps, and cold traps and cut into sections as large as practicable, purged with inert gas, and sealed. Insulation and trace heat will be removed from the sections to be cut as necessary. Asbestos-containing insulation cannot be shipped and must be removed and properly disposed of. Pipe and tubing will be cut as much as practical with hand-held pipe and tubing cutters to minimize heat

build-up and avoid melting the sodium. Portable band saws may be used in some instances when absolutely necessary. The cut sections will then be packaged and sent to LM. In-line components such as pumps, flowmeter, and valves will either be left in the large piping sections, or removed and sectioned for separate shipment. The SHTL piping was shipped in its framing module.

- Piping and components that are not to be shipped to LM will be loaded into DOT-approved containers and shipped to a Treatment Storage and Disposal (TSD) for disposal. WHC has a contract thorough the Hanford Central Waste Complex (CWC) with a RCRA compliant TSD facility for disposal. Some of the larger components will not meet the TSD's size restrictions and must be stored at the CWC pending resolution, which may necessitate additional storage space at the CWC for sodium-containing materials. All insulation, trace heat, and instrumentation will be removed from materials to be shipped to the CWC or the TSD, and disposed of. Some of the insulation and wiring contains asbestos and must be handled as such (a highly successful campaign to remove and safely dispose of asbestos-containing insulation, using a large vacuum system coupled to a water spray and bagging device, all inside a plastic tent, was performed on the SHTL in June, 1995).
- The two NaK systems will be drained, using techniques such as freezing the lines with dry ice or liquid nitrogen prior to cutting to attach the drain valves. The NaK will be drained into DOT-approved containers for sale or excess. The tubing lines will either be cleaned via a water-vapor nitrogen process and the tubing excessed, or the tubing will be cut into sections appropriate for shipping to a TSD for disposal.
- The bulk sodium in the system drain tanks has not been degraded by its use in the test programs, and is intended to be removed and sold. The larger tanks will be drained into rail cars supplied by the receiving organization, while the smaller tanks will be drained into DOT-approved containers to transfer to the receiving organization.
- Non-sodium equipment from the test systems such as electrical and control components, power supplies, etc. will be shipped to LM under terms of the CRADA. Other piping, components, insulation, trace heaters, pipe hangers, tanks, etc. that are not sodium wetted will be excessed. Some components may have no excess value and will be sent to appropriate land burial at the Hanford Site.
- Sectioning of the larger vessels and tanks is not practical and therefore these components will be cleaned in situ. For planning purposes, the process that would be used would be the water vapor-nitrogen process (WVN) developed at Westinghouse Hanford Company, and summarized in the Sodium Removal and Disposal Handbook prepared by Argonne National Laboratory for the Department of Energy, Reference 14. With the WVN process, the sodium residuals in a tank would be slowly reacted with a moist inert gas and the process monitored until no

further chemical reaction was detected. The vessel would then be flushed with a water rinse. After cleaning, the tank(s) could be left in place, excessed or disposed of in an appropriate landfill at Hanford. LM has indicated interest in the tanks from PAL, SHTL, TTL, and 221-T.

A portable water vapor-nitrogen process cleaning station will be built in FY 1996 to provide the required auxiliary services for cleaning tanks and other components, as necessary.

The following sections describe the facility specific plans for removal of the bulk sodium and removal of the remaining sodium wetted systems, components and tanks. Some of the larger tanks, as discussed below, will be cleaned and remain in place.

7.3.1 1720-DR Sodium Storage Building

The 4,600 gallons of sodium will be transferred from the 6,000 gallon storage tank in the 1720-DR Building into the buyer's shipping container, which for the present reference buyer is a rail car. Temporary tracks to gain access to the 1720-DR building would be required to use this option. Temporary services including an electrical supply, an instrument monitoring/control system, and a heat traced transfer line will be routed from the facility tank to the buyer's shipping container. The sodium will be heated and transferred by inert gas pressure assist. The residual sodium remaining in the tank will be removed using the in situ WVN cleaning method. Once the tank is cleaned and released, it will be excessed for reuse by others, or disposed of in an appropriate Hanford landfill. If the excessing process is successful for the cleaned tank, in order to remove the cleaned tank from the facility, the metal building would have to be torn down.

An evaluation is underway to determine whether it would be advantageous to move the tank and associated building to the 300 area, so that only the temporary rail line in the 300 Area would need to be placed, and the costs of providing services to the remote 1720-DR tank location would be avoided. The actual draining operation is scheduled to begin in FY 2000.

7.3.2 213-K Sodium Storage Facility

On April 7, 1994, the 75 drums of new sodium previously stored in this facility, were shipped off-site to a buyer. The facility will be redesignated to support other Hanford programs or turned over to the Hanford Environmental Restoration Contractor.

7.3.3 221-T Containment Systems Test Facility (CSTF)

The 215 gallons of sodium contained in two tanks in the CSTF will be heated and transferred to 55-gallon drums using a nitrogen pressure transfer through a specially designed trace heated transfer pipeline. During operation of the CSTF, the sodium was never used in any radiological experiments, therefore no radiological contamination is expected. However, because the system is located within a Radiologically Controlled Area, sodium samples will be taken during the transfer operation to verify analytically whether any radioactivity

can be detected in the sodium that is above the release limits. These analyses will determine if the sodium can be released to the private sector, or have to be managed as radioactive material.

Once the sodium is removed, the CSTF delivery piping, control panel, and sodium loading station will be removed. Sodium piping and tanks that are releasable will be packaged and shipped to LM. The process tanks will be cleaned by the water vapor-nitrogen process before shipment. Sodium-wetted components that are not shipped to LM will be packaged and sent to a TSD, or managed at the Central Waste Complex. Any items that cannot be released and are not sodium wetted, will be buried as low level radioactive waste. Items that are sodium wetted and cannot be released will be appropriately managed as mixed radioactive waste at the Central Waste Complex.

The CSTF containment vessel will be opened and the in-vessel sodium wetted piping removed, as required, and packaged as discussed above for excess or off-site shipment to a TSD facility. After removal of the in-vessel sodium piping, the containment vessel will be inspected for residual sodium compounds, cleaned and reclosed by installing blank flanges, etc., as appropriate.

This effort is scheduled to begin during Fiscal Year 2000.

7.3.4 335 Building/SHTL and PAL

The Small Heat Transfer Loop (SHTL) was removed in FY 1995. The electrical and control components were removed and shipped to LM Manufacturing. The insulation on the loop contained asbestos, therefore it was removed using approved techniques and a specially trained work crew, and sent to an asbestos landfill for permanent burial or conversion to a nonhazardous material. The loop piping was sectioned to split the loop enclosure into three sections. The cold trap, vapor traps, and drain tank were removed from the piping system. The piping was filled with inert gas and sealed with compression fittings. The electromagnetic pump and flowmeter were separated from the piping system, and these components and the remaining piping were re-sealed, and moved to one of the other sections. The two sections containing sodium-wetted materials were enclosed in large plywood boxes reinforced with dimension lumber, per the conditions of the DOT exemption request to ship sodium-containing materials to LM. Shipment to LM per the CRADA was conducted on September 20, 1995. Figure 14 shows the SHTL prior to dismantling and boxed for shipment to LM.

The cold trap and vapor traps will either be sent to a TSD or the Central Waste Complex for management as waste. The drain tank will be connected to a trace-heated piping system, heated, and the sodium transferred into a DOT-rated receiving vessel for sale or excess. The tank draining and cleaning operation is scheduled for FY 1998.

95030176-13cn

(March, 1995)

BEFORE

95080363-22cn

(August 1995)

AFTER

Figure 14. SHTL Removal

The Prototype Applications Loop (PAL) differs from the SHTL and other systems in that the loop piping is largely below the elevation of the sodium in the process tank, and thus is filled with sodium. LM has requested that sodium-filled (as compared to sodium-wetted) piping not be shipped to them. In addition, PAL has a small NaK loop used for cold trap cooling which contains about 15 pounds of NaK.

The dismantlement plan for PAL differs somewhat from that for SHTL. First, the electrical and control circuits not required for vessel sodium melt-out or NaK removal will be removed and all usable parts sent to LM. Then, the NaK will be drained into a DOT-approved container for sale or excess. The NaK piping will be removed and packaged for shipment to a TSD. The next step will be draining sodium from the process vessel in a manner similar to that done for SHTL. This step will permit complete electrical isolation of the sodium system, and facilitate dismantlement of the electrical and control systems. The electrical and control systems will be shipped to LM (some equipment was shipped in FY 1995). Insulation, heaters, and wiring will be removed from the piping and disposed of appropriately (first indication is that the insulation on PAL does not contain asbestos). The piping system will be cut up into pieces suitable for shipment to a TSD. Usable components such as valves, flowmeter, and pumps will be shipped to LM. The tank, and perhaps the usable components, will then be cleaned by the water-vapor nitrogen process. The dismantlement of the PAL and shipment of the piping to a TSD is scheduled for FY 1996, with the cleaning of the tank and components to occur in FY 1997.

7.3.5 335-A Building/TTL

The Thermal Transient Loop (TTL) is considerably larger and more complex than either SHTL or PAL, but can be removed using the same general principles. The sodium in the loop, approximately 670 gallons, has been drained to the 1050 gallon dump tank. Additional complexities include a large heater and heat exchanger, and two sealed radioactive cesium sources that were used for flowmeter calibration. The heater and heat exchanger may not be useful to LM and will be cleaned and excessed if that is the case. The sealed radioactive sources will be buried as low-level waste. The usable electrical and control components, piping, and liquid metal components such as pumps, valves, and flowmeters will be prepared and sent to LM. Since the TTL system is not compact within a module like SHTL and PAL, it will not be possible to make only a few cuts and ship sub-modules. Either another DOT exemption for shipping packaged sodium-wetted material must be obtained, or the sodium-wetted parts must be cleaned of sodium residues before shipment. The last item for TTL is draining and cleaning of the dump tank for shipment to LM or excessing, and sale of the sodium to a commercial buyer. This activity is scheduled to start in FY 1997, however, some of the planning activities may start before then as budget and schedule permit.

7.3.6 337 Highbay Building/HTSF and CRCTA

The HTSF and the CRCTA are the largest and most complex test loop and supporting vessels to be dispositioned. A similar approach will be used as with the smaller test loops for dismantling the piping systems. All usable piping, components, and electrical and control system hardware will be sent to LM.

The CRCTA is a large below grade vessel which was previously drained to the extent practical. Special provisions such as installation of a dip tube will be required to remove the remaining 75 gallons of sodium in the tank. The residual sodium remaining in the vessel will be reacted using the in situ WVN cleaning process. The vessel will remain in its current location for the following reasons: 1) it could be used to support equipment testing activities (i.e., large pump run-in), 2) the vessel is so large that removal could disrupt future testing programs on the main floor of the 337 Highbay Building, and/or 3) the removal cost would be very large for the small gain achieved.

Contained in this loop facility is a NaK system that was used for heat removal from the cold trap. The oil in the system was removed and excessed in 1994. The NaK will be drained from the loop using techniques similar to those developed for PAL, and the NaK excessed or sold. The NaK piping will be sent to a TSD, or cleaned and excessed.

Removal of the 337 building test loop complex is estimated to begin during Fiscal Year 1999 and be completed by the end of Fiscal Year 2001. The space used by this test facility is expected to be utilized by other Hanford programs.

7.3.7 3718-M Sodium Storage Building

The 42,000 gallons of sodium in the 50,000 gallon storage tank housed in the 3718-M Building will be heated and transferred to the buyer's shipping container/vehicle which is expected to be a rail car or tanker truck. If a rail car is used, temporary tracks will need to be placed at the west end side of 337 Building to provide access. Two or three rail cars will be required to accommodate the entire sodium inventory. The present discussions with a commercial vendor have specified a rail car as the required method of transfer. Once the sodium is removed, the residual sodium in the tank will be cleaned using the in situ WVN cleaning method. The storage tank will remain in the 3718-M Building if a need is identified, otherwise the tank may be removed and excessed. If the tank is excessed, the roof will have to be removed to provide the necessary access. Once the vessel and associated piping is removed, the roof will be reinstalled and the building can be reassigned to another Hanford Program. This effort should begin in Fiscal Year 2000 and be completed by the end of Fiscal Year 2001.

The last task involving sodium management at any of the retired test facilities will be cleaning of the transfer piping used to move sodium from the tanks being drained to the receiving vessel. This piping, and any valves, control systems, and other components will then be transferred for other on-site use, or excessed.

8.0 REGULATORY COMPLIANCE PLAN

A major component in the safe disposition of these facilities is to ensure compliance with applicable environmental regulations. This Sodium Management Plan provides the framework for discussions with Ecology and the EPA on the regulatory issues/activities identified in the following sections. These requirements are based on the planned activities as described in Section 7.0. This plan is a vital element for ensuring that all involved stakeholders, including WHC, DOE, Washington State regulators, and public entities, understand the activities being planned and to ensure that the disposition of this immense sodium legacy is a cohesive effort by all relevant parties.

8.1 FFTF

The decommissioning process for FFTF will be accomplished in three phases: Phase I (Facility Transition), Phase II (Surveillance and Maintenance), and Phase III (Disposition). The Phase I activities will place the FFTF in a safe and stable end-point condition such that it can be dispositioned at a later date. This section defines the activities required to achieve compliance with the environmental regulations which impact the Phase I transition activities. These regulations fall under the *National Environmental Policy Act of 1969*, the *State Environmental Policy Act*, the *Resource Conservation and Recovery Act of 1976*, the *Clean Air Act*, the *Toxic Substances and Control Act of 1976*, and the *National Historic Preservation Act of 1966*.

The January 1994 amendment to Section 3.1 of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Action Plan, required DOE to enter into negotiations with the Washington State Department of Ecology and the United States Environmental Protection Agency, Region 10, for the coordination of activities associated with the transition of FFTF in June, 1994. The intent of the negotiations was to establish Tri-Party Agreement milestones and target dates for the transition activities that will result in an expeditious and cost efficient transition of the FFTF to a radiologically and environmentally safe shutdown condition such that it can be decommissioned at a later date. Major and interim milestones and target dates were agreed upon and established in the Tri-Party Agreement in M-81-00 and M-20-00 to address the transition of the FFTF (Reference 8). In most cases, these milestones were selected based on the critical path schedule for FFTF transition.

The environmental regulations/activities discussed below support the activities discussed in Section 7, and the Tri-Party Agreement commitments on the FFTF transition that relate to sodium management and disposition.

8.1.1 National Environmental Policy Act

The *National Environmental Policy Act of 1969* (NEPA) requires the scope of the FFTF deactivation activities to be evaluated to determine if they or any related activity meet the criteria for a major Federal action which has the potential for significantly affecting the quality of the human environment.

No action concerning the transition to shutdown should take place which would have significant environmental impacts or limit the choice of reasonable alternatives for each major task until this process is completed.

8.1.1.1 Actions

- (1) An Action Decision Memorandum was prepared and submitted to RL on January 21, 1994, to support a DOE determination regarding the appropriate level of NEPA documentation for the proposed shutdown scope.
- (2) DOE determined that an Environmental Assessment is the appropriate level of NEPA documentation for the proposed FFTF deactivation scope (Reference 15). An Environmental Assessment was prepared that addresses: the major activities associated with shutdown including the construction of the Sodium Storage Facility and Sodium Reaction Facility, drain and storage of the FFTF sodium, possible transfer and reaction of the Hallam and Sodium Reactor Experiment sodium at the FFTF Sodium Reaction Facility, inert gas blanketing or passivation of the sodium residuals, conversion of the bulk sodium to a stabilized form, and management of resultant waste streams. After reviewing the Environmental Assessment, DOE determined on May 1, 1995 that preparation of an Environmental Impact Statement was not required in a Finding Of No Significant Impacts (Reference 16).

8.1.2 Resource Conservation and Recovery Act (RCRA)

The *Resource Conservation and Recovery Act of 1976* (RCRA) establishes requirements for the management of hazardous waste. The State of Washington Department of Ecology administers the requirements of this Act through the "Dangerous Waste Regulations" contained in Chapter 173-303 of the Washington Administrative Code. Waste sodium would be regulated pursuant to these requirements. The following actions reflect the agreement that was reached by the State of Washington Department of Ecology, the U.S. Environmental Protection Agency and the U.S. Department of Energy for management of hazardous materials at FFTF which is documented in the Tri-Party Agreement milestone series M-81-00 and M-20-00.

8.1.2.1 Actions

- (1) The approximately 260,000 gallons of FFTF sodium coolant provides cooling for the irradiated fuel components, therefore serving a useful function until the fuel offload is complete. The reactor vessel and heat transport systems will be drained to the Sodium Storage Facility when fuel offload is complete. A new purpose for the sodium has been identified by the Tank Waste Remediation System (TWRS) Program (Reference 12).

The TWRS Program plans to use the sodium, converted to sodium hydroxide, for caustic washing as part of the high level waste tank sludge pretreatment process. The TWRS Program technical baseline specifies caustic washing as the primary process for tank waste sludge pretreatment. The current TWRS flowsheet, WHC-SD-WM-T1-613, Rev. 0, dated June 29, 1994, requires 21,000 metric tons of sodium hydroxide.

Sodium hydroxide produced from the sodium metal at FFTF represents approximately 8 percent of the sodium hydroxide identified in the TWRS flowsheet. The FFTF Transition Project technical baseline includes planning for conversion of the sodium to sodium hydroxide for use in the TWRS Program. The sodium will be managed as product material for use at TWRS until an evaluation is completed in May, 1998 to confirm the final sodium disposition and form (i.e., product or waste). The FFTF evaluation (Tri-Party Agreement Milestone M-81-02-T01) will be conducted in concert with the TWRS evaluation (Tri-Party Agreement Milestone M-50-03) which will define the TWRS tank waste pretreatment requirements.

In the interim, activities have been initiated, as discussed in Item 2 below, to provide RCRA and WAC 173-303 compliant storage for the sodium in the Sodium Storage Facility and treatment in the Sodium Reaction Facility, in the event the 1998 evaluation determines the sodium use at TWRS is not viable and would have to be managed as dangerous waste.

- (2) On September 13, 1994, RL submitted a letter notifying Ecology of their intent to request interim status expansion of the Hanford Facility's Permit for the Sodium Storage Facility and Sodium Reaction Facility (Reference 17). Subsequently, on December 19, 1994, in accordance with WAC 173-303-281, RL and WHC submitted a Notice of Intent (NOI) for Expansion Under Interim Status for the Hanford Facility (Reference 18). The expansion included the Sodium Storage Facility and the Sodium Reaction Facility. Following a 150 day public review and comment period, a Part A Permit Application was submitted to Ecology on May 22, 1995, and was subsequently approved by Ecology on June 14, 1995 (Reference 19).

If the sodium use at TWRS is confirmed in 1998 as expected, the Sodium Storage Facility and Sodium Reaction Facility unit would then undergo procedural closure as defined in Section 6.3.3 of the Tri-Party Agreement. In this event, the FFTF End-Point Criteria Document (Tri-Party Agreement Milestone M-81-03) and Surveillance and Maintenance Plan (Tri-Party Agreement Milestone M-81-05) would be provided to the U.S. EPA and Ecology for review, and approval for the hazardous substances proposed to remain in the plant pending Phase III (Disposition) of the decommissioning process.

- (3) When the sodium systems have been drained to the maximum practical extent, sodium residuals will remain in the plant's cooling systems. In addition, there are a number of sodium-wetted equipment [i.e., non-fuel core components, stalks from experimental assemblies (MOTAs, FOTAs, etc.), and various fuel handling equipment] that will remain either in the FFTF core to maintain reactor core geometry, or in cells adjacent to the core (i.e., In-vessel Storage, Interim Decay Storage Vessel, Test Assembly Conditioning Station, or Interim Examination and Maintenance Cell). Final disposition of this equipment has not been determined; however it is expected that the majority will be retained in FFTF until the disposition phase of the decommissioning process.

The FFTF End-Point Criteria Document and Surveillance and Maintenance Plan will address management of these materials, and will be submitted to the U.S. EPA and Ecology for review and approval of the hazardous materials proposed to remain in the plant.

- (4) As discussed in Item 1 above, the Sodium Storage Facility and the Sodium Reaction Facility will be designed and operated to meet appropriate RCRA requirements. WAC 173-303 requires sodium storage in a manner equivalent with the Uniform Fire Code. Sodium is classified in the Uniform Fire Code as a flammable solid, pyrophoric and water-reactive material and the rules of 80.305, 80.308 and 80.310 apply, respectively. Due to the large amount of sodium that will be stored in the Sodium Storage Facility in surplus Clinch River Breeder Reactor Project tanks, exact compliance with two UFC rules must be clarified and/or alternate methods concurred with by the authority having jurisdiction over the WAC 173-303. The authority has been established as the Washington State Department of Ecology, who will coordinate with the State Fire Marshall on UFC issues. A letter was submitted on June 29, 1994 (Reference 20) requesting approval of the proposed approach which was subsequently approved on December 15, 1995 (Reference 21). Following is a brief description of each item:

- Uniform Fire Code Section 80.301 (p) Fire-extinguishing Systems, states "Unless exempted or otherwise provided for in Sections 80.302 through 80.315, indoor storage areas and storage buildings shall be protected by an automatic sprinkler system."

Basis: Sprinkler systems in a sodium facility are not consistent with current industry practice and are unacceptable because water reacts with sodium to produce violent and uncontrollable reactions. Section 10.509 specifically states that "Sprinklers shall not be installed when the application of water or flame and water to the contents may constitute a serious life or fire hazard, as in the manufacture or storage of quantities of...metallic sodium...".

- Uniform Fire Code Section 80.308 (a) 7, Storage Conditions, states "Tanks or containers inside buildings shall not be larger than 500 gallons."

Basis: There are approximately 260,000 gallons of FFTF sodium that will be drained from the Plant. Four Clinch River Breeder Reactor vessels will be used to store the FFTF sodium (three with a capacity of 80,000 gallons each and one with a capacity of 52,000 gallons). The safety hazards associated with the transfer and storage of this very large volume of sodium to 500 gallon tanks would be imprudent, increasing the likelihood of a spill/fire and exorbitantly increasing the required size and cost of the facility for no credible technical or safety rationale.

- (5) Following conversion of the sodium inventory stored within the Sodium Storage Facility, any residual sodium or chemicals used for the reaction process will be appropriately addressed prior to turnover of the facility to the Hanford Environmental Restoration Contractor.

8.1.3 State Environmental Policy Act (SEPA)

The State Environmental Policy Act (SEPA) is the State or local equivalent of NEPA that requires evaluation of environmental impacts associated with a project prior to approval (license or State permit). A SEPA checklist was submitted to the Washington State Department of Ecology with the RCRA Notice of Intent for Expansion Under Interim Status for the Hanford Facility (Reference 18).

8.1.4 Clean Air Act (CAA)

Two potential new sources of air emissions (e.g., the Sodium Storage Facility and Sodium Reaction Facility) will be evaluated, as discussed below, to determine if there will be any increase in radioactive or toxic air pollutants impacted by the Clean Air Act:

- (1) Any increase in radionuclide emissions as a result of these planned activities are regulated by the National Emission Standards for Hazardous Air Pollutants (radioactive only), 40 CFR 61 Subpart H, and Radioactive Air Emissions Program, WAC 246-247. A Notice of Construction (NOC) was prepared according to requirements of the WAC 246-247, Radiation Protection - Air Emissions, and 40 CFR 61 Subpart H for the Sodium Storage Facility and submitted to the Washington State Department of Health (DOH) and the U.S. Environmental Protection Agency (EPA) which was approved on February 24, 1995, and February 8, 1995, respectively (References 22 and 23). An NOC will also be required for the Sodium Reaction Facility prior to construction.
- (2) The Combined Exhaust (registration #141-001) will continue to be evaluated, per existing practice, to determine whether any transition activities would require a notification to the State of Washington Department of Health.
- (3) Fugitive emissions (especially dust) from construction/operational activities associated with the construction of the Interim Storage Area, Sodium Storage Facility and Sodium Reaction Facility will be controlled in accordance with normal practices, per Benton-Franklin Clean Air Authority.

8.1.5 Other Regulatory Requirements

The Hanford Cultural Resources Laboratory conducted a cultural resources review of the FFTF Transition Project entailing the deactivation of FFTF and construction of the Interim Storage Area, modifying the Plutonium Finishing Plant fuel storage area, and the Sodium Storage Facility and Sodium Reaction Facility in June, 1994 (Reference 24). The review indicated that the new construct sites have been highly disturbed by building, road, and utility construction and survey and monitoring by an archaeologist during excavation work is not necessary.

However, the review indicated that the FFTF has not been evaluated for eligibility for the National Register of Historic Places (NRHP). An historical evaluation of the FFTF, in compliance with the *National Historic Preservation Act of 1966* (NHPA) will be conducted during the Transition Phase.

A biological site assessment was conducted of the project construction sites (e.g., Interim Storage Area, Sodium Storage Facility, Sodium Reaction Facility). The pedestrian survey focused on plant and animal species listed as threatened, endangered, candidate, sensitive, or monitored by the State of Washington. The survey concluded that no adverse impacts to such species would occur from the proposed action (Reference 25).

8.2 NE LEGACY RADIOACTIVE SODIUM

The primary regulatory concern with management of the Hallam and SRE sodium is the applicability of RCRA should the disposition options discussed in Section 7.2 not materialize and the sodium is declared waste. The RCRA issues associated with potential storage and disposition options are discussed in Section 8.2.3.

8.2.1 NEPA

The final disposition of the Hallam and SRE sodium has not been determined at this time. However, the two most likely options would appear to be conversion at the FFTF Sodium Reaction Facility or private sector conversion to a form suitable for reuse or disposal. Treatment at the FFTF facility is included within the scope of the Environmental Assessment that was prepared to support the FFTF shutdown activities (Section 8.1.1). Sodium conversion by either the private sector or ANL-West would require a NEPA review, to address both conversion actions and transportation.

The preferred storage option for the Hallam sodium is to leave it in its current storage location within the 2727-W Building. This would not require any NEPA review unless facility modifications are required. Depending on the final disposal option selected, additional review may be required. Transfer of the tanks and treatment at the FFTF Sodium Reaction Facility is included within the scope of the Environmental Assessment submitted for the FFTF transition activities.

8.2.2 SEPA

As a result of appropriate NEPA reviews that may be required as discussed in Section 8.2.1, and discussions with Ecology, submittal of a SEPA checklist for planned activities may be required.

8.2.3 RCRA

The SRE sodium is stored in RCRA compliant SAM storage modules at the Central Waste Complex. Currently it appears favorable that the Hallam and SRE sodium inventories may have beneficial re-use by the TWRS Program or the private sector. As these options remain open, this inventory is being managed as product, and not subject to RCRA regulation. If beneficial re-use of the

sodium does not materialize, final treatment of the sodium for disposal would be conducted at either the FFTF Sodium Reaction Facility, ANL-West or by the private sector.

If the Hallam sodium is declared a waste, the preferred storage option is to leave it in its current safe configuration within the 2727-W facility. The 2727-W Building which houses the Hallam sodium, does not meet certain criteria imposed by the Washington Administrative Code 173-303 which requires sodium storage in a manner equivalent with the Uniform Fire Code. Therefore, leaving the Hallam sodium in this location would require negotiation/agreement with Ecology.

The Uniform Fire Code requirements/waivers discussed for the FFTF facilities (see Section 8.1.3.1) are also applicable to storage of the Hallam sodium in the 2727-W Building and a waiver, or Ecology/EPA approval, may be required. In addition, the following WAC requirement is not met and a waiver or equivalency determination may be required:

- WAC 173-303-640 requires secondary containment for a tank system. This secondary containment must be designed to contain 100% of the capacity of the largest tank within its boundary. (The UFC requires secondary containment for storage rooms and buildings containing water reactive solids in accordance with Section 80.310 (a) 9.

Basis: WAC 173-303-640 (1)(b) allows solids to be in tanks without compliant secondary containment as long as they are within a building and placed on an impermeable floor. Part of the floor of the 2727-W Building is gravel, however, there are no activities planned to heat the sodium in this facility. Also, there is no credible container breach scenario that can be postulated where a spill could occur (even if a breach were to occur, there would be no spill).

8.2.4 CAA

There are no air emissions associated with the current storage configuration for the Hallam Storage Tanks and SRE drums. Therefore, the CAA is not applicable.

8.3 NE LEGACY NON-RADIOACTIVE SODIUM

The primary regulatory activities associated with the disposition of the various test loops, as discussed in Section 7.3, are related to appropriate management of waste that may be generated during disposition of the sodium wetted loop piping, components, and tanks following drain of the bulk sodium. It is planned to in situ clean the residual sodium from the larger vessels in these systems.

8.3.1 NEPA

The Action Description Memorandum (ADM) supporting NEPA documentation for the disposition of the alkali metal test loops was submitted in January, 1994 (Reference 26). Based on the information contained in the ADM, RL determined that an Environmental Assessment is the appropriate level of NEPA documentation for disposition of the test loops. After reviewing the Environmental Assessment, DOE determined on May 1, 1995, that preparation of an Environmental Impact Statement was not required in a Finding of No Significant Impact (Reference 27).

8.3.2 RCRA

Three firm bids were received from off-site buyers for the non-radioactive bulk sodium extending over a multi-year period. A shipment of sodium in 75 drums was transferred to a buyer on April 7, 1994. The remaining sodium is housed in tanks and test loops requiring repackaging prior to off-site sale. The bulk sodium inventories in these various facilities will continue to be managed as product material during this period. The sodium test loops are being transferred to LM Manufacturing under the terms of the CRADA discussed in Section 7.3. At the time of system dismantling or cleaning, any waste that is generated (e.g., sodium wetted sectioned pipe and components, sodium hydroxide solutions) will be appropriately managed.

Following drain of the large CRCTA and 1720-DR and 3718-M tanks, it is currently planned to remove the residual sodium by in situ water-vapor nitrogen WVN cleaning. The tanks will either be reused, disposed of, or remain in their current location.

In November, 1985, a RCRA Part A and Part B permit applications were submitted for the CSTF in 221-T, as a protective filing in anticipation of future use. A petition to Ecology for withdrawal of the Part A was submitted in June, 1989 (*Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement, Milestone M-20-45). The withdrawal request was predicated on the fact that the unit has never been used, nor is planned to be used for the treatment, storage, and disposal (TSD) of hazardous or mixed waste. The petition was resubmitted in January, 1990 (Tri-Party Agreement Milestone M-23-02), and has not been acted upon to date. A new request to procedurally withdraw the permit has been prepared for submittal to Ecology. If the petition is not withdrawn it could significantly impact the schedule and cost for removal of CSTF sodium and systems.

8.3.3 CAA

The sodium drain, system dismantlement, and in situ cleaning activities will require review to determine whether any Class B Toxic Air Pollutants such as sodium hydroxide emissions could result from the planned activities. There are no radiological emission issues associated with these activities.

8.3.4 Other Regulatory Requirements

A Cultural Resources Review of the planned removal of the alkali metal test loops was completed which indicated that these activities will not alter the facilities in any way that would impact characteristics that could make the associated buildings eligible for the National Register of Historic Places (Reference 28).

8.4 4843 AMSF

A RCRA interim status compliance assessment (Tri-Party Agreement Milestone M-21-00) was submitted prior to March 31, 1989. A closure plan (Reference 11) was submitted to Ecology and EPA in June, 1991, which satisfied Tri-Party Agreement Milestone M-20-14. The closure plan states that before the first activity of closure, all waste will be removed from the 4843 AMSF. Waste removal was completed in May, 1995. Sampling of the AMSF to EPA SW-846 protocols, as required by the Data Quality Objectives agreed to by Ecology, RL, and WHC has been completed. The closure plan is under revision to include the analytical data from the sampling campaign and other changes agreed to through the appropriate Tri-Party Agreement process.

9.0 COST AND SCHEDULE

9.1 FFTF

The summary schedule for the FFTF Transition Project is depicted in Figure 15 and the associated cost profile is provided in Figure 16. The summary schedule graphically demonstrates the integration and interrelationship of the key deactivation activities effective December 15, 1993, when the shutdown directive was received. Approximately seven years will be required to complete the Transition Project.

9.2 NE LEGACY RADIOACTIVE SODIUM

Continued storage of the Hallam and SRE sodium, in the 2727-W Building and SAM storage modules, respectively, require minimal costs due to continuation of maintenance and surveillance, monitoring activities, and small quantities of nitrogen gas usage.

Since evaluation of the disposition alternatives discussed in Section 7.2 have not been completed to date for the Hallam and SRE radioactive sodium inventories, selection of the final disposition option is premature. This document will be revised to reflect the status of these activities and to provide costs and schedules for disposition based on the final option selected.

In Fiscal Year 1996 the following activities are planned:

- Pursue private sector options for NE Legacy Radioactive Sodium and implement if found to be viable and as funding allows.
- Obtain DOT "Regulatory Relief for Shipment of Hallam Sodium Tanks" (Safety Evaluation Report approved by the Department of Energy and submitted to DOT with request for relief in FY 1995).

9.3 NE LEGACY NON-RADIOACTIVE SODIUM

Figure 17 represents the proposed multi-year funding profile for the NE Legacy Program. These estimates are based on the following assumptions:

- Removal of piping systems and transfer to LM is the highest priority within the NE Legacies sodium disposition project.
- Should emergent activities arise in other areas of the NE Legacy Program that require prompt attention, then resources would be diverted, as necessary, and the schedule would be adjusted accordingly.
- The indicated costs are preliminary estimates. Should these costs and/or the authorized funding levels change, then the figure will be adjusted accordingly.

Figure 15. FFTF Shutdown Summary Schedule

FFTF Transition Project - Annual Costs

(Escalated Dollars)

Figure 16. FFTF Summary Level Cost Profile

Funding Profile

Figure 17. NE Legacy Non-Radioactive Sodium Cost Profile

- Technological changes and application of lessons learned for other sites (nationally or internationally) may change the approach for dispositioning the test loops and/or in situ cleaning techniques.
- Detail cost estimates will be developed as part of each test loop's overall task.

Each of the annual activities shown in Figure 17 are briefly discussed below:

Fiscal Year 1995 (work completed)

- Revise program activity, planning, and financial documents to reflect the CRADA.
- Remove and ship the SHTL piping and components, isolate and secure tank.
- Choose concept for 1720-DR and 3718-M sodium (type of receiver, whether to move 1720-DR, etc.)
- Begin design for portable sodium and NaK cleaning station.

Fiscal Year 1996

- Remove and ship PAL; drain and dispose of PAL NaK loop, isolate and secure tank and components not disposed of for future cleaning and shipment.
- Complete design and construction of portable cleaning station.

Fiscal Year 1997

- Clean and ship (or otherwise properly dispose of) PAL components.
- Begin breakdown of TTL.
- Begin breakdown of 337 Building loop.

Fiscal Year 1998

- Drain and clean PAL and SHTL tanks, and excess.
- Complete delivery of piping from TTL, secure components as above.
- Drain and dispose of NaK loop in 337; continue dismantlement of 337 Building piping.

Fiscal Year 1999

- Complete breakdown of 337 Building piping, and ship.
- Begin cleaning and disposal of CRCTA tank in 337 Building.
- Drain and ship sodium from TTL; clean and excess tank and components.

Fiscal Year 2000

- Break down 221-T sodium piping, ship or dispose of as required.
- Drain 221-T tanks, excess or dispose of sodium.
- Complete cleaning and disposal of CRCTA vessel (the cleaned vessel may be left in place)
- Set up for draining operation of 1720-DR tank, and begin draining.
- Set up for draining operation of 337 tank.

Fiscal Year 2001

- Drain 1720-DR tank, ship sodium, clean transfer piping and equipment, disposition equipment as appropriate.
- Drain 3718-M tank, ship sodium, clean transfer piping and equipment, disposition equipment as appropriate.

10.0 REFERENCES

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2. Letter, J. D. Wagoner, RL, to T. M. Anderson, WHC, "Fast Flux Test Facility (FFTF) Shutdown," OTD:OAF, dated December 15, 1993.
3. WHC-SD-FF-SSP-004, Rev. 1, "The Fast Flux Test Facility Transition Project Plan," dated November 15, 1994.
4. WHC-SD-GN-PD-30002, "Compilation of Hanford Site Nuclear Energy Nonreactor Facilities, Legacy Documentation," dated June, 1992.
5. WHC-SD-NEL-ES-001, Rev. 0, "Evaluation of Disposition Alternatives for the Sodium System at the Containment Systems Test Facility Located in the 221-T Building," dated October 18, 1993.
6. WHC-SD-NEL-ES-002, Rev. 0, "Evaluation of Disposition Alternatives for the Sodium Systems in the 335/335-A Buildings," dated January 19, 1994.
7. WHC-SD-NEL-ES-003, Draft, "Evaluation of Disposition Alternatives for the Sodium System in the 337/3718-M Buildings," dated January 1994.
8. Document, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, "Hanford Federal Facility Agreement and Consent Order," Fifth Amendment, July, 1995.
9. Letter, J. E. Mecca, RL, to President, WHC, "Disposition of Sodium and Test Loops," ORD:RGH, dated June 9, 1993.
10. Engineering Change Notice (ECN) 152558, "Alkali Metal Waste Storage Modules at CWC," Bonner 1992.
11. DOE/RL-90-49, Rev. 0, "The 4843 Alkali Metal Storage Facility Closure Plan," dated June 1991.
12. Letter, T. R. Sheridan, to J. E. Mecca, "Use of Fast Flux Test Facility (FFTF) Sodium for the Tank Waste Remediation System (TWRS) Waste Pretreatment Program," 94-RTI-011, dated September 20, 1994.
13. Memo, I. E. Reep, to T. M. Burke, "Response to Evaluation of FFTF Sodium Use By TWRS," jlc, dated June 23, 1995.
14. ANL-87-30, "Sodium Removal and Disposal Handbook," D. E. Vaden, dated 1987.

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15. Letter, J. R. Hunter, Assistant Manager for Waste Management, RL, to President, WHC, "National Environmental Policy Act (NEPA) Environmental Assessment (EA) Determination: Shutdown of the Fast Flux Test Facility," OTD:RGH, dated April 15, 1994.
16. DOE/EA-0993, "Environmental Assessment: Shutdown of the Fast Flux Test Facility, Hanford Site, Richland, Washington," dated May, 1995.
17. Letter, J. E. Rasmussen, RL, to Ms. Dru Butler, State of Washington Department of Ecology, "Notification of Intent to Request Expansion Under Interim Status for the Fast Flux Test Facility (FFTF) Sodium Storage Facility (SSF) and Sodium Reaction Facility (SRF)," dated September 13, 1994.
18. Letter, J. E. Rasmussen, RL, and W. T. Dixon, WHC, to S. M. Alexander, Ecology, "Notice of Intent for Expansion Under Interim Status for the Hanford Facility (WA7890008967)," dated December 19, 1994.
19. Letter, M. Jaraysi, Ecology, to J. E. Rasmussen, RL, and W. T. Dixon, WHC, MJ:mf, dated June 14, 1995.
20. Letter, J. E. Rasmussen, RL, to Ms. Julie Atwood, Ecology, "Compliance with the Washington Administrative Code (WAC) and the Uniform Fire Code (UFC) for the Storage of Fast Flux Test Facility (FFTF) Sodium," TPD:RGH, dated August 16, 1994.
21. Letter, O. A. Farabee, RL, to President, WHC, "Authorization to Use Alternate Methods of Compliance With the Washington Administrative Code (WAC) in Applying the Uniform Fire Code (UFC) to the Bulk Storage of Sodium From the Fast Flux Test Facility (FFTF)," 94-TPD-104, dated December 15, 1994.
22. Letter, J. McCormick, U.S. EPA Region 10, to J. E. Rasmussen, RL, dated February 8, 1995.
23. Letter, A. W. Conklin, State of Washington Department of Health, to J. E. Rasmussen, RL, February 24, 1995.
24. Letter, M. E. Crist, PNL, to D. L. Nielsen, WHC, "Cultural Resources Review of the FFTF Shutdown Project, HCRC #94-400-008," dated June 23, 1994.
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27. DOE/EA-0987, "Environmental Assessment: Disposition of Alkali Metal Test Loops, Hanford Site, Richland, Washington," dated May 1995.
28. Letter, D. W. Harvey, PNL, to J. D. Briggs, WHC, "Cultural Resources Review of the Hanford Site Legacy Sodium Test Facilities Removal Plan. HCRC #94-200-081," dated February 17, 1994.