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⑤ Sta 14

MAR 13 1995

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 160162

2. To: (Receiving Organization) Systems Integration	3. From: (Originating Organization) Systems Integration	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: Spent Nuclear Fuel Project	6. Cog. Engr.: J. C. Womack	7. Purchase Order No.: N/A

8. Originator Remarks:
This document supports and coincides with a Site Systems Engineering U.S. Department of Energy Richland Operations milestone to baseline the Hanford Site System.

9. Equip./Component No.: N/A

10. System/Bldg./Facility: N/A

11. Receiver Remarks:
None

12. Major Assm. Dwg. No.: N/A

13. Permit/Permit Application No.: N/A

14. Required Response Date: N/A

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-SNF-SD-003		0	Spent Nuclear Fuel Project Technical Baseline Document Fiscal Year 1995	N/A	1	1	1

16. KEY

Approval Designator (F)	Reason for Transmittal (G)		Disposition (H) & (I)	
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 2. Release 3. Information	4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment	4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION
(See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
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2	1	Cog. Mgr. J. C. Womack	JC Womack	3/7/95	R3-86						
		QA N/A									
		Safety N/A									
		Env. N/A									
	1	SNFP Director: J. C. Fulton			R3-85						

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21. DOE APPROVAL (if required)
Ctrl. No.
☐ Approved
☐ Approved w/comments
☐ Disapproved w/comments

RELEASE AUTHORIZATION

Document Number: WHC-SD-SNF-SD-003, REV.0

Document Title: Spent Nuclear Fuel Project Technical Baseling Document Fiscal Year 1995

Release Date: March 10, 1995

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

APPROVED FOR PUBLIC RELEASE

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SUPPORTING DOCUMENT

1. Total Pages 439

2. Title
Spent Nuclear Fuel Project Technical Baseline Document Fiscal Year 1995

3. Number gec 3/13/95
WHC-SD-SNF~~P~~-SD-003

4. Rev No.
0

5. Key Words
Spent Nuclear Fuel Project, Systems Engineering, Technical Baseline, Functions and Requirements, IDEF Diagrams

6. Author
Name: J. C. Womack
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Signature
Organization/Charge Code 2C300/LB102

7. Abstract
This document presents the results of the Spent Nuclear Fuel (SNF) Project systems engineering analyses since September 1994. It is not a total revision to the September 1994 document since the Mission Analysis Report contained in Volume II of the September 1994 document is still current. Section 1.2 of Volume I of this document contains the purpose of the document as a whole. The scope of the SNF Project and of this Technical Baseline Document can be found in Section 1.3 of Volume I of this document. Figure 1.2-1 presents the Hanford Spent Nuclear Fuel Planning Basis. It serves as an overview of the SNF Project as presented in this document.

8. RELEASE STAMP
OFFICIAL RELEASE ⑤
BY WHC
DATE MAR 13 1995
Sta. 4

WHC-SD-SNF-SD-003
Revision 0

Spent Nuclear Fuel Project Technical Baseline Document Fiscal Year 1995

Volume I, Baseline Description

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Westinghouse
Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

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WHC-SD-SNF-SD-003
Revision 0

Spent Nuclear Fuel Project Technical Baseline Document Fiscal Year 1995

Volume I, Baseline Description

SNFP Systems Engineering

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CONTENTS

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1.0 INTRODUCTION

1.1 BACKGROUND

This document is a revision to *Spent Nuclear Fuel Project Technical Baseline Document*, WHC-SD-SNF-SD-002, published in September 1994 (WHC 1994). The document is being issued at this time to support the individual projects that make up the Spent Nuclear Fuel Project (SNFP) in the development of the lower-tier functions, requirements, interfaces, and technical baseline items. Also, this revised SNFP technical baseline will partially support the Systems Engineering need for Hanford Site planning to be based on the Hanford Site Systems Engineering technical baseline. This SNFP technical baseline is a "snapshot in time" of the technical baseline development and the SNFP path forward for completion of the SNFP mission. Since the publication of the draft *Spent Nuclear Fuel Project Technical Baseline Document Fiscal Year 1994* (WHC 1994), several significant events have occurred. The most notable of these was the U.S. Department of Energy (DOE) Office of Environmental Restoration and Waste Management (EM) direction for a path forward for the spent nuclear fuel (SNF) currently contained in the K Basins (DOE 1994). In addition, a path forward has been proposed for "other SNF," which refers to non-K Basin SNF (Gerber 1994)

This SNFP technical baseline will be revised as needed and will be maintained current. Changes will be made in a controlled manner using configuration management procedures. The *Spent Nuclear Fuel Project Mission Analysis Report* (WHC 1994a) was not revised.

The implementation of Systems Engineering processes is a result of the Defense Nuclear Fuel Safety Board (DNFSB) Recommendation 92-4, which was accepted by DOE, that Systems Engineering methodology be applied to the Hanford Site mission. This recommendation was implemented as policy in DOE-RL RLPD 4900.1 (DOE-RL 1994c) and as a new requirement in the *Hanford Mission Plan, Volume I, Site Guidance*, DOE/RL-93-102 (DOE-RL 1994a). Systems Engineering is also required by DOE 4700.1 because the SNFP is a program being managed as a project.

1.2 SPENT NUCLEAR FUEL PROJECT MISSION

The SNFP mission details continue to evolve. The Hanford Site SNFP mission is derived from the national SNFP mission as stated by the U.S. Department of Energy Headquarters Office (DOE-HQ) and the overall Hanford Site mission. The Hanford Site SNFP mission statement is as follows (WHC 1994x):

> *"The mission of the SNFP on the Hanford Site is to provide safe, economic, environmentally sound management of Hanford SNF in a manner which stages it to final disposition."*

The mission is the transformation of a set of unacceptable initial conditions to acceptable final conditions. These initial and final conditions, and programmatic and physical constraints, interfaces, and resources are described in the *Spent Nuclear Fuel Project Mission Analysis Report* (WHC 1994a).

1.3 PURPOSE

This technical baseline document presents the results of SNFP Systems Engineering analyses conducted after publication of the initial technical baseline in September 1994. These analyses establish the baseline functions, requirements, and interfaces to a level necessary to complete the SNFP mission as defined in the *Spent Nuclear Fuel Project Mission Analysis Report*, published in September 1994 (WHC 1994a). During the analysis, it was necessary to make enabling assumptions. These assumptions and the identified studies, physical interfaces, and issues are also presented in this document. The technical baseline is a summary-level description of the activities necessary to successfully complete the SNFP mission. Since September 1994, a path forward for the SNF in the K Basins has been approved. However, top-level decisions have yet to be made on disposal of other spent fuel on the Hanford Site. In addition, several key issues need to be resolved and several key trade studies are yet to be completed. A decision on final disposition of SNF may be years away. A narrative baseline description has been provided as a basis for a point of departure for individual trade studies and further SNFP definition and development.

This document is composed of two volumes. Volume I presents the summary level SNFP baseline description. Volume II presents the detailed SNFP baseline description and supporting data for the first volume.

1.4 SCOPE

1.4.1 Spent Nuclear Fuel Project Scope

All Hanford Site SNF, as defined in *Hanford Irradiated Fuel Inventory*, WHC-SD-SNF-TI-001 (Bergsman 1994), is included in the scope of the project. Canister sludge is assumed to be SNF. Basin sludge is assumed to be SNF until it is removed from the K Basins.

The revised scope of the SNFP includes the following:

- Correcting existing K Basin physical plant deficiencies and maintaining a safe and environmentally compliant working environment during deactivation

- Acquiring a Staging and Storage Facility (SSF) and a Fuel Stabilization Facility (FSF) for K Basin fuel

- Defining and Acquiring a fuel stabilization process
- Providing and expediting a safe, environmentally sound method to retrieve, package, and transport K Basin fuel to the SSF, where it will be of less risk to workers, the public, and the environment
- Staging the interim-stored K Basin SNF at the SSF for final disposition
- Providing pre-interim storage at the Pre-Interim Storage Pad (PISP) for other Hanford Site SNF until it is transferred off site for disposition
- Deactivating the K Basins, SSF, FSF, and PISP for transition to decontamination and decommissioning (D&D) or alternative use.

All SNFP activities will be accomplished safely, efficiently, in compliance with applicable regulations, and with the involvement of stakeholders.

1.4.2 Document Scope

As described in the *Hanford Site Systems Engineering Management Plan* (HS-SEMP) (WHC 1994d) and the *Spent Nuclear Fuel Project Mission Analysis Report* (WHC 1994a), the technical baseline includes that body of technical information associated with a system under development, modification, or deactivation. It consists of specific products created during each of the various stages of a project's life, as presented in the HS-SEMP. A key attribute of a technical baseline is that its information will be placed under configuration control. The SNFP technical baseline is a piece of the unified Hanford Site technical baseline and, at present, includes portions of the SNFP functional requirements baseline. Also, an operational baseline, which documents the "made to work" redlines and operations and maintenance documents, is under development for the K Basins. This baseline is not yet complete. Priority is currently given to this operational baseline and to development of the SNFP baseline for all individual systems that are part of the SNFP. An effort is ongoing to establish an integrated mission baseline containing cost, schedule, and technical baselines. Further functional decomposition and analyses will be continued throughout the rest of fiscal year (FY) 1995 for the individual SNFP systems.

The functional structure for successful completion of the SNFP mission (i.e., the system) is compatible with the Hanford Site Systems Engineering functional structure (Capstone) (WHC 1994e). The system, as it currently exists, is discussed in Section 2.0. The SNFP functional structure is also compatible with the recently developed DOE-HQ EM-37 functional structure. All of the functions required by the DOE-HQ system are contained in the SNFP functional structure. An effort to maintain compatibility will continue as part of the FY 1995 activities.

1.5 SPENT NUCLEAR FUEL PROJECT CONTEXT

The Hanford Site SNFP is new and details are still evolving. The SNFP mission, functions and requirements fit within four Hanford Site Systems Engineering functions:

- 2.0, Provide Mission Essential Capabilities
- 3.0, Obtain Public Involvement
- 4.1, Deactivate Facilities
- 4.7, Store, Treat, and Disposition of Special Nuclear Material/Nuclear Fuel.

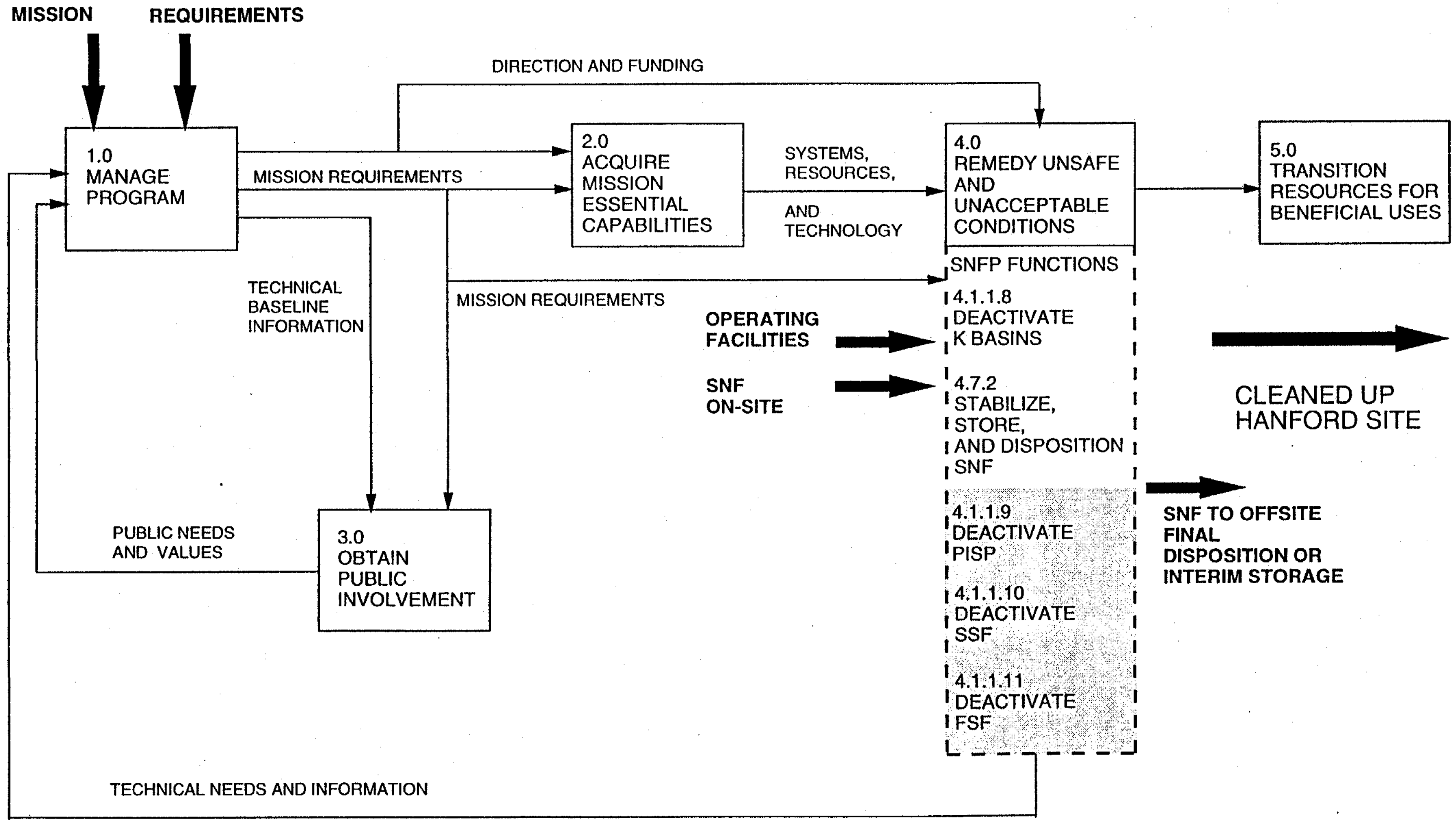
Hierarchial numbers are assigned to lower-tier system functions. The criteria for determining the function under which each facility belongs is dependent on the mission of the facility. If a facility has the mission of deactivation, it is under Function 4.1, Deactivate Facilities. If a facility has a mission other than deactivation, it is under Function 4.7.2, Store, Stabilize, and Disposition SNF. The mission of the K Basin facilities is deactivation, which includes the earliest possible transfer of SNF from the facilities.

Function 4.1, Deactivate Facilities includes Functions 4.1.1.8, 4.1.1.9, 4.1.1.10, 4.1.1.11, and 4.7.2. Function 4.1.1.8, Deactivate K Basins (and their support systems), has been fully developed for the SNFP levels. The development of the functions by individual teams who are developing systems will continue below the SNFP levels. Functions 4.1.1.9, Deactivate SNF (Other) Pre-Interim Storage Pad (PISP); 4.1.1.10, Deactivate SNF (K Basin) Staging and Storage Facility (SSF); and 4.1.1.11, Deactivate SNF (K Basin) Fuel Stabilization Facility (FSF) have not been developed at this time because the definition of these lower-tier functions requires the operational function of these facilities be understood. Project teams are developing these functions. Function 4.7.2, Store, Stabilize, and Disposition SNF, includes the operation of the facilities that have a mission to receive, stabilize and/or store SNF in a safe and compliant manner. This would include any currently existing facilities or new facilities that may be required to satisfy that mission.

Alternatives selected by the SNFP through use of the Systems Engineering process will not prejudice the DOE programmatic environmental impact statement (EIS), *Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs' Environmental Impact Statement*. Function 2.0, Provide Mission Essential Capabilities, includes the functions needed to acquire the mission-essential capabilities for the SNFP. Figure 1-1 presents a simplified representation of the relationship between these functions of prime interest to the SNFP (4.1.1.8 and 4.7.2) and the top-level functions of the Hanford Site Systems Engineering functions. Functions 1.0, Manage Program; 2.0, Acquire Mission Essential Capabilities; and 3.0, Obtain Public Involvement; are of prime direct importance to the SNFP. These functions are contained in the SNFP to a significant degree and provide important project direction, mission essential needs, and resources for the project. The SNFP has decomposed Functions 2.0 and 3.0 for its own use as part of its functional analysis.

FIGURE 1 -1

RELATIONSHIP OF FUNCTIONS



1.6 RESULTS AND CONCLUSIONS

The following paragraphs in this section provide a summary of results and conclusions that have been derived from the Systems Engineering analyses conducted by the SNFP technical baseline development team.

Since September 1994, project planning has been aided by the clear programmatic and technical direction given through the selection of a path forward for K Basin SNF. This direction has closed several identified studies and issues. The path forward is currently being extended to include other Hanford Site SNF. This extension will provide a clear programmatic and technical direction for all Hanford Site SNF.

The approval of the SNFP charter has formalized the responsibilities and authorities of the SNFP. This has enabled programmatic interfaces to be established with custodians of non-K Basin SNF. These custodians are now able to begin planning for transfer of their SNF to the SNFP. An action being taken is the development and maintenance of formal external interfaces with custodians of non-K Basin SNF. This interface development includes a plan for the transfer of all SNF to the SNFP. An interface control plan is currently under development. The identified physical interfaces are described in Section 6.0.

With the exception of the PISP for other SNF, the SNFP work breakdown structure (WBS) is compatible with the Hanford Site systems top-level functional structure and product breakdown structure (PBS). Some key activities, such as K Basin deactivation and characterization, appear to be at too low a level, and other key activities, such as receipt of Plutonium Uranium Extraction (PUREX) facility SNF, appear to be missing. These issues will be addressed separately with the organization responsible for the WBS.

There are broad and urgent needs for characterization data to support the requirements of current storage through final disposition of SNF. Characterization plans may need to be expanded and characterization activities should continue to receive high priority.

The SNFP Systems Engineering analyses were constrained by the lack of a Hanford Site-level analyses of Functions 1.0, Manage Program; 2.0, Acquire Mission Essential Capabilities; and to a lesser extent; 5.0, Transition Resources for Beneficial Use. In this SNFP technical baseline revision, the SNFP has taken responsibility for analysis of Functions 2.0 and 3.0 to support the SNFP. Preliminary analysis of Functions 1.0 and 5.0 are included here for planning.

The Hanford Site Systems Engineering Organization is accepting Function 3.0, Obtain Public Involvement, that was developed for the *Spent Nuclear Fuel Project Technical Baseline Fiscal Year 1994* in September 1994 for the Hanford Site (WHC 1994c). The project-level public interaction plan and/or policies and procedures will be developed.

Most non-mission-driven requirements were identified to the source document level only, which was considered adequate for this "snapshot" technical baseline document. More detailed requirements analyses will be conducted as part of the development of the individual SNFP systems. Follow-on activities to provide detailed project requirements should consider similar current and past endeavors (e.g., standards/requirements identification document [S/RID]).

The operation of the K Basins (SNFP Function 4.1.1.8.1) was assumed to be a highly scrutinized and well understood activity; therefore, little time was spent on alternatives evaluation. This activity is very significant from a budget standpoint (≈$40,000,000 annually), which may gain the SNFP an overall benefit from a detailed evaluation of operating options. The SNFP is currently constructing an operational baseline for the K Basins.

K Basin deactivation activities are commencing without a deactivation plan. Deactivation planning needs to be performed to integrate and optimize path forward activities.

There is no known DOE direction for a deactivation mission for the K Basins. There are few requirements for the deactivation of the K Basins or transition to D&D. Specific turnover criteria for other facilities going to D&D were established in the past. K Basins-specific updated deactivation requirements must be established as part of the external interface definition effort before the need for the SNFP to begin K Basins deactivation planning. Because K Basin deactivation is one of the key functions in the SNFP system, it should be included in the SNFP mission statement and reflected prominently in the WBS and organization.

There is a need for the systems engineering process to be implemented consistently throughout the SNFP. This is being done in FY 1995 and will include generating key documentation (e.g., System Engineering management plan and configuration management plan) and providing Systems Engineering staffing to the teams developing the individual SNFP systems. By integrating their efforts with those of the SNFP, these teams will reduce the risk of inconsistencies between their identified functions and those of the SNFP.

A process is needed to manage the key issues which evolve from this evaluation, and those issues that will be identified during the more detailed functional analysis to be done by the individual projects.

The adoption of an objective risk assessment and decision methodology is needed to provide an auditable basis for selection of alternatives for the SNFP. The informed, continuous involvement for the customer is crucial to the understanding and (therefore) acceptance of the Systems Engineering products and successful interfacing with DOE-HQ on Systems Engineering activities.

The DOE-HQ (EM-37) Systems Engineering process and functional structure differ from the Hanford Site Systems Engineering process and functional structure. The SNFP, by basing the development of its functional structure on that of the Hanford Site, has produced a structure that is also different than that of EM-37. However, the SNFP has ensured that its structure, while not the same, is compatible with that of EM-37.

Three new SNFP facilities were identified: SSF, FSF, and PISP.. The PISP is an existing facility which will be transferred to the SNFP from the FFTF project.

Because this is a new document, a uniform understanding and application of the technical baseline is needed by the system teams and the DOE-RL customer.

In order to expedite this revision of the technical baseline document, the *Spent Nuclear Fuel Project Mission Analysis Report* (WHC 1994a) was not revised. This should be done as soon as practicable.

2.0 SPENT NUCLEAR FUEL PROJECT FUNCTIONS (2.X.Y, 3.X.Y, 4.1.1.X.Y AND 4.7.2.X)

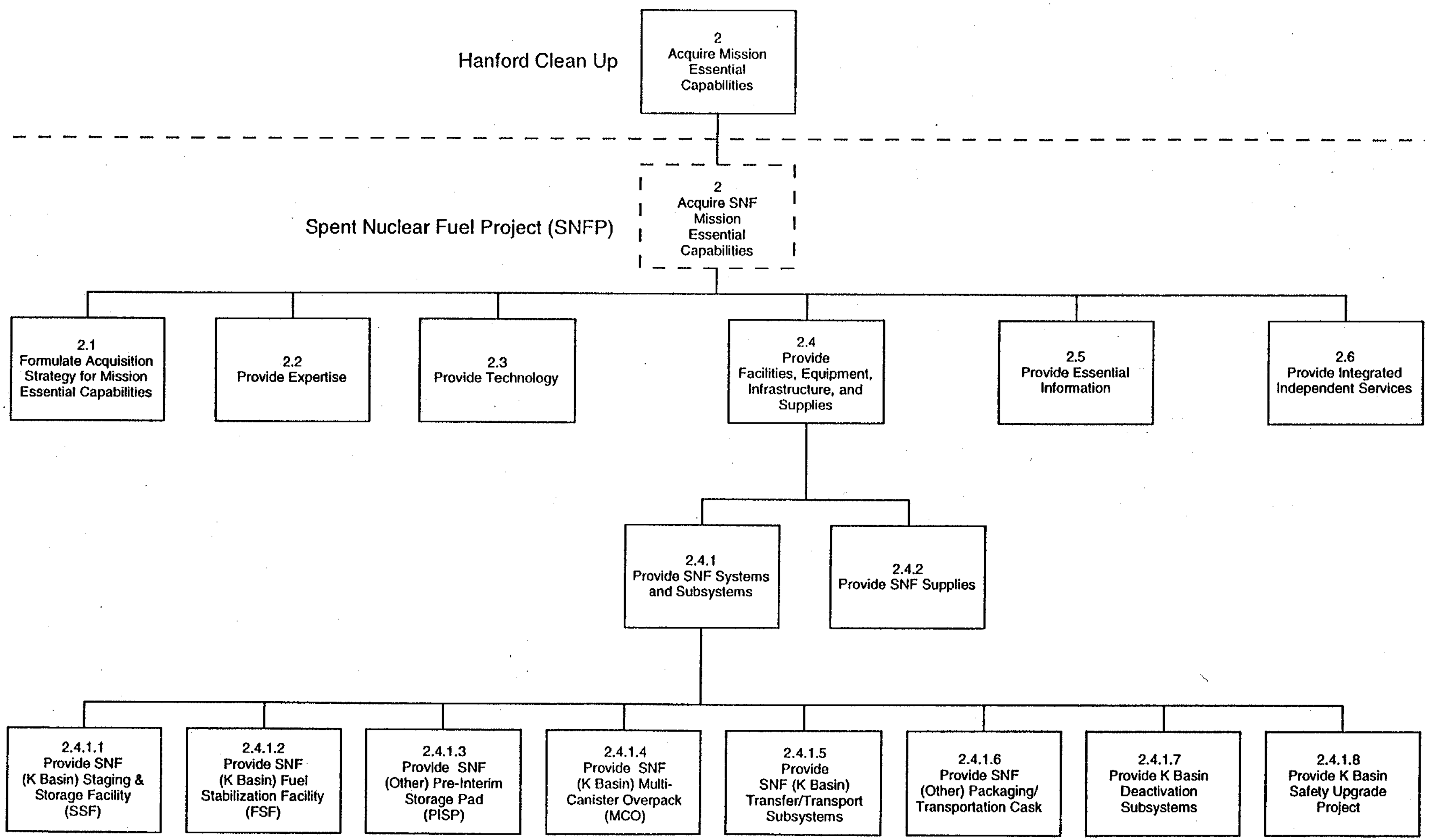
2.1 FUNCTION TREES

The SNFP ties into the Hanford Site function structure at four locations. The SNFP has performed its functional analysis by decomposing and tailoring the site functions at these four locations:

- Function 2.0, Acquire Mission Essential Capabilities
- Function 3.0, Obtain Public Involvement
- Function 4.1.1, Deactivate SNFP Facilities
- Function 4.7.2, Stabilize, Store, and Disposition SNF Material.

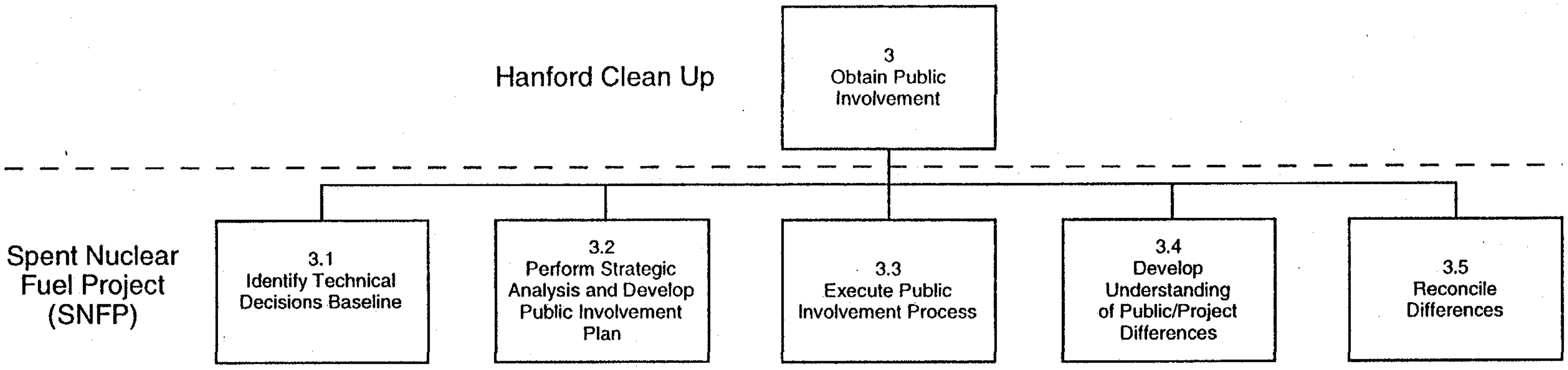
Figure 2-1 contains the SNFP top-level functional decomposition of Function 2.0, Figure 2-2 contains the top-level SNFP functional decomposition of Function 3.0, Figure 2-3 contains the top-level SNFP functional decomposition of Function 4.1.1, and Figure 2-4 contains the top-level SNFP functional decomposition of Function 4.7.2. Volume II of this document contains the complete function trees for each of these functions.

Figure 2-1
Spent Nuclear Fuel Project Function 2.0 Hierarchy



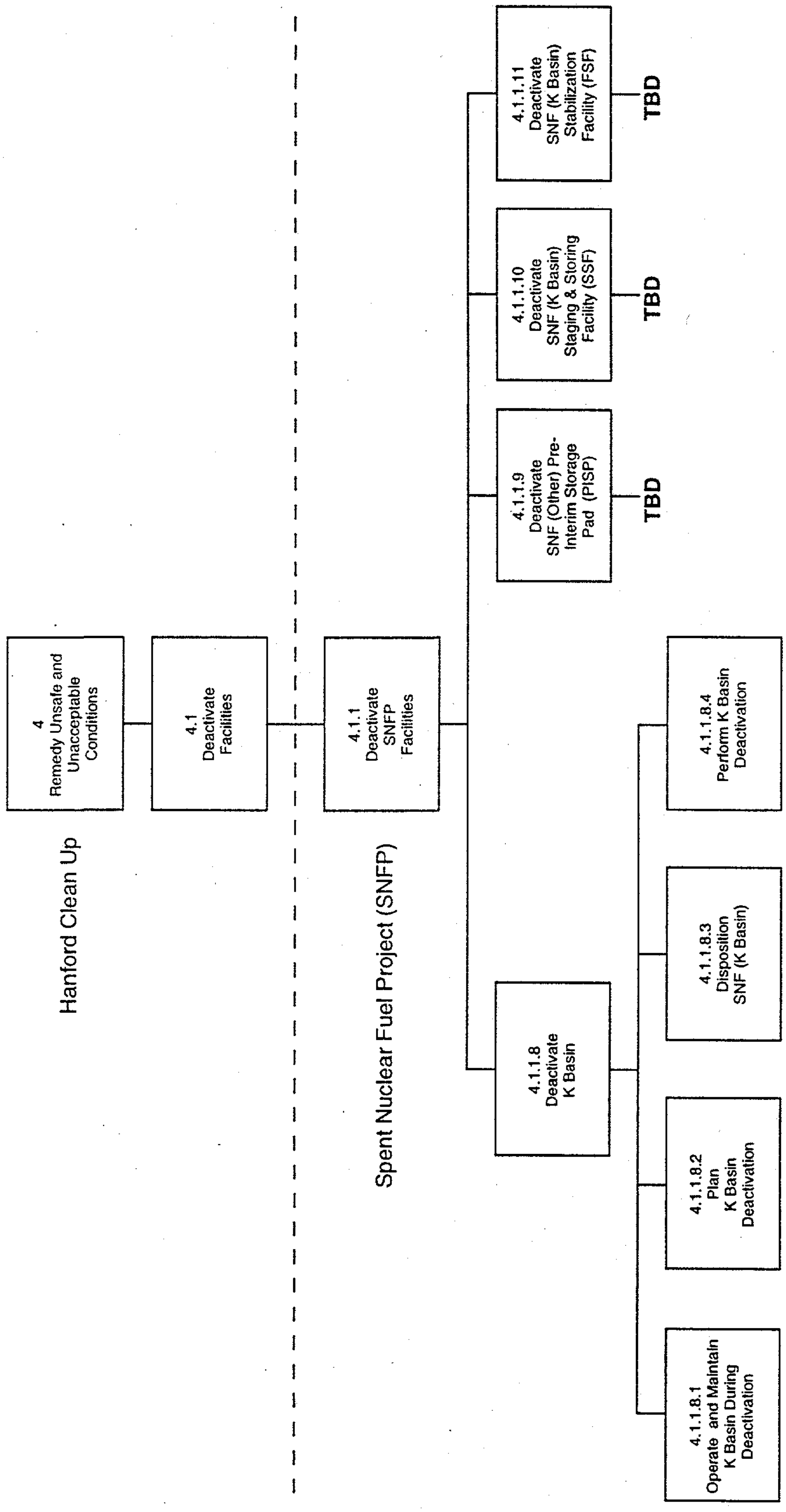
SNFP Systems Engineering

Figure 2-2
Spent Nuclear Fuel Project Function 3.0 Hierarchy



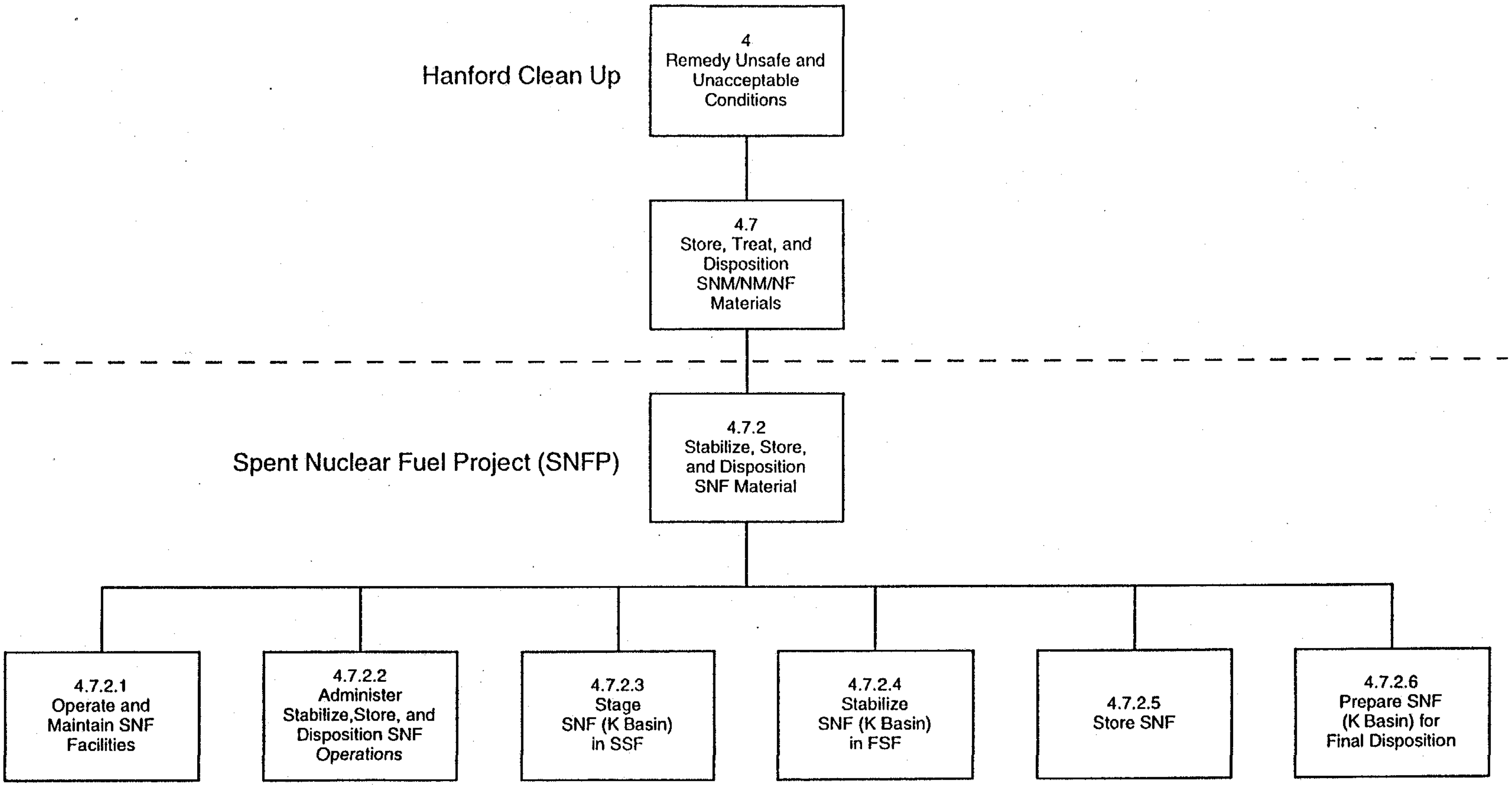
SNFP Systems Engineering

Figure 2-3
Spent Nuclear Fuel Project Function 4.1.1 Hierarchy



SNFP Systems Engineering

Figure 2-4
Spent Nuclear Fuel Project Function 4.7.2 Hierarchy



SNFP Systems Engineering

2.2 FUNCTION DESCRIPTIONS

The definitions for the top-level SNFP functions developed for the SNFP (i.e., Functions 2.0, 3.0, 4.1.1.8, and 4.7.2) are provided in the following tables. Table 2-1 contains the SNFP top-level function definitions for Function 2.0, Acquire Mission Essential Capabilities. Table 2-2 contains the top-level SNFP function definitions for Function 3.0, Obtain Public Involvement. Table 2-3 contains the top-level SNFP function definitions for Function 4.1.1.8, Deactivate K Basins (and their support systems). Table 2-4 contains the top-level SNFP function definitions for of Function 4.7.2, Stabilize, Store, and Disposition SNF Material. Volume II of this document contains the complete set of function definitions for each of these functions. The function definitions for 4.1.1.9, 4.1.1.10, and 4.1.1.11 have not been developed because the functions associated with the deactivation of the SNFP facilities not yet constructed have not been developed.

Table 2-1. Function Definitions for 2.

Function titles	Function definitions
2.0 Acquire Mission Essential Capabilities (Spent Nuclear Fuel Project [SNFP])	Provide all new intellectual and physical resources. This includes personnel, consultants, services, supplies, equipment, structures, systems, and components, that are supplied by the site contractors, construction projects, and subcontracts of all kinds.
2.1 Formulate Acquisition Strategy For Mission Essential Capabilities	Evaluate SNFP acquisition needs with respect to opportunities for consolidation or assignment to a full-service, non-Hanford Site contractor. Opportunities identified are provided for Function 1.0, Manage Program, for programming or reprogramming.
2.2 Provide Expertise	Provide new personnel, retrain existing professional personnel for new assignments outside their usual discipline, provide expert consultants, and acquire offsite expert services of all types.
2.3 Provide Technology	Develop technology to meet objectives. The *Spent Nuclear Fuel Project Mission Analysis Report*[a] certified that: "The SNFP may require the development of new technologies in order to meet its stated objectives." As an example, the following are activities for which new technology may be required: (1) cleanup of the K Basin cooling water (including tritium removal), (2) retrieval/containment of sludge in the K Basin, (3) development of staging and interim storage technologies, (4) development/design of new facilities and equipment, and (5) development of spent nuclear fuel (SNF) conditioning technologies (e.g., conversion of the SNF to other physical or chemical form or drying of the SNF).
2.4 Provide Facilities, Equipment, Infrastructure, and Supplies	Produce all facilities, equipment, software, and related items needed for all work activities, including all systems, subsystems, components and structures.
2.4.1 Provide SNF Systems and Subsystems	Define, design, procure, construct, start up, and test line item projects, major systems acquisitions (MSA), general plant projects, and modifications, and upgrades to facilities and systems.

Table 2-1. Function Definitions for 2.

Function titles	Function definitions
2.4.1.1 Provide SNF (K Basin) Staging and Storage Facility (SSF)	Define, design/build, start up and test the SNF (K Basin) SSF on an accelerated basis, as a line item project.
2.4.1.2 Provide SNF (K Basin) Fuel Stabilization Facility (FSF)	Define, design, construct, procure, start up, and test the FSF as a line item project.
2.4.1.3 Provide SNF (Other) Pre-Interim Storage Pad (PISP)	Define, design, construct, transfer existing facilities and equipment, and test the SNF (Other) PISP as a general plant project.
2.4.1.4 Provide SNF (K Basin) Multi-Canister Overpack (MCO)	Define, design, fabricate, procure, test, deliver and accept the MCOs for use in transferring, staging, stabilizing, and storing K Basin SNF.
2.4.1.5 Provide SNF (K Basin) Transfer/ Transport Subsystem.	Define, design, fabricate, procure, test, deliver and accept the SNF cask, cask transporter, and associated support equipment and subsystems to support transfer of the K Basin SNF from the K Basins to the SSF.
2.4.1.6 Provide SNF (Other) Packaging/Transportation Cask	Define, design, fabricate, transfer, procure, test, deliver, and accept the SNF (Other) packaging/transportation casks for the SNF (Other) to be stored at the PISP and shipped to another DOE site for interim storage.
2.4.1.7 Provide K Basin Deactivation Subsystems	Define, design, fabricate, transfer, procure, test, deliver, and accept the basin sludge removal, sludge transporter, debris removal, debris transporter, water treatment, and other support K Basin deactivation systems.
2.4.1.8 Provide K Basin Safety Upgrade Project (W-405)	Define, design, fabricate, construct, modify, procure, test, start up, and accept the K Basin safety upgrade projects. These are required to maintain the K Basins in a safe and compliant state until completion of deactivation.
2.4.2 Provide SNF Supplies	Specify and procure general store items and consumables needed to support the Hanford cleanup mission functions and activities.

Table 2-1. Function Definitions for 2.

Function titles	Function definitions
2.5 Provide Essential Information	Supply the entire SNFP with access to various offsite databases, proprietary commercial data, and offsite expert systems and allows wide and facile access to internally generated information used in cleanup mission activities.
2.6 Provide Integrated Independent Services	Deliver integrated service contracts of all types to other related integrated efforts.

[a] WHC, 1994a, *Spent Nuclear Fuel Project Mission Analysis Report*, WHC-EP-0790, Rev. A, Westinghouse Hanford Company, Richland, Washington.

Table 2-2. Function Definitions for 3.

Function title	Function definition
3.0 Obtain Public Involvement	Obtain public involvement and interaction needed to complete the mission of the project. Include public involvement in the decision making process and all related public information and relations activities. Identify decisions involving the public from the technical baseline for the project, formulate public involvement plans based on strategic analysis of each important decision, execute the public involvement plans, and reconcile differences between the project and the public values about the decisions when necessary. Transform public concerns and information into public involvement in the decisions made by project senior management.
3.1 Identify Technical Baseline Decisions	Identify important decisions and related actions to be made and involve the public in defining the technical baseline decisions that need public involvement. The input to the function is "cleanup program information" which includes the technical baseline for the project. From this baseline, the technical baseline decisions involving the public are identified, as are the "public concerns and information" which includes assumptions, concerns, and general information about and from the public.
3.2 Perform Strategic Analysis and Develop Public Involvement Plan	Perform an analysis of each technical baseline decision and develop a public involvement plan for each specific decision that requires public involvement. Fully define the decisions and involve the public, participants, and decision makers. Determine constraints to public involvement, issues that bear on decisions, and objectives for each decision. Define information that needs to be exchanged with the public in developing the public involvement plan.

Table 2-2. Function Definitions for 3.

Function title	Function definition
3.3 Execute Public Involvement Process	Execute the public involvement process prescribed by the public involvement plan. Promulgate public information derived from the execution of the process, both to the public and to management, and also information on recommended decisions provided to management. Identify public values resulting from the process. Identify for further reconciliation recommendations not accepted by the public. Recommendations accepted by the public contribute to public involvement which is the key objective of the public involvement process.
3.4 Develop Understanding of Public/ Project Differences	Develop full understanding of the differences between the public and project for decision recommendations that are not accepted by the public. Define and analyze the differences. Develop defined value differences between the public and the project.
3.5 Reconcile Differences	

Table 2-3. Function Definitions for 4.1.1.8.

Function titles	Function definitions
4.1.1.8 Deactivate K Basins (and their support systems)	Deactivate K Basins containing Spent Nuclear Fuel (SNF) including sludge, debris, contaminated water, and other radioactive or hazardous materials. This includes K Basin facilities and equipment.
4.1.1.8.1 Operate and Maintain K Basins during Deactivation	Operate and maintain the K Basin structures, systems, components, qualified staff, safe and compliant equipment, and documentation. Provide assessment of safety and compliance states. Provide all necessary resources for safe and compliant operation in accordance with governing safety codes and regulations.
4.1.1.8.2 Plan K Basin Deactivation	Assess the current state of the K Basin. Identify and/or negotiate material and equipment disposition requirements. Develop plans to deactivate facilities. Negotiate and administratively maintain the desired K Basin turnover endpoint specifications. Plan operations to support SNF transfer, including fuel and sludge. Establish and maintain a long-term archive of K Basin information.
4.1.1.8.3 Disposition SNF (K Basin)	Collect and prepare material for temporary storage and transfer, and transport material out of the K Basins. Characterize canister sludge, fuel, and basin sludge. Categorize basin sludge as SNF or waste.
4.1.1.8.4 Perform K Basin Deactivation	Deactivate nonessential systems, system components, and physical structures. Take other actions, as required to minimize environmental, public, and personnel hazards; ensure actions taken are consistent with minimizing continuing K Basin costs.
4.1.1.9 Deactivate SNF (Other) Pre-Interim Storage Pad (PISP)	TBD.

Table 2-3. Function Definitions for 4.1.1.8.

Function titles	Function definitions
4.1.1.10 Deactivate SNF (K Basin) Staging & Storage Facility (SSF)	TBD.
4.1.1.11 Deactivate SNF (K Basin) Stabilization Facility (FSF)	TBD.

TBD = to be determined.

Table 2-4. Function Definitions for 4.7.2.

Function title	Function definition
4.7.2 Stabilize, Store, and Disposition Spent Nuclear Fuel (SNF) Material	Safely and efficiently manage SNF handling, staging, stabilizing, storing and transferring for ultimate disposition. SNF includes irradiated fuel and other irradiated nonwaste materials that have not been processed.
4.7.2.1 Operate and Maintain SNF Facilities	Operate and maintain the facilities, structures, systems, components, qualified staff, safe and compliant equipment, and documentation. Assess safe and compliance states. Provide all necessary resources for safe and compliant operation in accordance with governing safety codes and regulations.
4.7.2.2 Administer, Stabilize, Store and Disposition SNF Operations	Plan, coordinate, and schedule all necessary operations within Function 4.7.2. Define the handling, stabilization, staging, storage and transfer needs and criteria for SNF. Physical work activities for SNF handling, stabilization, staging, storage, and transfer are not included.
4.7.2.3 Stage SNF (K Basin) in Staging and Storage Facility (SSF)	Provide temporary storage of wet SNF. Receive shipments; set up the SNF multi-canister overpacks (MCO) for staging, monitoring and controlling the SNF MCO environment; maintain the integrity of the SNF MCOs; transfer the SNF MCOs to the SNF (K Basin) fuel stabilization facility (FSF); and disposition incidental waste.
4.7.2.4 Stabilize SNF (K Basin) in FSF	Prepare and condition staged K Basin SNF in the FSF and transfer it to interim dry storage. Prepare the SNF by separating the fuel from the canister sludge and repackaging (in an MCO) the fuel and canister sludge after separation. Condition the SNF by drying the SNF and canister sludge and passivating the SNF. Characterize the SNF as needed for stabilization. Dispose of incidental wastes generated during stabilization.
4.7.2.5 Store SNF	Provide interim storage of stabilized K Basin SNF at the SSF. Also provide pre-interim storage of other SNF at the pre-interim storage pad (PISP).

Table 2-4. Function Definitions for 4.7.2.

Function title	Function definition
4.7.2.6 Prepare SNF (K Basin) for Final Disposition	Prepare, stabilize, and transfer SNF for final disposition. Disposition the SNF by one of two processes: Transfer useable SNF or transfer materials for disposal. Arranges for disposal of incidental wastes generated during the disposition process.

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3.0 MISSION REQUIREMENTS

The mission requirements described below are recognized to be constraints to Hanford Site Function 1.0, Manage Program, that are passed on through the constraint "direction and control" to SNFP Functions 2.0, 3.0, 4.1.1.8, and 4.7.2. These requirements were used as the primary, or "driver" requirements for the SNFP requirements analyses. Table 3-1 lists the top-level mission requirements for the SNFP.

3.1 PRIMARY SOURCES OF REQUIREMENTS

3.1.1 U.S. Department of Energy-Headquarters

DOE-HQ Direction. The primary source of direction to the SNFP has been the *Approval of Path Forward for N Reactor Spent Nuclear Fuel Interim Storage*, a memorandum from J. E. Lytle to T.P. Grumbly (EM-36), dated November 9 (DOE 1994), which provided the SNF path forward direction.

DNFSB Recommendations 90-2 and 94-1. DNFSB recommendations, in and of themselves, are not requirements. DNFSB recommendations have resulted in commitments by the DOE which constitute requirements for the SNFP.

SNF Programmatic EIS. The DOE is in the process of developing a programmatic environmental impact statement (PEIS) dealing with the problem of SNF throughout the entire DOE complex. The final approved PEIS may impact the SNFP at the Hanford Site and may limit or expand on the scope of alternative solutions for the SNFP, such as the storage location of foreign research reactor fuel. This is the subject of a separate environmental impact statement (EIS). To the extent that the foreign research reactor fuel may be handled at Hanford Site facilities, the foreign research reactor SNF EIS Record of Decision (ROD) will lead to requirements for the SNFP at Hanford Site.

Orders and Guidance documents. DOE orders contain requirements that are contractual obligations for the Hanford Site and the SNFP. The extent that DOE orders apply to the operation of the K Basin facilities and the final disposition of SNF must be determined.

Draft National Spent Nuclear Fuel Program. The primary source of requirements for the Hanford Site SNFP is the *Spent Nuclear Fuel Program Requirements Document* (EM-37), SNF-RD-PM-001 (DOE 1994 [Draft]). A second document that resulted in mission requirements is the *DOE-Owned Spent Nuclear Fuel Strategic Plan* (EM-37) (DOE 1994x).

3.1.2 Department of Energy, Richland Operations Office

U.S. Department of Energy, Richland Operations Office (RL) Guidance. This guidance is contained in the *Hanford Mission Plan, Volume I, Site Guidance*, DOE/RL-93-102 (DOE-RL 1994a).

DNFSB Recommendations. As in the case of commitments made by DOE-HQ, commitments made by RL in response to DNFSB recommendations constitute requirements for the Hanford Site and the SNFP.

Hanford Site EIS. After the PEIS is completed at the DOE-HQ level, each site in the complex will be required to complete the requisite level of *National Environmental Policy Act of 1969* (NEPA) review to implement the programmatic decision at that site. On the Hanford Site, the ROD for the site-specific EIS will constitute a set of requirements that will bear directly on the SNFP and on the technical decisions and alternatives for the final disposition of the SNF.

Orders and Policy Direction. In addition to DOE-HQ, RL issues orders that contain requirements that are contractual requirements for the Hanford Site and the SNFP. The extent to which the orders apply to the operation of K Basin facilities and the disposition of SNF must be determined.

Contract Performance Requirements. The management and operating (M&O) contract for the operation of the Hanford Site contains specific performance requirements that may impact the SNFP.

3.1.3 The Hanford Federal Facility Agreement and Consent Order

The *Hanford Federal Facility Agreement and Consent Order* (known as the Tri-Party Agreement). The Tri-Party Agreement of the Washington State Department of Ecology (Ecology), U.S. Environmental Protection Agency (EPA), and DOE, establishes both target dates and enforceable dates for enforcement milestones for bringing the Hanford Site into compliance with all applicable environmental laws and regulations. The agreement contains specific milestones for bringing the K Basins into compliance (Ecology et al. 1994).

3.1.4 Regulatory Agencies

Laws and Regulations. The overall SNFP is subject to the full range of applicable local, State and Federal laws and regulations. The administrative and technical requirements contained in the laws and regulations may impact the alternatives that are considered for the SNFP products. In addition, the administrative requirements (e.g., permitting) may significantly impact the timing and sequencing of planned project activities.

Permits. Permits are issued by the regulatory agencies for specific activities when required by applicable laws and regulations. The permits contain requirements and constraints that directly impact the activities for which they are issued. In addition to the requirement to have a permit, the specific requirements of the permit will impact the project activities.

3.1.5 Westinghouse Hanford Company

SNFP Charter. The charter statement that defines the SNFP roles and responsibilities is the "Spent Nuclear Fuel Project Charter," contained in WHC-CM-1, *Company Policies and Charters*.

Policies and Procedures. Site management has established policies and procedures that place requirements and constraints on the activities of any project. Some policies and procedures (e.g., Quality Assurance and Safety) are required to be established by higher authority documents such as laws, regulations, and orders. In addition, management may establish policies and procedures specifically for the conduct of the SNFP.

Strategic Plans. Strategic planning for the Hanford Site and the SNFP may include commitments and requirements that will impact the alternative solutions available to the project. Priorities established in the planning process may impact resources available to the project. This would include the *Spent Nuclear Fuel Project K Basin Path Forward Acquisition Strategy*, WHC-SP-1144 (WHC 1994c)

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.1.1.8 Deactivate K Basins (and their support systems)	SNF-RD-PM-001, Revision 0 (M), Section 4.2.2, "Regulatory Compliance."[a] SNF facilities shall be designed, constructed, and operated in full compliance with applicable Federal, State and local laws and regulations for the protection of the public and worker health and safety.
	SNF-RD-PM-001, Revision 0 (M), Section 4.3.3, "Existing Facilities."[a] Modifications and upgrades to existing facilities shall be designed and executed to minimize adverse environmental impact.
	SNF-RD-PM-001, Revision 0 (M), Section 4.3.4, "Pollution Prevention and Waste Minimization,"[a] SNF facilities shall be designed, constructed, and operated to integrate the fundamental goals of (1) reducing through source reduction and recycling the total release of hazardous materials to the environment, (2) establishing site-specific goals for the reduction of the generation of all types of wastes and pollutants from site operations, and (3) establishing operational restrictions to meet as low as is reasonably achievable (ALARA) objectives for radioactive materials in effluents.
	SNF-RD-PM-001, Revision 0 (M), Section 4.3.5, "Use of Recyclable Materials."[a] Recyleable materials (i.e. depleted uranium and contaminated/irradiated metals) shall be incorporated into the design of SNF storage and/or transportation canister, casks, and facilities to the extent practical.
	SNF-RD-PM-001, Revision 0 (M), Section 4.5.1, "Decisionmaking."[a] Decisions regarding SNF facilities shall resolve competing interests in a manner which recognizes the following priorities: public and worker health and safety, environmental protection, operations, and cost.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.1.1.8 Deactivate K Basins (and their support systems) (continued)	SNF-RD-PM-001, Revision 0 (M), Section 4.5.2, "Technology Development."[a] The SNF technology development program shall minimize the number and scope of technology demonstration projects for DOE-owned SNF through incorporation of the objectives and results of existing government and industry sponsored technology development programs, and shall reflect the significant lessons learned from the design and operation of commercial spent fuel facilities. Existing and proven commercial facility designs shall be adapted for DOE use, when appropriate. Recognizing that differences exist between commercial and DOE-owned SNF, technology development activities necessary to support viable facility designs and storage concepts for DOE-owned SNF shall be planned, approved in advance, and scheduled to maximize the benefits to design and operation of the facilities. Results from geologic repository performance assessments shall be used to influence the direction and priorities for technology development and the specifications for interim storage, conditioning, and disposal systems.
	SNF-RD-PM-001, Revision 0 (M), Section 4.5.5, "Site Related Hazards."[a] SNF facilities shall be designed to commercial industry standards for resistance to seismic events, floods, winds, and other natural phenomena.
	SNF-RD-PM-001, Revision 0 (M), Section 4.6.1, "Safeguards and Security."[a] SNF facilities shall incorporate measures necessary to prevent unauthorized access to nuclear materials, theft, diversions, hoaxes, and other malevolent acts intended to release radioactivity or disrupt operations, based upon a specified threat.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.1.1.8 Deactivate K Basins (and their support systems) (continued)	SNF-RD-PM-001, Revision 0 (M), Section 4.7.2, "Pre-Operational Testing."[a] Restart of existing facilities and pre-operation and startup testing of new SNF facilities shall be planned and conducted to assure proper performance of components and subsystems individually and as part of the overall facility performance. New facilities shall be designed for ease of system and hardware checkouts.
	SNF-RD-PM-001, Revision 0 (M), Section 5.1.1, "Prioritization."[a] Structured risk analysis methods shall be used to prioritize actions needed for resolution of existing SNF vulnerabilities.
	SNF-RD-PM-001, Revision 0 (M), Section 5.1.2, "Life Extension."[a] Programs shall be undertaken for existing SNF facilities to permit their continued use pending transfer of stored SNF to new interim storage facilities. Existing SNF facilities shall be utilized to the extent practical, considering safety, life cycle cost, reliability, operability, and maintainability.
	SNF-RD-PM-001, Revision 0 (M), Section 5.1.3, "Facilities Transition."[a] A structured, risk-based management approach shall be used to determine the order and schedule for phaseout of existing SNF facilities.
4.1.1.8 Deactivate K Basins (and their support systems) (continued)	SNF-RD-PM-001, Revision 0 (M), Section 5.1.5, "Conditioning."[a] SNF shall be conditioned to the extent necessary to ensure its integrity under existing storage conditions. When evaluating conditioning options for existing storage, SNF conditioning requirements for interim storage and waster acceptance criteria (WAC) for geologic disposal shall be considered. Conditioning implies the processing of SNF by physical, mechanical, or chemical means to stabilize and confine the SNF in order to meet predetermined performance requirements. An example would be to encapsulate degraded SNF within a sealed canister to preclude its dispersal into the surrounding storage medium.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.1.1.8 Deactivate K Basins (and their support systems) (continued)	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance* (M)[b] In concert with Federal, State, and public direction, Hanford Site programs are directed to embrace pollution prevention to the maximum extent possible. They will incorporate waste minimization, waste volume reduction, and recycling into their program planning. Site programs are directed to implement waste minimization and pollution prevention activities to prevent pollution from entering the environment; conserve resources and energy; and reduce the quantity and toxicity of hazardous, radioactive, mixed, and sanitary waste generated at the Hanford Site.
	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance* (M)[b]. Site cleanup will be performed in accordance with the Tri-Party Agreement (Ecology et al. 1994), as amended, and other agreements, and in compliance with all applicable Federal, State, and local laws and American Indian treaty rights. Hanford Site programs must also comply with DOE policies and directives. The cleanup work will be performed with the intent of transferring a positive legacy to the community through economic diversification activities.
	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance* (M)[b]. Demolition waste from radioactive facilities outside the 200 Areas will be transferred to the 200 Areas for disposal or recycling.
	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance* (M)[b]. Material Management Responsibilities. The Spent Fuel Program is responsible for near-term safe storage of spent nuclear fuel in the 105-K Basins. The NEPA process will be used to make a decision of how and where spent nuclear fuel will be managed on the Site.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.1.1.8 Deactivate K Basins (and their support systems) (continued)	WHC-EP-0722, *Systems Engineering Functions and Requirements for the Hanford Cleanup Mission: First Issue*, Section 4.1.4 (M)[c] All facilities, when their missions become non-essential, shall be converted to a state where environmental restoration can take place.
	WHC-EP-0779, *Architecture Synthesis Basis for the Hanford Cleanup System: First Issue*, Para 4.4.1 (M)[d] Facilities having no confirmed future use shall be rapidly deactivated to the point where a stable configuration exists which poses a low risk to follow demolition work. Deactivated facilities shall be allowed to degrade in a manageable way until final disposition occurs. "High-Risk" equipment and materials shall be transferred to qualified waste storage.
	WHC-EP-0779, *Architecture Synthesis Basis for the Hanford Cleanup System: First Issue*, Para. 4.4.1.1[d] Hazardous and radioactive materials shall be identified and stabilized. Radioactive materials which pose a threat to ER work shall be removed. SNF shall be removed. Utilities and facilities interties shall be terminated. Secure reentry access shall be provided. Facilities shall be abandoned except for surveillance.
	WHC-EP-0779, *Architecture Synthesis Basis for the Hanford Cleanup System: First Issue*, Para 4.4.1.1.1.[a] Only those systems and portions of a facility involved with the size of the active safety and compliance envelop shall be maintained and operated. All aspects of the safety envelop shall be fine tuned during the deactivation process to reflect the continual reduction in the size of the active safety envelop taking place. All facility reconfigurations shall be performed under OSHA construction requirements.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.1.1.8 Deactivate K Basins (and their support systems) (continued)	WHC-EP-0779, *Architecture Synthesis Basis for the Hanford Cleanup System: First Issue*, Para 4.4.1.1.2[d] A generic type 1 deactivation plan shall be developed and augmented with facility-specific planning. Formal design and configuration control procedures shall be used. The characterization data needed by disposition activities using current knowledge, walk downs, and supplemental investigations shall be provided. A graded approach for characterization shall be used.
	WHC-EP-0779, *Architecture Synthesis Basis for the Hanford Cleanup System: First Issue*, Para. 4.4.1.1.3.[d] Type 1 facilities shall be converted to Type 2 facilities as soon as possible. Type 1 facilities shall consolidate spent nuclear fuel materials early in the deactivation process to minimize the size and complexity of the safety and compliance envelop. Type 1 facility personnel shall perform any initial stabilization or preparation activities involving SNM/NM/NF materials and radioactive waste for disposition either on site or off site.
	WHC-EP-0779, *Architecture Synthesis Basis for the Hanford Cleanup System: First Issue*, Para. 4.4.1.2.[d] Hazardous and radioactive materials shall be identified and stabilized to an appropriate level: Radioactive materials which pose an unacceptable risk to ER work shall be removed. Utilities and facilities interties shall be placed in a safe minimum maintenance configuration; valuable materials shall be removed and secure reentry provided. Deactivated facilities shall not be entered, except for surveillance and minimized maintenance (managed degradation) before demolition activities.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.1.1.8 Deactivate K Basins (and their support systems) (continued)	WHC-EP-0779, *Architecture Synthesis Basis for the Hanford Cleanup System: First Issue*, Para. 4.4.1.2.1.[d] Only those systems and portions of a facility that are necessary to support deactivation and to maintain the safety and compliance envelop during the deactivation process shall be maintained and operated. All aspects of the safety envelop shall be continually challenged during the deactivation process to reflect the continual reduction in the safety envelop taking place. All facility reconfigurations shall be performed under Occupational Safety and Health Administration construction requirements.
	Hanford Federal Facility Agreement and Consent Order, para. 19.[e] *Resource Conservation and Recovery Act of 1976* and *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* remedial actions are to protect human health and the environment to an extent that no further actions will be required after actions under the agreement are completed. The actions are to address all aspects of contamination at units included in the action plan. Remediation of groundwater may be managed either as a remedial and corrective action or as part of permitting and closure of treatment, storage, and disposal units.
	Hanford Federal Facility Agreement and Consent Order, para. 90.[e] The Tri-Party Agreement is not intended to produce cleanup actions which make other actions less effective. [Articles XXV and XXVI contain procedures for resolving circumstances where actions appear physically inconsistent.]
	Hanford Federal Facility Agreement and Consent Order, para. 106[e] If response activities threaten Hanford Site workers, people in the surrounding area, or the environment, any party to the Tri-Party Agreement may require that the work stop.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.1.1.8 Deactivate K Basins (and their support systems) (continued)	*Hanford Federal Facility Agreement and Consent Order*, Milestone M-34-00-T03 (M)[e] "Submit an engineering study to determine the feasibility of moving and temporarily storing K-East fuel and sludge (once encapsulated) to the K-West basin." Due Date: 6/30/94
	SNF-RD-PM-001, Revision 0 (M), Section 4.2.8, "Safety Documentation."[a] Safety analysis reports and technical safety requirements or technical specifications (in accordance with Nuclear Regulatory Commission regulations) as appropriate, shall be developed to establish facility safety bases and to control spent nuclear fuel facility operations.
	SNF-RD-PM-001, Revision 0 (M), Section 4.4.1, "Quality Assurance Program Description (QAPD)."[a] As an appendix to the EM-30 QAPD, the spent nuclear fuel project shall prepare and maintain a QAPD based on the requirement of 10 CFR 830.120 and appropriate consensus standards referenced in implementation guide IG-830.120. The consensus standards shall be selected to appropriately control existing and planned spent nuclear fuel activities such as fuel treatment, storage and disposal. The spent nuclear fuel quality assurance program shall also incorporate the requirements of the civilian high-level radioactive waste program contained in RW-0333P. This process will ensure the smooth flow of spent nuclear fuel from existing facilities through interim storage to final disposal.
	SNF-RD-PM-001, Revision 0 (M), Section 4.4.2, "Quality Assurance (QA) Requirements."[a] QA controls shall be applied, using a graded approach, commensurate with the degree of importance of spent nuclear fuel project activities, to the proper conditioning and storage of spent nuclear fuel and to achieve compatibility with the geologic disposal system and related radioactive waste activities.
	SNF-RD-PM-001, Revision 0 (M), Section 4.7.1, "Maintenance."[a] Preventative maintenance approaches shall receive primary focus when undertaking facility maintenance planning.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.1.1.8 Deactivate K Basins (and their support systems) (continued)	SNF-RD-PM-001, Revision 0 (M), Section 4.7.3, "Staff Training."[a] A staff training program shall be implemented to meet either U.S. Department of Energy or nuclear power industry standards, as appropriate for the particular operation. Retraining and recertification shall be part of the operator training plan.
	SNF-RD-PM-001, Revision 0 (M), Section 4.7.3, "Staff Training."[a] Training of facility staff shall be conducted based on standards consistent with the importance of the function and complexity of operations.
	DOE/RL-93-08, *Hanford Mission Plan, Vol. 1, Site Guidance*, para. 5 (M)[f]. Conduct planning and carry out activities to clean out retired facilities to conditions appropriate for turnover to decontamination and decommissioning efforts.
	Hanford Federal Facility Agreement and Consent Order, Milestone, M-34-00-T05 (M)[e] the U.S. Department of Energy shall provide to the Environmental Protection Agency and Washington State Department of Ecology a schedule for fuel and sludge encapsulation and contaminated water removal or replacement that supports the Tri-Party Agreement milestone. Due Date: 3/31/95
	SNF-RD-PM-001, Section 5.1.4, "Characterization."[a] The technology development program shall establish the technical basis needed to demonstrate SNF integrity during existing storage. Ensuring spent nuclear fuel integrity during storage implies that the storage environment be such that, while changes may occur in the physical state of the spent nuclear fuel, those changes do not cause any unacceptable safety risk or foreclose any reasonable disposition option.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.1.1.8.2.2.1 Determine Deactivation Requirements	*Hanford Federal Facility Agreement and Consent Order*, Milestone M-34-00-T04 (M)[e] Submit a schedule describing activities for the final disposition of contaminated K-East basin water for planning purposes to support the 100-KR-4 record of decision. Due Date: 10/31/94
	Hanford Federal Facility Agreement and Consent Order, Milestone M-34-02 (M).[e] Initiated negotiations with ecology and the Environmental Protection Agency on incorporation of transition activities including stabilization of the basins, consistent with Section 3.1 of the agreement (as amended) and the record of decision regarding long-term storage and ultimate disposition of the irradiated fuel. The U.S. Department of Energy will submit a signed Tri-Party Agreement change request proposing milestones for (1) the completion of removal of fuel and sludge from the K-Basins and (2) the completion of stabilization of the basins. Due Date: 6/30/96
	DOE Order 5480.10, *Contractor Industrial Hygiene Program* (K).[g]
	Hanford Federal Facility Agreement and Consent Order, Milestone M-34-00-T01 (M).[e] Issue Notice of Intent for N-Reactor Fuel Environmental Impact Statement. Due Date: 6/30/94
	WHC-CM-2-14, paragraph 1 (K).[h] Ensure, by summary or by reference, that hazardous material shipments will be conducted in accordance with applicable regulations and orders (list attached). According to WHC-CM-2-14, Part II, Rev. 4, Section 1.0, Responsibilities: "Onsite packaging and shipping shall be conducted according to the U.S. Department of Transportation (DOT) regulations or, if not technically or economically practicable, provide an equivalent degree of safety."

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.1.1.8.2.2.1 Determine Deactivation Requirements (continued)	*Hanford Federal Facility Agreement and Consent Order*, paragraph 1 (M)[e] K-East Basin sludge encapsulation shall be initiated by June 6, 1996.
	Hanford Federal Facility Agreement and Consent Order, Milestone M-34-00 (M).[e] Encapsulation of sludge within K-East Basin shall be completed by December 31, 1998.
	Hanford Federal Facility Agreement and Consent Order, paragraph 3 (M).[e] All encapsulated sludge stored within the K-East Basin shall be removed by December 31, 2002
	SNF-RD-PM-001, Revision 0 (M), Section 4.8.1, "Resource Conservation and Recovery Act (RCRA) Applicability."[a] The Spent Nuclear Fuel Project shall undertake a dialogue with the Environmental Protection Agency (EPA) and affected States to determine the applicability of the *Resource Conservation and Recovery Act* to DOE-owned spent nuclear fuel, seeking legislative action if required. DOE-owned spent nuclear fuel shall be evaluated for hazardous materials characteristics to provide a technical basis for cooperation with the Environmental Protection Agency and affected States in the determination of *Resource Conservation and Recovery Act* applicability, and to establish a basis for contingency actions.
	SNF-RD-PM-001, Revision 0 (M), Section 4.8.2, "Federal Facilities Compliance Act (FFCA) Applicability."[a] The Spent Nuclear Fuel Project shall undertake an evaluation of DOE-owned spent nuclear fuel and establish its classification in accordance with requirements specified in the FFCA for preparation of site treatment plans.
	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance*.[b] Material transferred to the Spent Nuclear Fuels Program shall comply with Spent Fuels Program acceptance criteria before transfer to that program.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.1.1.8.2.2.1 Determine Deactivation Requirements (continued)	DNFSB letter to Secretary O'Leary dated May 26, 1994 (K) (DRAFT) the Board recommends: That the program be accelerated to place the deteriorating reactor fuel in the K-East Basin at the Hanford Site in a stable configuration (stabilize/containerize) for interim storage until an option for ultimate disposition is chosen. This program needs to be directed toward storage methods that will minimize further deterioration.
	Hanford Federal Facility Agreement and Consent Order, Milestone M-34-93-01 (M).[e] It is the common goal of the U.S. Department of Energy, Washington State Department of Ecology, and the U.S. Environmental Protection Agency to move the fuel and sludge (once encapsulated) from the K-East Basin and the encapsulated materials from K-West Basin to "a safer long-term storage facility..."
	SNF-RD-PM-001, Revision 0 (M), Section 4.2.3, "Facility Authorization Basis."[a] Where existing, Nuclear Regulatory Commission technical requirements shall be incorporated into the design, construction, and operation of new facilities.
	SNF-RD-PM-001, Revision 0 (M), Section 4.2.2, "Regulatory Compliance."[a] Spent nuclear fuel facilities shall be designed, constructed, and operated in full compliance with applicable Federal, State and local laws and regulations for the protection of the public and worker health and safety.
	10 CFR 71, "Packaging and Transportation of Radioactive Material (K)."[i]
	10 CFR 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste" (K).[j]
	DOE/RL-93-08, *Hanford Mission Plan, Volume 1, Site Guidance*, para. 3 (M).[b] Environmental Restoration includes conducting interim cleanup actions without limiting implementation of the final decision on restoration.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.1.1.8.2.2.1 Determine Deactivation Requirements (continued)	*Hanford Federal Facility Agreement and Consent Order*, Milestone M-34-01 (M).[e] Contaminated K-East basin water will be removed, replaced, or treated. The timing of this action must be coordinated with encapsulation and the cleaning of the residual contamination in the basin and (as noted below) the alternative selection is dependant on the feasibility of moving encapsulated K-East basin fuel and sludge to the K-West basin. The contaminated water will be dispositioned in accordance with reasonable available Hanford Site treatment and/or disposal processes and methods, available at the time of this action. Unless a better option becomes available, the water will be trucked to C-018 for disposal. If the K-East fuel and sludge, once encapsulated, can be moved to the K-West Basin (determined through a September 1994 engineering study target date) the removal and disposal of the contaminated water shall be completed by September 2000. This date is an eighteen month action, starting in March 1999, three months after fuel and sludge encapsulation is completed. If the transfer of encapsulated K-East basin fuel and sludge to K-West basin is unfeasible, contaminated K-East basin water will be replaced by fresh water, starting in September 1996 at a rate of 7,570,824 L/year (2,000,000 gal/year) and will continue until such time that the tritium concentration in the basin is decreased and is maintained at or below 300,000 pCi/L (the goal is to reduce the tritium concentration in the basin such that resulting groundwater tritium concentrations meet drinking water concentration standards, recognizing a lag between basin and groundwater concentrations. Due Date: To be determined.
4.7.2 Stabilize, Store, and Disposition SNF Material	10 CFR 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste" (K).[k] DOE 6430.1A Shall consider

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	SNF-RD-PM-001, Rev. 0, Section 4.1.2, "Performance Assessments."[a] A comprehensive performance assessment shall be performed for each spent nuclear fuel waste form destined for disposal in a geologic repository. A coordinated systems approach that encompasses storage concepts consistent with the geologic disposal system and activities undertaken by RW shall be used.
	SNF-RD-PM-001, Rev. 0, Section 4.1.5, "Processing of "At Risk" Spent Fuels."[a] Processing of "at risk" spent fuels (fuels not expected to maintain a safe and nonhazardous condition in underwater basin storage, before movement to interim storage or in extended interim storage) shall be evaluated as an option to ensure personnel, facility, and environmental safety. Selection of "at risk" spent nuclear fuel types for processing shall be based upon technical documentation such as technical risk evaluation studies; process studies; cost studies; waste form, volume, and stability studies; and systems engineering studies. The evaluations shall address stakeholder concerns and support U.S. nonproliferation policies and agreements.
	SNF-RD-PM-001, Rev. 0, Section 4.2.1, "General Safety Requirement."[a] Safety of the public, the worker, and the protection of the environment shall be a primary consideration in program planning and execution, and in the design, construction, startup, and operation of spent nuclear fuel facilities.
	SNF-RD-PM-001, Rev. 0, Section 4.2.2, "Regulatory Compliance."[a] Spent nuclear fuel facilities shall be designed, constructed, and operated in full compliance with applicable Federal, State, and local laws and regulations for the protection of the public and worker health and safety.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	SNF-RD-PM-001, Rev. 0, Section 4.2.3, "Facilities Authorization Basis."[a] New spent nuclear fuel facilities shall be sited, designed, constructed, and operated to modern industry standards promulgated for new facilities having equivalent functions within the commercial nuclear industry. Where existing, Nuclear Regulatory Commission (NRC) technical requirements shall be incorporated into the design, construction, and operation of new spent nuclear fuel facilities.
	SNF-RD-PM-001, Rev. 0, Section 4.2.4, "Demonstration Projects."[a] Technical and safety bases shall be developed for suitable demonstration projects to support licensability reviews by the Nuclear Regulatory Commission and to facilitate procurement of standardized facility designs within the U.S. Department of Energy complex.
	SNF-RD-PM-001, Rev. 0, Section 4.2.5, "Accidental Radioactive Releases."[a] New spent nuclear fuel facilities shall be designed, constructed, and operated such that after a design basis accident, potential exposure to radiation shall be within regulatory requirements, as specified in applicable sections of Title 10 of the *Code of Federal Regulations* (CFR).
	SNF-RD-PM-001, Rev. 0, Section 4.2.7, "Worker Safety and Industrial Hygiene."[a] New spent nuclear fuel facilities shall be designed, constructed, and operated such that worker exposures to occupational safety hazards are within regulatory requirements, as specified in applicable sections of Titles 40 and 49 of the *Code of Federal Regulations* (CFR).
	SNF-RD-PM-001, Rev. 0, Section 4.3.1, "National Environmental Policy Act (NEPA)."[a] Spent nuclear fuel facilities shall be designed, constructed, and operated in full compliance with the NEPA, as specified by implementing regulations in 40 CFR 1500-1508 (on a government-wide basis) and 10 CFR 1021 (for DOE).

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	SNF-RD-PM-001, Rev. 0, Section 4.3.2, "New Facilities."[a] New spent nuclear fuel facilities shall be designed, constructed, and operated in full compliance with applicable Federal, State and local laws and regulations for the protection of the environment.
	SNF-RD-PM-001, Rev. 0, Section 4.3.5, "Use of Recyclable Materials."[a] Recyclable materials (i.e. depleted uranium and contaminated/irradiated metals) shall be incorporated into the design of spent nuclear fuel storage and/or transportation canisters, casks, and facilities to the extent practical.
	SNF-RD-PM-001, Rev. 0, Section 4.4.1, "Quality Assurance Program Description (QAPD)."[a] As an appendix to the EM-30 QAPD, the spent nuclear fuel program shall prepare and maintain a QAPD based on the requirement of 10 CFR 830.120 and appropriate consensus standards referenced in Implementation Guide IG-830.120.[k] The consensus standards shall be selected to appropriately control existing and planned spent nuclear fuel activities such as fuel treatment, storage, and disposal. The Spent Nuclear Fuel Quality Assurance Program shall also incorporate the requirements of the civilian high-level radioactive waste program contained in RW-0333P.[l] This process will ensure the smooth flow of spent nuclear fuel from existing facilities through interim storage to final disposal.
	SNF-RD-PM-001, Rev. 0, Section 4.4.2, "Quality Assurance (QA) Requirements."[a] Quality Assurance controls shall be applied, using a graded approach, commensurate with the degree of importance of spent nuclear fuel project activities, to the proper conditioning and storage of spent nuclear fuel and to achieve compatibility with the geologic disposal system and related RW activities.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	SNF-RD-PM-001, Rev. 0, Section 4.5.1, "Decision making."[a] Decisions regarding spent nuclear fuel facilities shall resolve competing interests in a manner which recognizes the following priorities: public and worker health and safety, environmental protection, operations, and cost.
	SNF-RD-PM-001, Rev. 0, Section 4.5.2, "Technology Development."[a] The spent nuclear fuel technology development program shall minimize the number and scope of technology demonstration projects for U.S. Department of Energy-owned spent nuclear fuel through incorporation of the objectives and results of existing government and industry sponsored technology development programs, and shall reflect the significant lessons learned from the design and operation of commercial spent fuel facilities. Existing and proven commercial facility designs shall be adapted for DOE use, when appropriate. Recognizing that differences exist between commercial and DOE-owned SNF, technology development activities necessary to support viable facility designs and storage concepts for DOE-owned SNF shall be planned, approved in advance, and scheduled to maximize the benefits to design and operation of the facilities. Results from geologic repository performance assessments shall be used to influence the direction and priorities for technology development and the specifications for interim storage, conditioning, and disposal systems.
	SNF-RD-PM-001, Rev. 0, Section 4.5.3, "Inherent and Passive Systems."[a] New spent nuclear fuel facilities shall incorporate inherent and passive systems and features to preclude the need for active, manpower intensive operations. Designs for new spent nuclear fuel facilities shall be simplified to improve safety, reliability, constructibility, operability, inspectability, and maintainability.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	SNF-RD-PM-001, Rev. 0, Section 4.5.4, "Defense-in-Depth."[a] Designs for new spent nuclear fuel facilities shall utilize the fundamental principles of defense-in-depth (i.e., redundancy and diversity) to ensure that critical safety functions are achieved and that multiple barriers to the release of radioactivity are provided. Application of this principle shall include specific emphasis on the prevention and/or mitigation of design basis events.
	SNF-RD-PM-001, Rev. 0, Section 4.5.5, "Site Related Hazards."[a] Spent nuclear fuel facilities shall be designed to commercial industry standards for resistance to seismic events, floods, winds, and other natural phenomena.
	SNF-RD-PM-001, Rev. 0, Section 4.5.6, "Deterministic and Probabilistic Analysis."[a] Designs shall be based on conservative deterministic approaches that establish operational and design limits for systems and equipment, considering the most challenging "credible" occurrences. Probabilistic analyses may be used to augment the deterministic analyses. It is recognized that probabilistic analysis techniques have achieved a level of development and acceptance such that they are frequently used today to evaluate facility reliability and availability, to measure safety function reliability, to assist in systems optimization during design, to minimize the potential for operator error, and to characterize and manage risks to the public associated with postulated accidents. However, as the vast majority of design, construction and operations standards remain deterministically based, deterministic design analysis - augmented by probabilistic analysis in appropriate cases - is required.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	SNF-RD-PM-001, Rev. 0, Section 4.6.1, "Safeguards and Security."[a] Spent nuclear fuel facilities shall incorporate measures necessary to prevent unauthorized access to nuclear materials, theft, diversions, hoaxes, and other malevolent acts intended to release radioactivity or disrupt operations, based upon a specified threat.
	SNF-RD-PM-001, Rev. 0, Section 4.6.2, "Emergency Planning."[a] New spent nuclear fuel facilities shall be designed with a goal to eliminate the need for offsite evacuation and sheltering. In addition, spent nuclear fuel features and information necessary to support effective site emergency response actions shall be included in the design and coordinated with the emergency planning of the respective U.S. Department of Energy sites.
	SNF-RD-PM-001, Rev. 0, Section 4.7.1, "Maintenance."[a] New spent nuclear fuel facilities shall have ready access to equipment, provide support equipment located and sized to facilitate work, ensure that systems and components have high reliability, use automation when cost effective and safety enhancing, and provide for mockups and training aimed at reducing radiological exposure and easy repair or replacement of components. Preventative maintenance approaches shall receive primary focus when undertaking facility maintenance planning.
	SNF-RD-PM-001, Rev. 0, Section 4.7.4, "Instrumentation and Plant Controls."[a] The design of the man-machine interface for operation and control of new spent nuclear fuel facilities shall incorporate human factors engineering principles and operating experience to promote safety and high operational reliability. Facility designs shall incorporate appropriate instrumentation and controls to provide the operators with diagnostic and mitigation capability.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	SNF-RD-PM-001, Rev. 0, Section 4.8.1, "Resource Conservation and Recovery Act (RCRA) Applicability."[a] The spent nuclear fuel program shall undertake a dialogue with the Environmental Protection Agency (EPA) and affected States to determine the applicability of *Resource Conservation and Recovery Act* (RCRA) to U.S. Department of Energy-owned spent nuclear fuel, seeking legislative action if required. U.S. Department of Energy-owned spent nuclear fuel shall be evaluated for hazardous materials characteristics to provide a technical basis for cooperation with the EPA and affected States in the determination of RCRA applicability, and to establish a basis for contingency actions.
	SNF-RD-PM-001, Rev. 0, Section 4.8.2, "Federal Facilities Compliance Act (FFCA) Applicability."[a] The spent nuclear fuel program shall undertake an evaluation of U.S. Department of Energy-owned spent nuclear fuel and establish its classification in accordance with requirements specified in the FFCA for preparation of site treatment plans.
	SNF-RD-PM-001, Rev. 0, Section 5.2.1, "Construction of New Facilities."[a] Construction and operation of new spent nuclear fuel facilities shall be scheduled to minimize life cycle costs for storage of U.S. Department of Energy-owned spent nuclear fuel, subject to satisfying commitments and applicable requirements for worker safety, public health, and environmental protection. An enabling assumption is made that the budget process will support the spent nuclear fuel program schedule and that funding will be made available for individual projects.
	SNF-RD-PM-001, Rev. 0, Section 5.2.2, "Codes and Standards."[a] New spent nuclear fuel facilities shall be designed, constructed, and operated to modern commercial industry codes and standards.
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	SNF-RD-PM-001, Rev. 0, Section 5.2.3, "Design Life."[a] New spent nuclear fuel facilities shall be designed for a minimum of life of 40 years.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
	SNF-RD-PM-001, Rev. 0, Section 5.2.9, "Environmental Monitoring."[a] Spent nuclear fuel facilities shall utilize real time monitoring of facility effluents as a tool for minimizing environmental impacts.
	SNF-RD-PM-001, Rev. 0, "Decontamination and Decommissioning."[a] New spent nuclear fuel facilities shall be designed, constructed, maintained, and operated to facilitate eventual decontamination and decommissioning.
	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance*.[b] It is assumed, subject to the Record of Decision from the *Hanford Remedial Action Environmental Impact Statement* (HRA-EIS), that the 200 Area and central plateau will be used for the collection and disposal of waste materials that remain on site and for the activities associated with them. Activities that the U.S. Department of Energy considers incompatible with waste disposal actions will be excluded from the 200 Area surface, subsurface, and groundwater during waste management operations. Following waste management operations, institutional access control will be identified by performance assessments in accordance with DOE Order 5820.2A.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance.*[b] Nuclear materials will be treated, as necessary, and stored on site in long-term interim safe and secure storage pending development and implementation of a national policy regarding their final disposition. Those nuclear materials for which a beneficial offsite use has been identified will be shipped off site. Uranium and spent nuclear material will be converted to a form suitable for storage and transport. Plutonium will be assumed to have no asset value when selecting conversion processes. Irradiated fuel and cesium and strontium capsules will be disposed of as waste; however, safe and secure storage for these materials is assumed to continue at current locations until disposition paths are defined. The Plutonium Finishing Plant (PFP) will continue to store spent nuclear material for the foreseeable future until final disposition is determined. The capability to support future stabilization activities and terminal cleanout of the PFP will be maintained. Environmental impact statements will be prepared to finalize the disposition plans for irradiated fuel and special nuclear material as indicated in Section 3.5.1.3.2.
	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance.*[b] Material Disposition Responsibilities. The Spent Nuclear Fuel Program will define and establish alternative interim storage for spent nuclear fuel on site or transport it off site to support implementation of the pending *National Environmental Policy Act* decision. In addition, this program will define and establish a spent nuclear fuel waste package qualified for final disposition.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance.*[b] In concert with Federal, State, and public direction, Hanford Site programs are directed to embrace pollution prevention to the maximum extent possible. They will incorporate waste minimization, waste volume reduction, and recycling into their program planning. Site programs are directed to implement waste minimization and pollution prevention activities to prevent pollution from entering the environment; conserve resources and energy; and reduce the quantity and toxicity of hazardous, radioactive, mixed, and sanitary waste generated at the Hanford Site.
	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance.*[b] Site cleanup will be performed in accordance with the Tri-Party Agreement (Ecology et al. 1994), as amended, and other agreements, and in compliance with all applicable Federal, State, and local laws and American Indian treaty rights. Hanford Site programs must also comply with U.S. Department of Energy policies and directives. The cleanup work will be performed with the intent of transferring a positive legacy to the community through economic diversification activities.
	Hanford Federal Facility Agreement and Consent Order, para. 14.[e] The Tri-Party Agreement was entered into to accomplish four general goals: • Investigate past and present activities causing environmental impacts and respond to the impacts to protect health, welfare, and the environment. • Issue and obtain needed permits for facilities, conduct the investigation and response in orderly effective fashion, and avoid litigation. • Comply with the full spectrum of *Resource Conservation and Recovery Act* and State equivalent requirements. • Develop, prioritize, implement, and monitor response actions in accordance with the *Resource Conservation and Recovery Act* and the *Comprehensive Environmental Response, Compensation, and Liability Act.*

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	*Hanford Federal Facility Agreement and Consent Order*, para. 15.[e] The Tri-Party Agreement commits the parties to: • Follow *Resource Conservation and Recovery Act* (RCRA) procedures for treatment, storage, and disposal units • Identify interim cleanup actions where appropriate, implement selected RCRA and *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) interim actions • Follow the requirements the Tri-Party Agreement establishes for conducting investigations and studies • Incorporate response action schedules into the Tri-Party Agreement • Establish cleanup levels established by CERCLA or CERCLA ARARs.
	Hanford Federal Facility Agreement and Consent Order, para. 19[a] *Resource Conservation and Recovery Act* and *Comprehensive Environmental Response, Compensation, and Liability Act* remedial actions are to protect human health and the environment to an extent that no further actions will be required after actions under the agreement are completed. The actions are to address all aspects of contamination at units included in the action plan. Remediation of groundwater may be managed either as a remedial and corrective action or as part of permitting and closure of treatment, storage, and disposal units.
	SNF-RD-PM-001, Rev. 0, Section 4.2.8, "Safety Documentation."[a] Safety analysis reports and technical safety requirements or technical specifications (in accordance with Nuclear Regulatory Commission regulations) as appropriate, shall be developed to establish facility safety bases and to control spent nuclear fuel facility operations.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	SNF-RD-PM-001, Rev. 0, Section 4.7.2, "Pre-Operational Testing."[a] Restart of existing facilities and pre-operation and startup testing of new SNF facilities shall be planned and conducted to ensure proper performance of components and subsystems individually and as part of the overall facility performance. New facilities shall be designed for ease of system and hardware checkouts.
	SNF-RD-PM-001, Rev. 0, Section 4.2.6, "Occupational Exposure."[a] New spent nuclear fuel facilities shall be designed, constructed, and operated such that worker exposures during normal operations and anticipated operational occurrences are within regulatory requirements, as specified in applicable sections of Title 10 of the Code of Federal Regulations. Actions shall be taken to achieve the fundamental goal of reducing worker exposures to as low as reasonably achievable (ALARA).
	SNF-RD-PM-001, Rev. 0, Section 4.7.3, "Staff Training."[a] A staff training program shall be implemented to meet either U.S. Department of Energy or nuclear power industry standards, as appropriate for the particular operation. Retraining and recertification shall be part of the operator training plan. Training of facility staff shall be conducted based on standards consistent with the importance of the function and complexity of operations.
	Hanford Federal Facility Agreement and Consent Order, para. 102.[e] The U.S. Department of Energy may propose additional work or work modifications, using the Tri-Party Agreement dispute resolution process.
	Hanford Federal Facility Agreement and Consent Order, para. 103.[e] The U.S. Department of Energy is to promptly notify the regulators' project manager of any work changes which adversely impact or would significantly revise work schedules.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	*Hanford Federal Facility Agreement and Consent Order*, para. 106.[c] If response activities threaten Hanford Site workers, people in the surrounding area, or the environment, any party to the Tri-Party Agreement may require that the work stop.
	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance*, para. 6 and 15 (M).[b] Complete appropriate *National Environmental Policy Act* documentation including an environment impact statement to support ultimate disposition of spent fuel.
	SNF-RD-PM-001, Rev. 0, Section 5.3.1, "Contract for Permanent Disposal."[a] The spent nuclear fuel program shall draft, in conjunction with RW, a proposed contract for permanent disposal of U.S. Department of Energy-owned spent nuclear fuel. This contract shall incorporate the principles and terms established for contracts with commercial nuclear utilities for permanent disposal of commercial spent nuclear fuel.
	SNF-RD-PM-001, Rev. 0, Section 5.3.2, "Waste Acceptance Criteria (WAC)."[a] The spent nuclear fuel program shall undertake a joint effort with RW to establish the WAC for permanent disposal of DOE-owned SNF in a geologic repository. Development of the WAC shall include evaluation of conditioning and volume reduction alternatives based upon analyses that balance the costs and benefits of such alternatives.
	SNF-RD-PM-001, Rev. 0, Section 5.3.3, "Criticality Safety."[a] The spent nuclear fuel program shall undertake a joint effort with RW to address criticality safety criteria for repository disposal of U.S. Department of Energy-owned spent nuclear fuel.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	SNF-RD-PM-001, Rev. 0, Section 5.3.7, "Accountability, Safeguards, and Security."[a] The spent nuclear fuel program shall undertake a joint effort with RW to address the accountability, safeguards, and security issues associated with geologic disposal of high enriched and/or classified U.S. Department of Energy-owned spent nuclear fuel.
	DOE/RL-93-08, *Hanford Mission Plan, Volume 1, Site Guidance*, para. 13 (M).[f] Irradiated fuel will be disposed of as waste.
	DOE/RL-93-08, *Hanford Mission Plan, Volume 1, Site Guidance,* para. 20 (M)[f] When offsite locations are prepared to accept SNF arrange offsite shipments.
	DOE/RL-93-08, *Hanford Mission Plan, Volume 1, Site Guidance,* para. 22 (M)[f] There is an interface issue with the undesignated program that will be responsible for ultimate disposition of irradiated fuels.
	DOE/RL-93-08, *Hanford Mission Plan, Volume 1, Site Guidance* (M).[f] Irradiated fuel is assumed to be disposed of off site, along with high-level waste without reprocessing to recover contained uranium and plutonium.
	SNF-RD-PM-001, Revision 0 (M), Section 5.1.4, "Characterization."[a] The technology development program shall establish the technical basis needed to demonstrate SNF integrity during existing storage. Ensuring SNF integrity during storage implies that the storage environment be such that, while changes may occur in the physical state of the SNF, those changes do not cause any unacceptable safety risk or foreclose any reasonable disposition option.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	SNF-RD-PM-001, Rev. 0, Section 5.2.7, "Conditioning."[a] SNF shall be conditioned to the extent necessary to ensure its integrity under long-term interim storage conditions. When evaluating conditioning options for interim storage, the waste acceptance criteria (WAC) established for geologic disposal shall be considered.
	DOE/RL-93-08, *Hanford Mission Plan, Volume 1, Site Guidance*, para. 12 (M).[f] Nuclear materials will be treated, as necessary, and stored on site in long-term interim storage pending development and implementation of a national policy regarding their final disposition.
	DOE/RL-93-08, *Hanford Mission Plan, Volume 1, Site Guidance*, para. 19 (M).[f] Store spent nuclear fuel destined for offsite disposition at an onsite location until offsite locations are prepared to accept spent nuclear fuel. Offsite disposal sites are assumed not to be available until site restoration is complete.
	SNF-RD-PM-001, Rev. 0, Section 5.2.3, "Design Life" (K).[a] New spent nuclear fuel storage facilities shall be designed for a minimum of 40 years.
	SNF-RD-PM-001, Rev. 0, Section 4.2.2, "Regulatory Compliance" (K).[a] Spent nuclear fuel facilities shall be designed, constructed, and operated in full compliance with applicable Federal, State, and local laws...
	SNF-RD-PM-001, Rev. 0, Section 5.2.5, "Dry Storage."[a] New spent nuclear fuel storage facilities shall utilize existing commercial storage technologies to minimize life cycle costs by taking advantage of commercial standards and licensing bases, and shall employ dry storage methods to the maximum extent permitted by environmental, safety, and cost considerations.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	SNF-RD-PM-001, Rev. 0, Section 5.2.6, "Characterization."[a] The technology development program shall establish technical bases for interim storage and permanent disposal of U.S. Department of Energy-owned spent nuclear fuel, and shall develop criteria and procedures to ensure that the spent nuclear fuel and facilities satisfy the technical bases.
	SNF-RD-PM-001, Rev. 0, Section 5.2.8, "Assurance of Storage Viability."[a] Criteria and methods, appropriate to each fuel form and storage method, shall be established to ensure continued safe storage of U.S. Department of Energy-owned spent nuclear fuel. Methods may include demonstration, analysis, retrieval for inspection, and utilization of representative samples.
	SNF-RD-PM-001, Rev. 0, Section 5.3.4, "Canisterization" (M).[a] The spent nuclear fuel program shall undertake a joint effort with RW to utilize a standard canister, developed by RW, for storing, transporting, and disposing of U.S. Department of Energy-owned spent nuclear fuel.
	SNF-RD-PM-001, Rev. 0, Section 5.3.4, "Canisterization."[a] The spent nuclear fuel program shall undertake a joint effort with RW to utilize a standardized canister, developed by RW, for storing, transporting, and disposing of U.S. Department of Energy-owned spent nuclear fuel.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	SNF-RD-PM-001, Rev. 0, Section 5.3.5, "Joint Technology Programs."[a] The spent nuclear fuel program shall undertake, where appropriate joint development efforts with RW to resolve technical issues associated with the geologic disposal of U.S. Department of Energy-owned spent nuclear fuel. Examples of these issues include: • Decay heat removal • Radiation shielding • Physical integrity • Physical dimensions and quantity • Standardization of packaging • Material incompatibilities • Corrosion product control.
	SNF-RD-PM-001, Rev. 0, Section 5.3.6, "Conditioning."[a] Spent nuclear fuel shall be conditioned to the extent necessary to meet the Washington Administrative Code for permanent disposal in a geologic repository.
	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance* (M).[b] It is assumed that the fuel must be converted to a form thermodynamically similar to other material currently planned for geologic repository disposal (either oxides in a metal-clad or glass in a metal container).
	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance* (M).[b] All fuel except the uranium metal fuels meet the thermodynamic similarity assumption.
	DOE/RL-93-102,*Hanford Mission Plan, Volume 1, Site Guidance* (M).[b] The uranium metal fuel is assumed to be oxidized and packaged in a metal container before offsite disposal.

Table 3-1. SNFP Top-Level Mission Requirements

Function	Requirement
4.7.2 Stabilize, Store, and Disposition SNF Material (continued)	DOE/RL-93-102, *Hanford Mission Plan, Volume 1, Site Guidance* (M).[b] Material transferred to the Spent Nuclear Fuels Program shall comply with Spent Fuels Program acceptance criteria before transfer to that program.

[a] DOE, 1994, *Spent Nuclear Fuel Program Requirements Document*, SNF-RD-PM-001, Revision 0 (M), U.S. Department of Energy, Washington, D.C.

[b] DOE-RL, 1994, *Hanford Mission Plan, Volume 1, Site Guidance*, DOE/RL-93-102, U.S. Department of Energy Richland Operations Office, Richland, Washington.

[c] WHC, 1994, *Systems Engineering Functions and Requirements for the Cleanup Mission*, WHC-EP-0772, Westinghouse Hanford Company, Richland, Washington.

[d] Holmes, J. J., 1994 (Draft), *Architecture Synthesis Basis for the Hanford Cleanup System: First Issue*," WHC-EP-0779, Westinghouse Hanford Company, Richland, Washington.

[e] Ecology, EPA, and DOE, 1994, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

[f] DOE-RL, 1993, *Hanford Mission Plan, Volume 1, Site Guidance*, DOE/RL-93-08, U.S. Department of Energy Richland Operations Office, Richland, Washington.

[g] DOE, 1985, *Contractor Industrial Hygiene Program*, DOE 5480.10, U.S. Department of Energy, Washington. D.C.

[h] WHC-CM-2-14, *Hazardous Material Packaging and Shipping*, Westinghouse Hanford Company, Richland, Washington.

[i] 10 CFR 71, "Packaging and Shipping and Radioactive Material," *Code of Federal Regulations*, as amended.

[j] 10 CFR 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste," *Code of Federal Regulations*, as amended.

[k] DOE-RL, 1994, *Systems Engineering*, RLPD 4900.1, U.S. Department of Energy Richland Operations Office, Richland, Washington.

[l] Bergsman, K. H., 1994, *Hanford Spent Fuel Inventory Baseline*, WHC-SD-SNF-TI-001, Westinghouse Hanford Company, Richland, Washington.

4.0 CONCEPT DESCRIPTION

This section provides a description of the SNFP baseline system functions and, in part, a conceptual architecture to accomplish these functions. This architecture does not represent the completed baseline concept but only a snapshot of the K Basin deactivation system and the SNF stabilization, storage, and disposition system. This architecture is a point of departure for the further development of the SNFP systems, serving as a basis for studies, analyses, and concept development. The product tree for the SNFP that supports the functions described below is provided in Section 7.

Figure 4-1 (3 sheets) contains the preliminary Level 0 Process Flow Description (PFD) for the SNFP. This PFD is based on the SNFP Path Forward. Page 1 shows the relationships between the systems and facilities and gives a top-level view of the process flows between the systems. Page 2 gives a more detailed view of the flows between the systems. Page 3 shows the subsystems associated with each system and the flows between these subsystems.

The Hanford Site systems engineering organization has developed five major functions that encompass Hanford Site activities. All of these functions are related to SNF. The SNFP functional decomposition effort applied to four of these first level functions was addressed in Section 2.

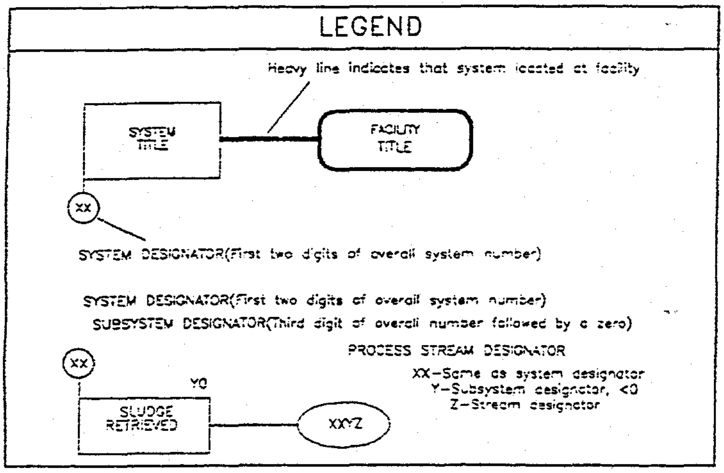
As stated in the introduction, the SNFP mission and functions fit within seven Hanford Site systems engineering functions:

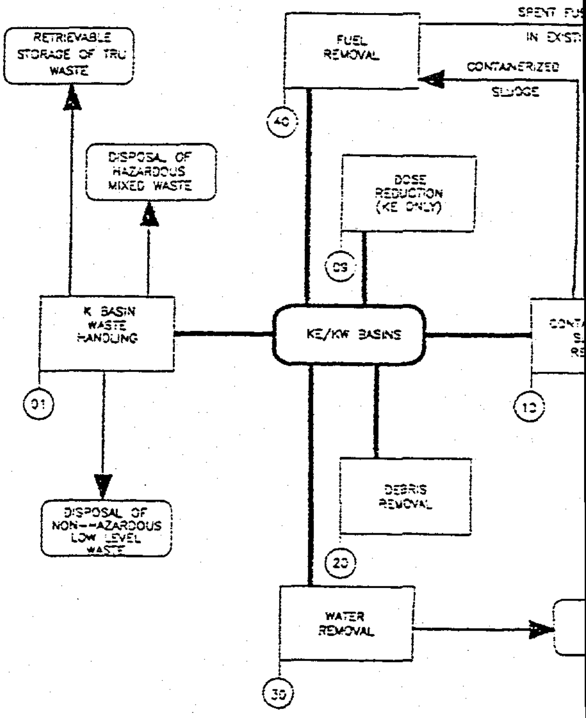
•	2.0	Acquire Mission Essential Capabilities
•	3.0	Obtain Public Involvement
•	4.1.1.8	Deactivate K Basins (and their support systems)
•	4.1.1.9	Deactivate SNF (Other) Pre-Interim Storage Pad (PISP)
•	4.1.1.10	Deactivate SNF (K Basin) Staging and Storage Facility (SSF)
•	4.1.1.11	Deactivate SNF (K Basin) Stabilization Facility
•	4.7.2	Stabilize, Store, and Disposition SNF Material.

Function 2.0 includes the acquisition of new or currently unavailable capabilities that are essential to the successful accomplishment of its mission. Function 3.0 includes obtaining public involvement in the decisions concerning the SNFP in order to mitigate public concern over the hazards involved in the continued storage of Hanford Site SNF in the K Basins. Functions 4.1.1.8, 4.1.1.9, 4.1.1.10, and 4.1.1.11 include the safe and compliant operation of all facilities that provide temporary storage, transfer, staging, stabilization, and storage for the SNF while these facilities are being deactivated. This includes the K Basins (Function 4.1.1.8), the Pre-Interim Storage Pad (Function 4.1.1.9), the Staging and Storage Facility (Function 4.1.1.10), and the Stabilization Facility (Function 4.1.1.11). The mission of the K Basin facilities is deactivation and not continued storage. Function 4.7.2 includes the

Figu

SNFP Proces





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2)

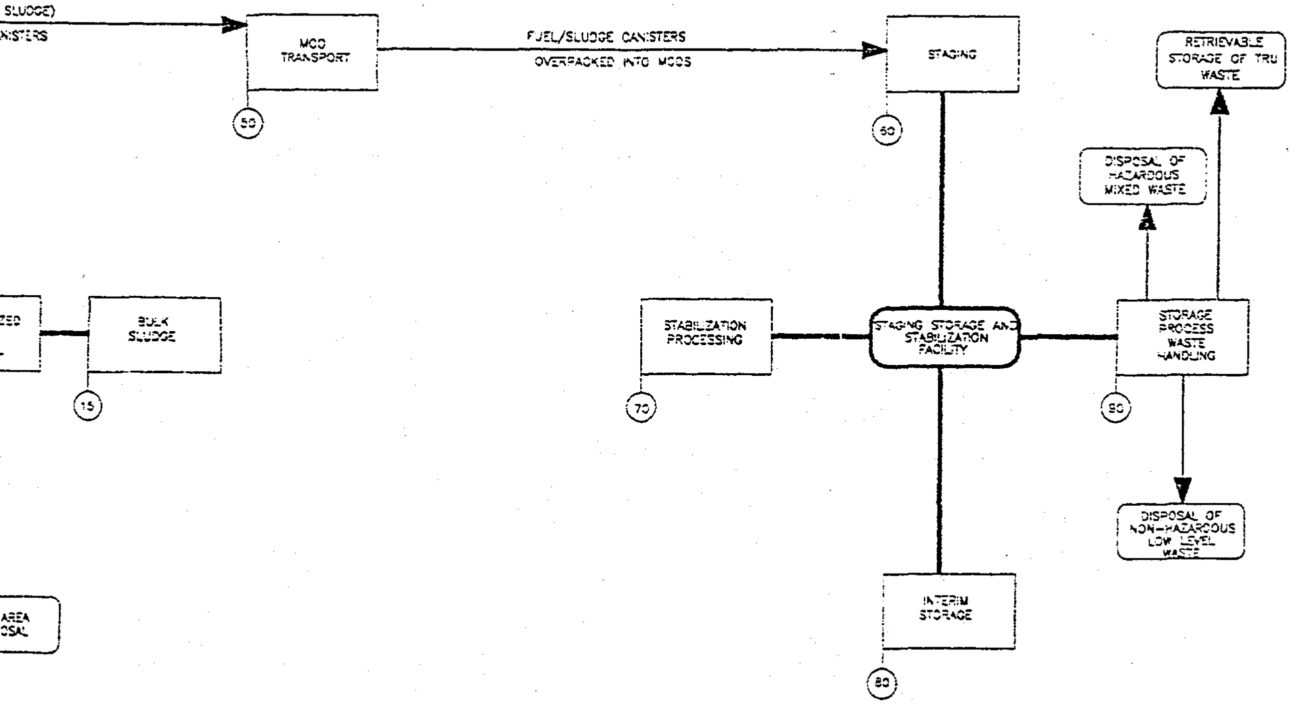
3)

4-1

Flow Description (3 sheets)

LEVEL 0–
SPENT NUCLEAR FUEL
PATH FORWARD PFD
(PRELIMINARY CONCEPT)

FILE NAME: PFDLVL0C | SHEET 1 OF 3 | DATE: 1/5/94
REV: B | BY: J. MICAHEL KNOX



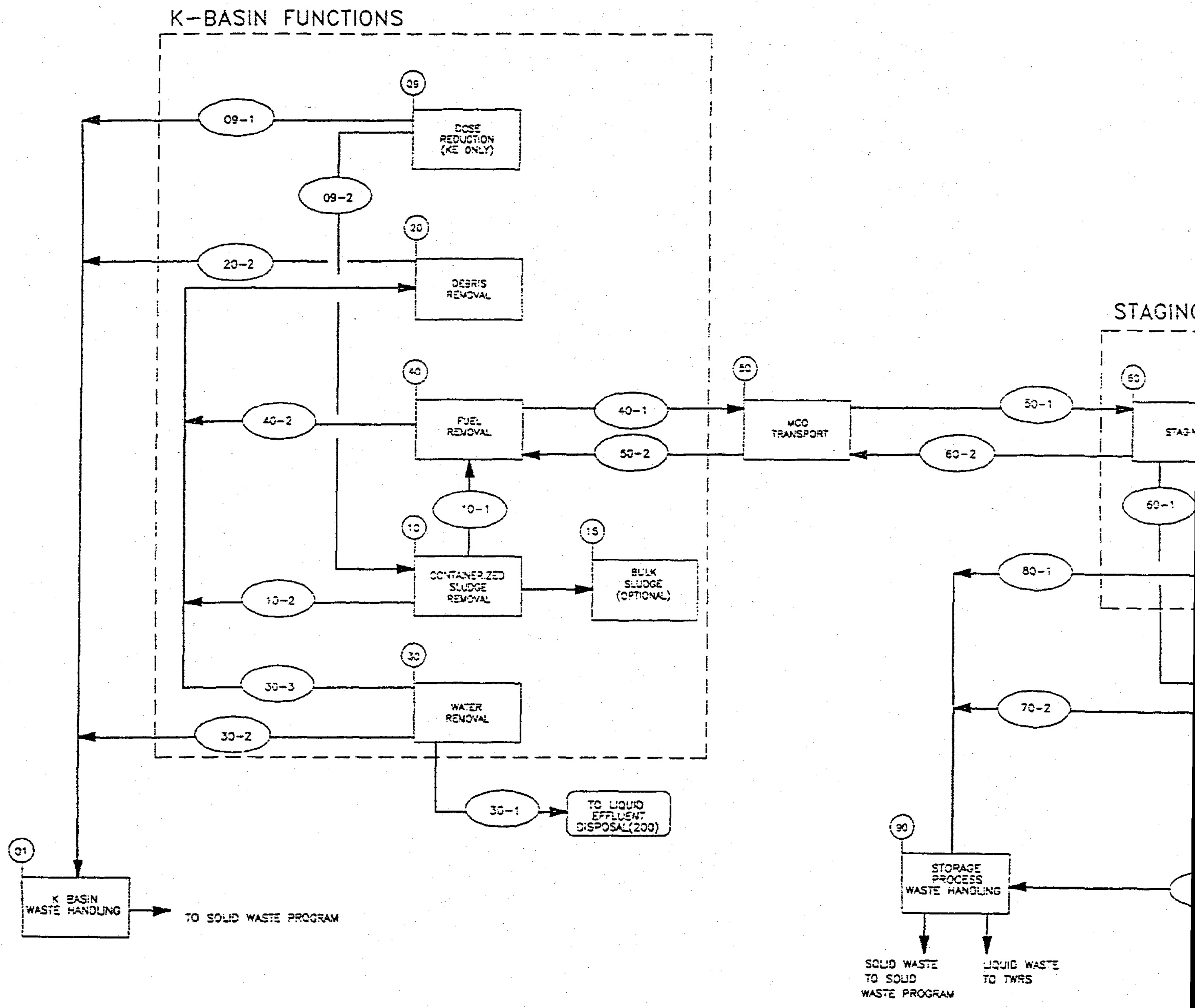
ERAL NOTES:

NCTIONAL RELATIONSHIPS among the various Systems and Subsystems are depicted, and major PROCESS STREAMS are identified on sheets 2 through TBD.

JOR PROCESS STREAM descriptions, average flow rates, design flow rates, processing cycle times, etc. are tabulated on sheets TBD through TBD, as
propriate.

ABLING ASSUMPTIONS are listed on sheet TBD.

Figu
SNFP Process Flow

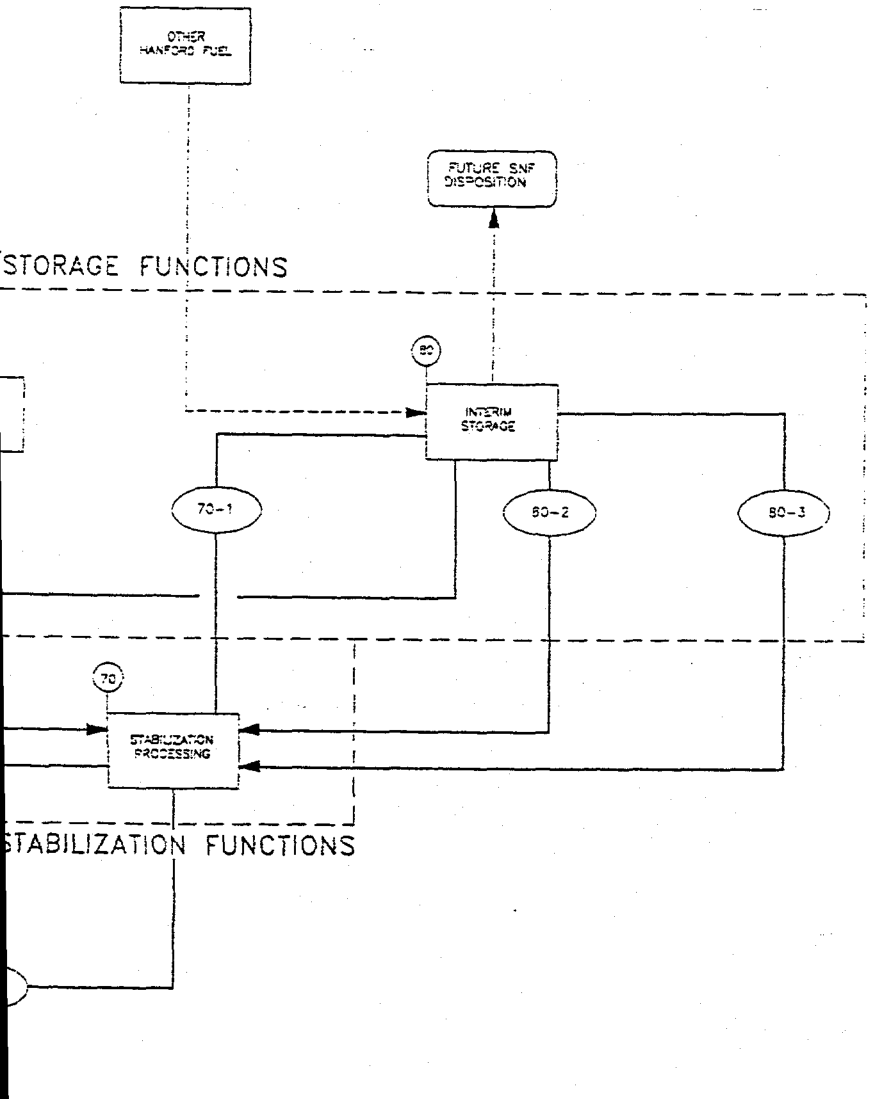


4-1

Description (3 sheets)

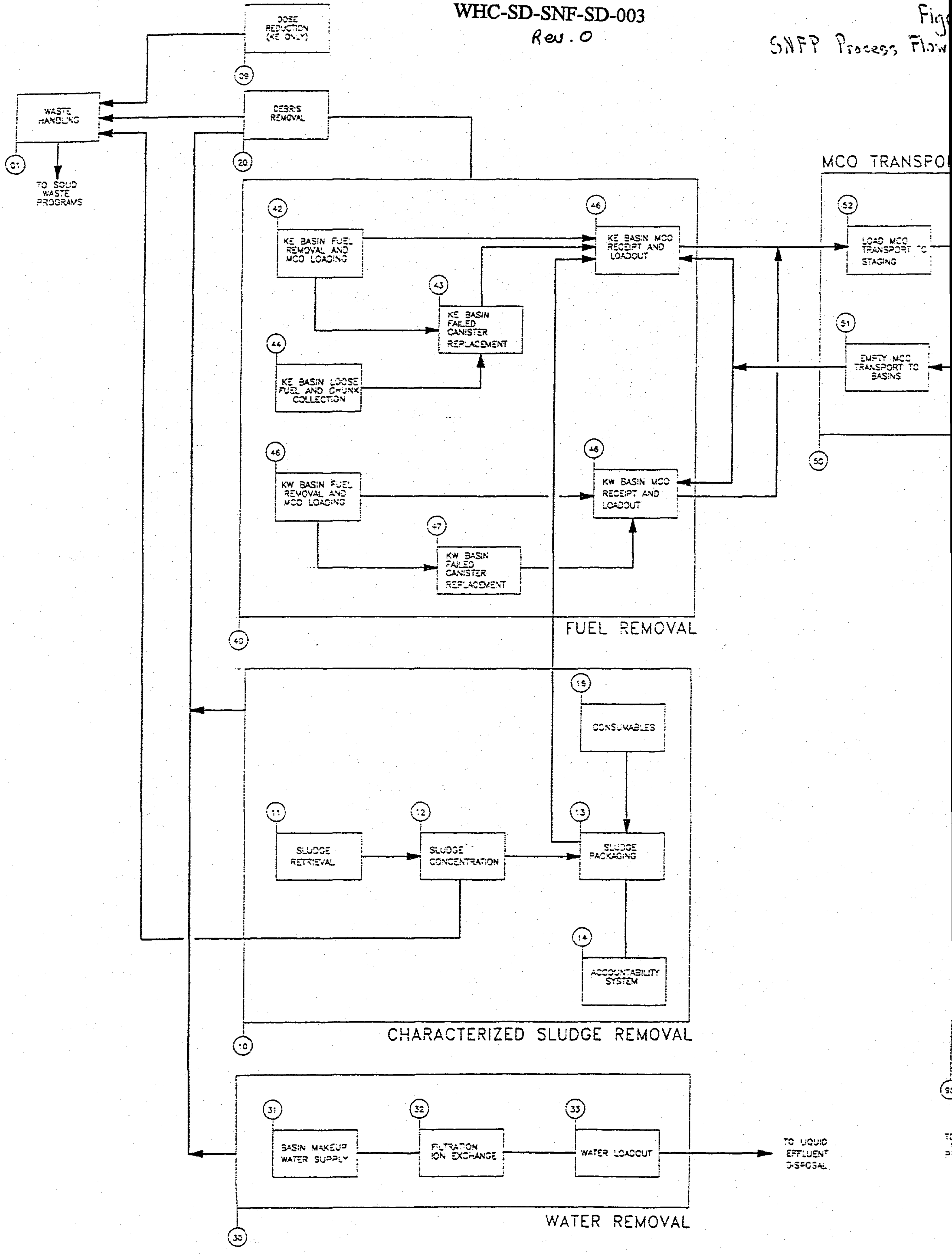
LEVEL 0-
SPENT NUCLEAR FUEL
PATH FORWARD PFD
(PRELIMINARY CONCEPT)

FILE NAME: PFDLVL0C	SHEET 2 OF 3	DATE 1/5/94
REV. B	BY: J. MICAHEL KNOX	



Fig

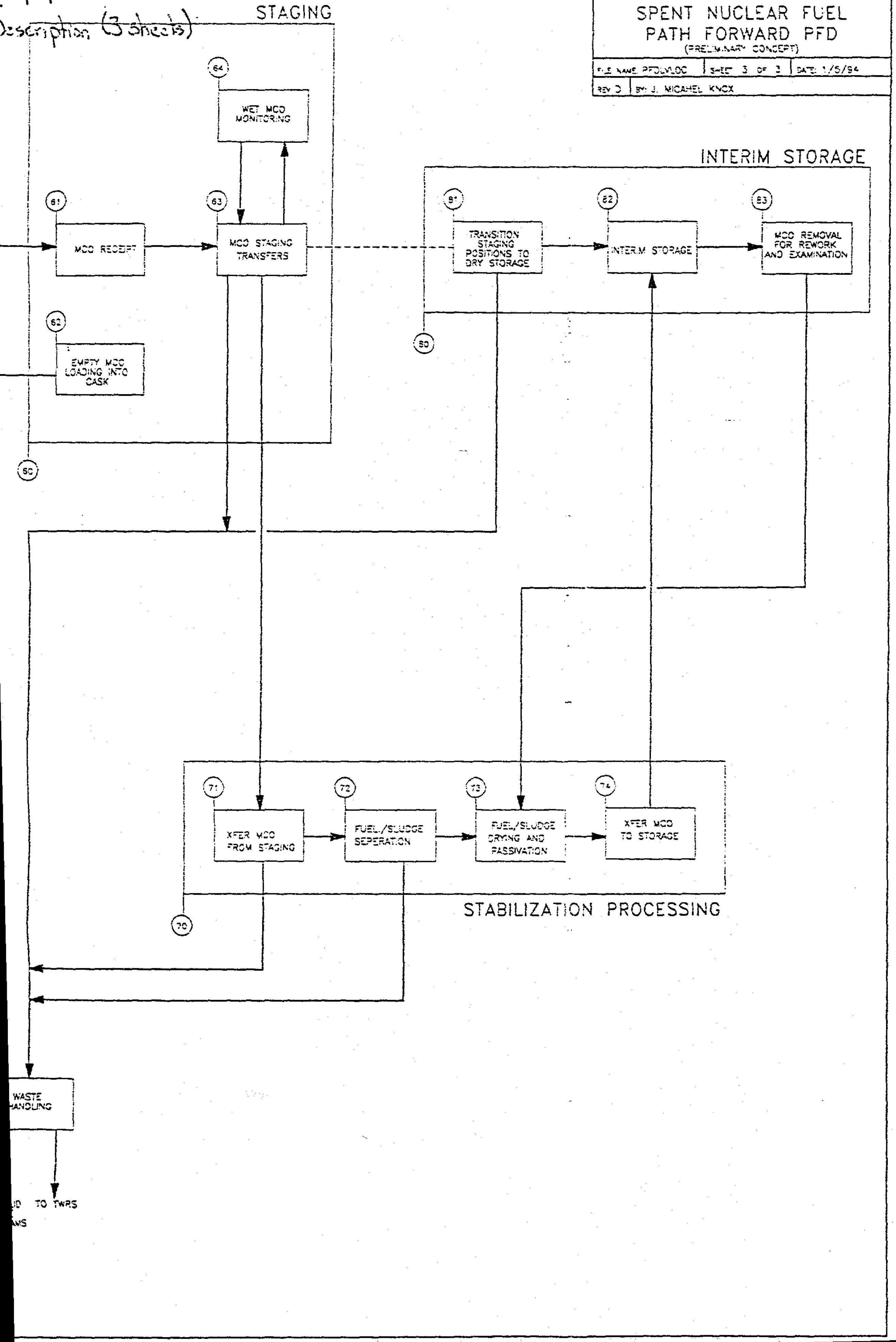
SNFP Process Flow



4-1
Description (3 sheets)

LEVEL 0–
SPENT NUCLEAR FUEL
PATH FORWARD PFD
(PRELIMINARY CONCEPT)

FILE NAME PFDLVL0C	SHEET 3 OF 3	DATE: 1/5/94
REV 0	BY: J. MICAHEL KNOX	



operation of the facilities that have a mission to receive, stage, stabilize and/or store SNF in a safe and compliant manner. This would include any currently existing facilities or new facilities that may be required to satisfy that mission.

Function 1.0, Manage Program, and Function 5.0, Transition Resources for Beneficial Use, are also of direct importance to the SNFP as they are contained in the SNFP to a significant degree. These functions provide very important direction, mission essential needs, and resources for the project.

4.1 OVERVIEW

4.1.1 K Basin SNF

The KE and KW Basins contain 2,100 tons of irradiated fuel stored in canisters under 9.9 m (16 ft) of water. The KE Basin contains 3,666 canisters containing 50,685 fuel elements. The KW Basin contains 3,815 canisters containing 52,959 fuel elements. Of this total mass, there is 1,143,600 kg uranium and 2,155 kg plutonium in the KE Basin and 951,900 kg uranium and 1,875 kg plutonium in the KW Basin. This is estimated to represent 55,200,000 Ci in both basins. The N Reactor irradiated fuel has been stored at the basins since discharge from N Reactor. The discharge dates range from 1971 to 1988. A three-dimensional representation of one basin (they are identical) is depicted in Figure 4-2.

The fuel in the KE and KW Basins is stored in canisters on the bottom of the basins in single stacked storage racks. Three different types of fuel canisters hold the irradiated fuel elements. The canisters are shown in Figure 4-3. Each canister has two cylindrical barrels that hold up to seven elements vertically. Mark 0 canisters have perforated bottoms and open tops and are made of aluminum. Mark I and Mark II canisters have solid bottoms and sealable tops; however, Mark I and Mark II canisters located in the 105-KE fuel storage basin do not have the tops installed. Mark I canisters are made of either aluminum or stainless steel. All Mark II canisters are made of stainless steel.

As a result of cladding damage that occurred during refueling activities, the uranium in some elements was exposed and has oxidized during storage. The loss of cladding integrity and oxidation of the uranium allows soluble and gaseous fission products to dissolve into the canister water. The Mark 0 canisters and open-top Mark I and Mark II canisters used in the KE Basin have allowed free exchange of water between the canister and the basin, and therefore soluble and gaseous fission products are continually released to the water of the KE Basin.

Compared to the KE Basin, the water in the KW Basin is relatively free of contamination. The KW Basin contains Mark I and Mark II canisters that have closed lids and bottoms. Therefore, contamination resulting from damaged and/or oxidizing fuel has been contained within the canisters, except for gaseous products.

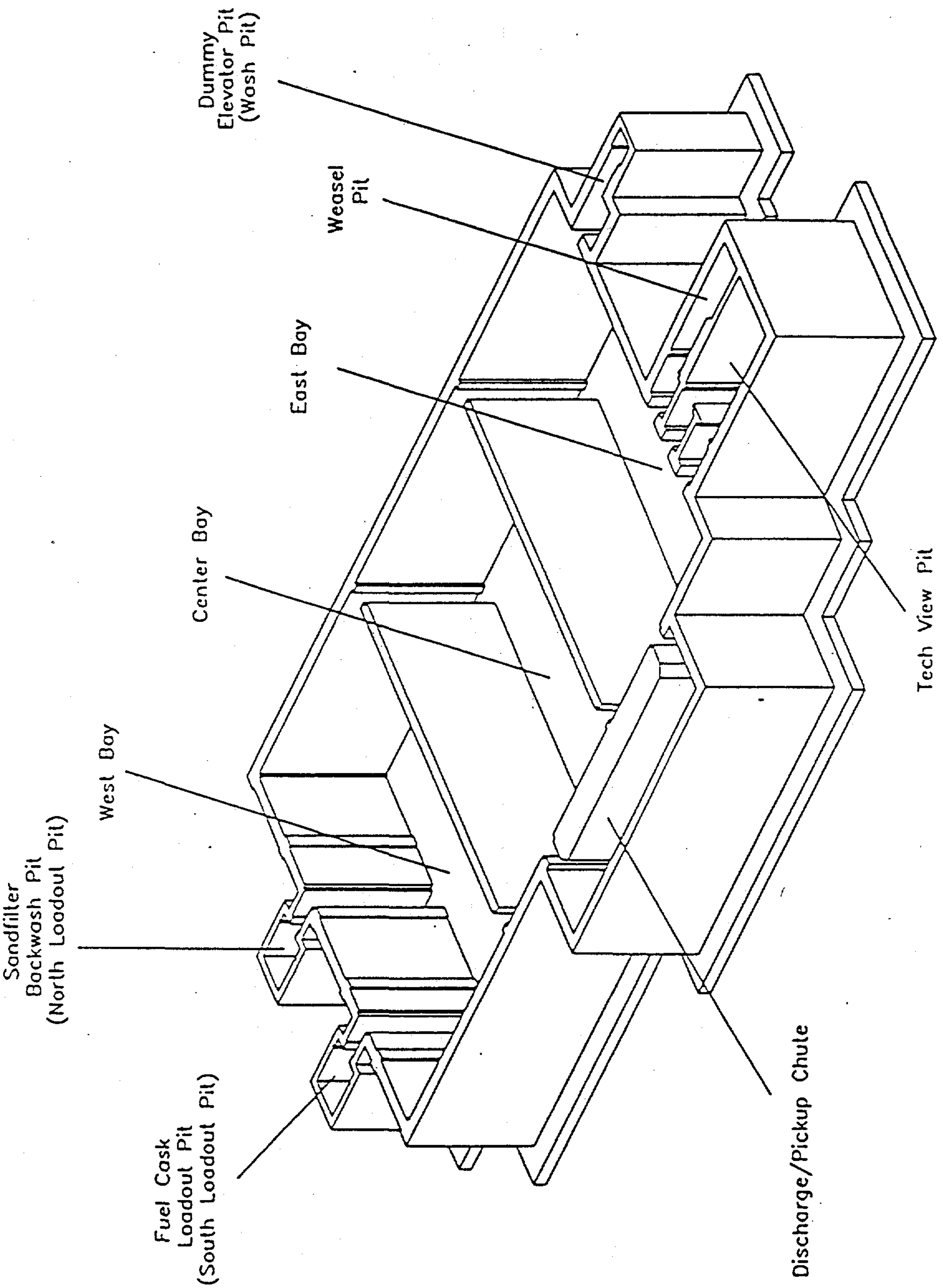
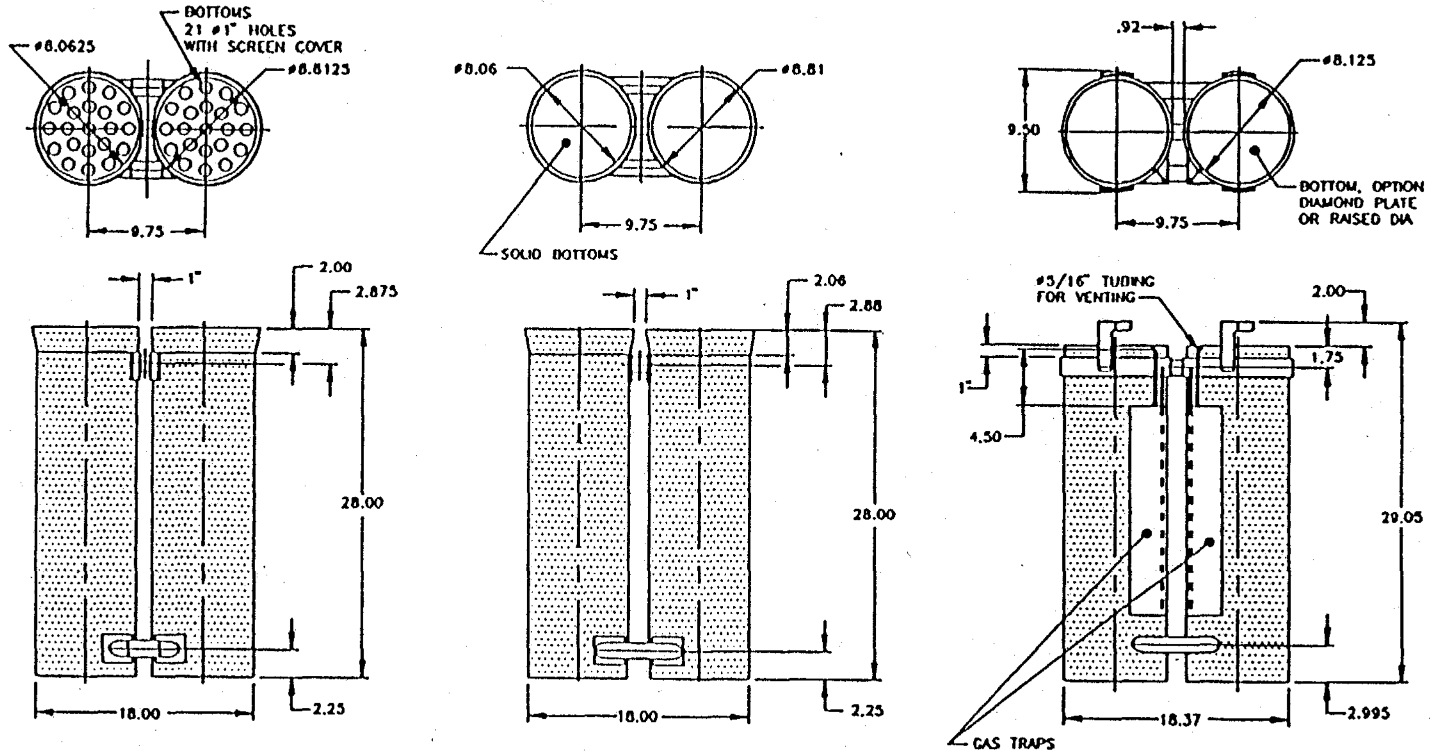


Figure 4-2
K Basin

Figure 4.3
N Reactor Fuel Canisters



MARK 0 CANISTERS
(H-2-36935)

MARK I CANISTERS
(H-2-42793)

MARK II CANISTERS
(H-2-46215)

In the KE Basin, the perforated-bottom Mark 0 canisters have allowed a significant amount (estimated to be 38 m^3) of sludge to accumulate on the basin floor. The composition of the sludge has not been completely characterized. It is postulated, however, that this sludge consists of uranium oxidized from the damaged fuel, iron oxide from the fuel storage racks and piping systems, concrete grit from the concrete walls, and other material including mixed insoluble fission products.

The KE and KW Basins were designed and built in the early 1950's as an attachment to their respective plutonium production reactor. The basins are approximately 366 m (1,200 ft) from the Columbia River. The original design life was 20 years. The significantly exceeded facility design life, coupled with severe funding deprivation during the past 20 years, has led to substantial storage basin facility and infrastructure issues. These include a KE Basin leak history, seismic adequacy concerns, ground water contamination, fire protection concerns, electrical system deficiencies and basic personnel housing issues such as office and shop inadequacies, potable water and basin water makeup supply and distribution concerns.

K Basins storage of SNF has been identified as one of the top safety concerns at Hanford. In recognition that these facilities were not designed for long-term storage, DOE has targeted to remove all fuel and sludge by 2002. DOE also has a strong commitment to safe storage of the material until disposition.

4.1.2 K Basin Point-of-Departure Architecture

This overview of K Basin SNF is based on the SNFP recommended path forward, which was approved in November 1994. The path forward uses fuel retrieval, packaging, transport, staging, drying, passivation, and dry storage. The SSF will serve as the 40-year dry interim storage facility as the fuel and sludge multi-canister overpacks (MCO) are cycled through the FSF for drying and passivation and returned to the storage facility.

K Basin operations activities (such as temporary storage of fuel and sludge, safety upgrades, and conduct of operations) will continue during design and development of SNF facilities. Once these facilities are operational, fuel and sludge will be removed from the K Basins. Fuel and canister sludge in the K East and K West Basins will be packaged in large MCOs. The current POD MCO concept has an outside diameter of 24 inches and allows for two canisters on each of the four levels. The MCO is a vertical right circular cylinder. Modifications will be constructed at the K Basins to enable minimum fuel and sludge handling to load the MCO. The canisters will be loaded into the MCO/MCO cask combination underwater in the technical transfer pit located in each of the basins. Fuel and sludge within a canister will stay in the canister for packaging in the MCO. Basin sludge on the floor of the K East Basin will be accumulated, loaded in a sludge transporter, and transferred to an appropriate waste disposal location on site. Remaining water in the K Basins will be treated as necessary and disposed of consistent with DOE requirements. Debris will be accumulated, packaged, and disposed of as low-level solid waste.

A SSF will be built to:

- Receive, stage, and store MCOs
- Maintain SNF integrity
- Monitor the SNF environment.

Upon receipt from the K Basins, the MCOs will contain wet-packed fuel and canister sludge and will be staged until transferred into the FSF. The MCOs will be held in the SSF until the fuel stabilization (drying and passivation) process is available. To facilitate wet package staging, the SSF will develop necessary purging/venting capabilities to accommodate radiolytic gas generation and provide the ability to selectively handle and correct an MCO that is exhibiting abnormal conditions, such as leakage. Once the fuel has been stabilized, it will be transferred back to the SSF, which will be redeployed for use as an interim dry storage facility until final disposition capability is available.

Once the fuel stabilization process is available and the facility is constructed, MCOs will be transferred from the SSF to the FSF, which may be co-located with the SSF. MCOs will be received in the FSF and transferred into a shielded process enclosure. Sludge will be separated and treated the same as SNF. Closed canisters will be opened and provisions for water removal applied. The MCO will be exposed to a programmed heating and purging sequence to first dry the fuel and then to provide a controlled oxygen introduction to passivate fuel surfaces. This will reduce the potential hazards associated with dry storage of metal fuel. The MCO will finally be cooled, sealed, and prepared for return to the SSF.

MCOs will be designed to store fuel and sludge in a wet or dry condition, in a facility or in transit. They will enable direct monitoring of fuel, sludge, and surrounding liquid and gas spaces during wet storage. MCOs will serve several purposes:

- Transportation of canisters from the K Basins to the SSF
- Wet storage of fuel and canister sludge in the SSF
- Transportation of canisters from the SSF to the FSF
- Stabilization of fuel and canister sludge
- Transportation of canisters from the FSF back to the SSF
- Dry interim storage of stabilized fuel and canister sludge in the SSF.

MCOs may also be used for the final disposition of the stabilized fuel and canister sludge. Since acceptance requirements for the depository are not yet well defined, the path for final disposition of K Basin SNF is not certain.

MCOs will be transferred between facilities in a rail cask. This cask will serve as an overpack for an MCO (one MCO per overpack). The MCO will be removed from the cask at each facility. Once empty, casks will be reused.

4.1.3 Other SNF

Other SNF is defined to be SNF on the Hanford Site (which in inventoried in *Hanford Spent Fuel Inventory Baseline*, WHC-SD-SNF-TI-001 Rev. 0 [Bergsman 1994]), which is not currently stored in the K Basins or in the PUREX plant. This SNF is not part of the SNFP K Basin path forward, so its path to final disposition is less defined. The SNFP path forward is currently being extended to include other Hanford SNF.

4.1.4 Other SNF Point-of-Departure Architecture

A portion of the other SNF will be collected at the PISP. Currently, the PISP is planned to be the FFTF storage pad in the 400 Area. Under this concept, control of the PISP will be transferred to the SNFP. This portion of the other SNF will be stored at the PISP until transferred off site. Currently, the offsite location is planned to be INEL. The remainder of the other SNF will be transferred directly to this offsite location from its current storage location. The concept for the PISP will be further developed when the SNFP path forward is extended and the systems engineering process is applied to disposition of other SNF.

4.2 DEACTIVATE SNFP FACILITIES FUNCTIONS (FUNCTION 4.1.1)

4.2.1 Deactivate K Basins (and their support systems) (Function 4.1.1.8)

This is the overall function to deactivate the K Basins and their support systems. This includes facilities that may or may not contain SNF and other radioactive and/or hazardous materials.

4.2.1.1 Operate and Maintain K Basins During Deactivation (Function 4.1.1.8.1). The mission for operation of the K Basins between now and deactivation is to manage and eliminate the urgent risks and threats currently recognized in the system and to provide a safe work place that is free from fatalities and serious accidents and continuously reduces injuries and radiation exposure to workers. Major upgrades that are being initiated are water system, electrical system, and fire protection system improvements and overall Conduct of Operations improvements. These are specifically:

- K Basin Essential System Recovery (W-405)
- KW Basin Roof (N-026)
- 105-KE Roof Upgrades (N-036)
- 105-KE/105-KW Facility Effluent Monitoring and Ventilation Upgrades (N-038).

While the path forward is being implemented for the disposition of the K Basins SNF, it is vital that a robust management and control function continue to provide operational and maintenance activities for necessary safe, environmentally sound and cost effective compliance with applicable DOE, Federal, and State regulations.

The ongoing and future boundary of function 4.1.1.8.1 will be highly influenced by other function outcomes within the overall SNFP systems engineering effort.

4.2.1.2 Plan K Basin Deactivation (Function 4.1.1.8.2). The deactivation of K Basin facilities with their associated ancillary buildings, which include the operations of safety and utility systems, will proceed in a planned and controlled manner. All deactivation planning shall apply as-low-as-reasonably-achievable (ALARA) principles to minimize exposure for all hazardous substances and conditions.

To meet the goal for placing the K Basin facilities in a safe and environmentally sound condition for surveillance and maintenance while the facilities await final disposition, specific activities have been identified by the Systems Engineering process for the deactivation function and include:

- Characterize K Basin initial state
- Develop K Basin deactivation plans
- Negotiate turnover criteria and state.

These functions describe activities that serve as key inputs for the cost-effective management of the SNFP deactivation planning. Identifying and quantifying the risks of remaining radioactive and hazardous materials provides the knowledge necessary for subsequent alternative usage or decommissioning of the K Basins.

4.2.1.3 Disposition SNF (K Basin) (Function 4.1.1.8.3). Removal of the SNF (fuel and sludge) from the basins is required by the Hanford Mission Plan (DOE-RL 1993) and the Tri-Party Agreement (Ecology et al. 1994). This must be accomplished before the KE and KW Fuel Basins can be deactivated. The disposition process will include collecting N Reactor and single-pass reactor (SPR) fuel from PUREX, characterizing and categorizing the fuel (i.e., SNF or waste), preparing the SNF for continued temporary storage, preparing it for transfer out of the basins, and finally packaging and transportation to the SSF away from the Columbia River.

At the national level, SNF will be categorized (classification established) either as "Material Not Categorized As Waste" or as "Waste," and the applicability of RCRA to SNF will be determined (DOE 1994 [Draft]). It is assumed that the K Basin sludge is not SNF but will be declared as waste once removed from the K Basins.

Characterization includes the activities to obtain required physical, chemical, and radionuclide inventory information about the SNF. Characterization is required to establish the technical basis needed to demonstrate SNF integrity during existing storage (DOE 1994 [Draft]). Additionally, characterization will establish technical bases for interim storage and permanent disposal of SNF, and will be used to develop criteria and procedures to ensure that the SNF and facilities satisfy the technical bases.

An SNF characterization plan was requested by DOE-RL for the purpose of providing analytical information about the K Basin fuel and sludge sufficient for implementation of interim long-term storage of the SNF (DOE-RL 1994b). In response to this request, a Hanford SNF characterization program management plan (Fulton 1994) was issued, and a Hanford SNF characterization plan (PNL 1994) was prepared.

The characterization plan identifies characterization information needs and potential needs to support programmatic objectives. These requirements are derived from the regulatory requirements for the handling, storage, transportation, and disposition of hazardous materials such as SNF. Some of the information needs include the following:

- Physical condition of the fuel elements
- Corrosion characteristics and corrosion rate of the fuel
- Pyrophoricity of the fuel and sludge
- Chemical stability of the fuel and sludge
- Drying characteristics of the fuel and sludge
- Physical properties of the sludge.

The K Basins will collect N Reactor and SPR SNF from these deactivating facilities and prepare it for staging, stabilization, and storage.

4.2.1.4 Perform K Basin Deactivation (Function 4.1.1.8.4). The function will be guided by the function 4.1.1.8.2, Plan K Basin Deactivation, which in turn will be highly influenced by experience gained from the N Reactor and PUREX Deactivation Programs currently under way and other comparable Hanford deactivation activities.

It must be recognized that K Basins are only a portion of the overall KE/KW Reactor facility and therefore the reactor decommissioning EIS (DOE 1993) and the pursuant ROD (58 FR 178) provides the bounding decision on the decommissioning of the KE/KW facility. The scope of K Basins deactivation will be within this boundary and will be a negotiated scope based on the operable influences at that time (i.e., budget, schedule, public perception).

This function will not likely come into significant play until after the year 2000.

4.2.2 Deactivate SNF (other) Pre-Interim Storage Pad (PISP) (Function 4.1.1.9)

Development of concepts for this function has been deferred until concepts for Function 4.7.2 are more fully developed for other SNF.

4.2.3 Deactivate SNF (K Basin) Staging and Storage Facility (SSF) (Function 4.1.1.10)

Development of concepts for this function has been deferred until concepts for Functions 4.7.2 are more fully developed.

4.2.4 Deactivate SNF (K Basin) Stabilization Facility (FSF) (Function 4.1.1.11)

Development of concepts for this function has been deferred until concepts for Functions 4.7.2 are more fully developed.

4.3 STABILIZE, STORE, AND DISPOSITION SNF MATERIAL (FUNCTION 4.7.2)

4.3.1 Store, Stabilize, and Disposition SNF (Function 4.7.2)

Function 4.7.2 includes the overall management of SNF in the SSF, FSF, and PISP. This includes receiving, handling, staging, stabilizing, storing, and transfer to final disposition of the Hanford SNF in a safe and efficient way. Currently, this is associated with interim storage.

4.3.1.1 Operate and Maintain SNF Facilities (Function 4.7.2.1). This function is expected to be very similar to the functions described in Function 4.1.1.8.1, Operate K Basins During Deactivation. However, because it will be in a new facility and the fuel will have undergone some degree of stabilization under Function 4.1.1.8.3, Disposition SNF (K Basin), it will not have to overcome the myriad of historical and inherited issues associated with 4.1.1.8.1.

It is assumed that the facility and operation will be under NRC license (or equivalency). However, it will be in compliance with current expectations and requirements and will require less of a corrective action effort than expended in 4.1.1.8.1.

This function is not expected to be active until the later stages of 4.7.2 when the specifications for the facilities will be finalized.

4.3.1.2 Administer Stabilize, Store, and Disposition SNF Operations (Function 4.7.2.2). Activities included in this function include planning, coordinating, and scheduling all the necessary operations within Function 4.7.2, Store, Stabilize, and Disposition SNF Material.

The function defines the staging, stabilization, storage, and transfer needs and criteria for the SNF. The function does not include the physical work to perform SNF receiving, stabilization, storage, and transfer.

Administration of the SNF uses systems engineering to establish technical performance measures for interrelated requirements. The primary mission is to consider the planning and management of the risk posed by the SNF. The complexity and cost of administering SNF storage are minimized by effective systems engineering analyses. To meet the goal of managing or eliminating risk associated with the SNF, the SNFP will follow baseline management methods.

Properly planned and executed administration of the SNF storage program provides the insight into existing and potential problems, and also provides the basis for rational decision making.

4.3.1.3 Stage SNF (Function 4.7.2.3). Fuel and canister sludge transported from the K Basins will be received at the SSF. Before shipment, a readiness review of the compatibility of the material form, packaging, and shipping container with the facility requirements to ensure readiness to receive the SNF is required. Upon material receipt, the manifest and material documents will be examined for accuracy and completeness, and the material custody will then be transferred. Receiving inspections will include radiological surveys to ensure acceptance criteria are met. MCOs will be unloaded and placed in lag storage.

The SNF will be removed from the MCOs. The casks and transporters will be inspected, surveyed, decontaminated, and repaired. New MCOs will be provided to the casks and transporters and the entire package will be released to the K Basins for reuse.

The MCOs containing SNF will be examined to verify consistency with documentation and the shipping manifest. Exceptions to consistency criteria will be reconciled. The packages will be examined to ensure integrity, and they will be transferred to staging.

4.3.1.4 Stabilize SNF (Function 4.7.2.4). This function stabilizes the K Basin SNF allowing dry storage in the SSF. Included is the disposal of wastes generated during the SNF stabilization process.

The N Reactor fuel, which is zircaloy-clad, metallic uranium, will require stabilization before storage. This stabilization may or may not convert the N Reactor fuel to a state which meets the repository acceptance criteria. These criteria have yet to be established. Therefore, an additional stabilization step in preparation for shipment to a repository may be required as part of Function 4.7.2.6, Prepare SNF (K Basins) for Final Disposition.

Characterization of the N Reactor and SPR SNF fuel stored in the K Basins would provide information to the process for defining what stabilization may be required.

Various trade studies are needed to permit the selection of stabilization alternatives without the high risks resulting from limited characterization data and definitive programmatic requirements.

4.3.1.5 Store SNF (Function 4.7.2.5). Characterization will help to reduce risks of various storage options and define the optimum path forward for interim storage and final disposition of K Basins N Reactor fuel and of other SNF. The activities supporting this function and Function 4.1.1.8.3, Disposition SNF, are integrated into a single characterization program.

This function includes both storage of K Basin SNF in the SSF and storage of other SNF in the PISP. This storage precedes dry storage in a repository. Therefore, dry storage will be used for storage in the SSF after stabilization and for the PISP. Selection of a particular storage method for each facility may require additional study and time since many programmatic and technical requirements which are needed to discriminate among the proposed alternatives are still in a draft form.

Ten different alternatives were considered for storage of K Basin SNF as part of Function 4.7.2.5. Trade studies are required to advance any of the alternatives without significant programmatic and technical risks. These are listed in Table 9-1.

4.3.1.6 Prepare SNF (K Basin) for Final Disposition (Function 4.7.2.6). This function prepares and transfers K Basin SNF for final disposition. It arranges for disposal of incidental wastes generated during the disposal process.

The nature of the offsite disposition is yet to be determined. However, dry storage in a geological repository is the base case of the alternatives currently being considered. Acceptance criteria for this option need to be developed. The N Reactor fuel may require additional stabilization beyond that required for storage in the SSF before transfer to final disposition. Characterization data for the N Reactor fuels is also needed to define acceptable processes to convert this fuel to a state that meets the acceptance criteria for final disposition.

4.4 ACQUIRE SNF MISSION ESSENTIAL CAPABILITIES (FUNCTION 2.0)

The SNFP will require that new or currently unavailable capabilities be acquired that are essential to the successful accomplishment of its mission. The acquisition of these capabilities, which includes both intellectual and physical resources, is provided within this function. Intellectual and physical resources can include personnel, consultants, services, subcontracts, supplies, equipment, and technology. This function is made up of six lower-level functions:

- 2.1 Formulate Acquisition Strategy for Mission Essential Capabilities
- 2.2 Provide Expertise
- 2.3 Provide Technology
- 2.4 Provide Facilities, Equipment, Infrastructure, and Supplies
- 2.5 Provide Essential Information
- 2.6 Provide Integrated Independent Services.

The *Spent Nuclear Fuel Project Mission Analysis Report* (WHC 1994) concluded that the existing site infrastructure has insufficient capability to accomplish the SNFP mission with respect to technology and physical infrastructure. Specific conclusions included the following.

- Existing SNFP facilities are not adequate for the interim storage of SNF.

- The existing SNFP facilities at the K Basins have not been adequately maintained to support the past, current, and future missions of the facilities in the SNFP.

- The existing equipment at the K Basins is not adequate for the current and future missions of the SNFP.

- SNF is currently being stored in conditions, facilities, quantities, and locations that are not considered adequate for interim storage leading to final disposition.

- Current SNF packaging is inadequate for interim storage in a license-equivalent storage facility or for final disposition.

- There is no currently approved onsite SNF transportation system.

Based on these conclusions and needs identified in the path forward direction, technology and acquisitions for eight SNF systems and subsystems were required.

- Staging and Storage Facility
- Fuel Stabilization Facility
- SNF (Other) Pre-Interim Storage Pad
- SNF (K Basin) Multi-Canister Overpack
- SNF (K Basin) Transfer/Transport Subsystems
- SNF (Other) Packaging/Transportation Cask
- K Basin Deactivation Subsystems
- K Basin Safety Upgrade Projects.

The Hanford Site Capstone Function 2.0 (Acquire Mission Essential Capabilities) was tailored and developed to acquire these systems. These functions are described in more detail in Volume II of this document.

The SNFP may require the development of new technologies in order to meet its stated objectives. Examples of activities that may require new technologies include, but are not limited to:

- Cleanup of the K Basin cooling water (including tritium removal)

- Retrieval of sludge in the K Basin

- Development of interim storage technologies

- Development and design of new facilities and equipment

- Development of SNF technologies that may be needed to physically or chemically alter SNF for transfer, storage, and/or final disposition (e.g., conversion of the SNF to another physical or chemical form, or drying of the SNF).

New technologies requiring development will be identified during the SNFP systems engineering and baselining activities. The development of new technologies will be managed and coordinated within the SNFP. Specific activities associated with technology development include identifying technologies potentially applicable to SNFP functional needs, performing necessary laboratory and analytical research to prove/disprove technological concepts, laboratory- and pilot-scale testing and demonstration of mission essential technologies, and identifying potential commercial suppliers of the demonstrated technologies.

A key ingredient to the success of Function 2.3 is the identification and prioritization of technology needs. Technological needs are an input to this function from other SNFP functions. These technology needs will likely be identified through engineering and trade studies and include technologies tentatively chosen for implementation that require further development, alternative technologies that should be evaluated to determine if they can significantly reduce costs or accelerate schedules, and functions or unit operations for which candidate technologies have not been identified. The SNFP is issuing a Technology Acquisition Plan, which provides an overview of the technology development planning process and a top-level description of the SNFP technology acquisition requirements.

Major activities within this function consist of defining the scope of the projects (including engineering studies, cost and schedule baselines, design criteria, conceptual design reports, and preliminary safety evaluations), and procuring, constructing, fabricating, starting up, and testing facilities and systems (including Congressional line item projects, general plant projects, and modifications and upgrades). This function needs further definition and development.

The following key enabling assumptions impact this function.

- All new SNF facilities will become part of the SNFP.
- The design life of interim storage is a minimum of 40 years.
- RCRA does not apply to SNF (excluding sludge).
- NRC Licensing Equivalency applies to new projects, with the exception of current SNF facilities.

4.5 OBTAIN PUBLIC INVOLVEMENT (FUNCTION 3.0)

One of the primary drivers behind the formulation of the SNFP is the public concern over the hazards involved in the continued storage of Hanford Site SNF in the K Basins. The project was formed to manage two major technical functions: (1) the deactivation of the K Basins and associated systems, and (2) the disposition of SNF from the entire Hanford Site. Obtaining public involvement in the decisions concerning this project is a significant part of the mission of the project.

During the development of the functions and requirements for the SNFP, it was agreed that the project would develop a system to address Function 3.0 in addition to the two technical functions: 4.1.1.8, Deactivate K Basins (and their support systems), and 4.7.2, Store, Stabilize, and Disposition SNF Material. At that time, site-wide functions and requirements for Function 3.0 had not been completed. Those developed by the SNFP are being submitted as a proposal for the site-wide function. The SNFP team has worked closely with External Communication, the support organization primarily responsible for the public involvement and public relations for the Hanford Site.

Central to the development of Function 3.0, Obtain Public Involvement, is the recognition that many areas of management require public involvement. The information that is required for public involvement is part of the technical baseline for the project, which includes those items that require decisions by management, and which are determined to also require public involvement in the decision process. This set of decisions is defined as the "technical baseline decisions."

The technical baseline decisions are the input to the strategic analysis for public involvement. The strategic analysis starts by clearly defining the decision in terms of public involvement. It identifies the decision makers and the extent of participation of the public. The analysis also determines what constraints exist on the decision-making process and what issues are involved in the decision. It determines what the objectives of the public involvement are and what information needs to be exchanged between the project and the public. The end result of the strategic analysis is a public involvement plan for each decision.

Once the public involvement plan is developed, the project executes the plan to involve the public in the decision-making process. The overall objective is to obtain public input into key decisions that relate to SNFP activities and, to a certain extent, acceptance of the decisions made by project management. Ultimately, for each decision that incorporates public values, a final recommendation is provided to the decision maker. Development of decision-making processes needs to be integrated with public involvement activities.

The functions for this area have been developed based on strategies and concepts that are not fully implemented within the External Communications organization and the SNFP organization. Three specific actions need to be completed in the near term:

- Develop the applicable guidelines for the public involvement processes to ensure that a consistent and integrated approach is used at the Hanford Site and within the SNFP.
- Review the technical baseline for the project and establish the technical baseline decisions that will require public involvement.
- Develop public involvement plans for the technical baseline decisions that are identified.

4.6 HANFORD SITE FUNCTIONS NOT TAILORED FOR SNFP

4.6.1 Manage Program (Function 1.0)

Hanford Site Function 1.0 is currently being defined by the Hanford Site systems engineering organization in terms of its relationship to Function 4.0, Remedy Unsafe and Unacceptable Conditions. Consequently, very little was done by the team to understand this function.

Because the SNFP is new, many of the management policies and procedures, configuration management, resolution of regulatory issues, and detailed schedules are under development. With DOE approval of the SNFP management plan, project management is defined sufficiently for FY 1995 until analysis of this function has been completed. Approved SNFP policies and procedures should be developed, including a change control process for requested (or required) work that is out of scope. As discussed in Section 1.6, management planning and control may be enhanced by establishing an organization containing both the Systems Engineering and the Strategic Project/Program Planning and Control functions.

4.6.2 Transition Resources for Beneficial Use (Function 5.0)

The SNFP will determine potential beneficial uses of resources by identifying resources that are candidates for use outside the Hanford Cleanup mission. It will seek "customers" to receive the resources, and establish agreements to actually transfer specific items. This function also provides for use of excess mission resources to an outside user without actually transferring ownership. It also provides the process of transferring the management (custodianship) of resource use within the Hanford management system.

5.0 ENABLING ASSUMPTIONS

The enabling assumptions associated with the development of the SNFP baseline, mission, technical functions, and requirements are summarized in Table 5-1.

Informed assumptions are used when actual requirements are not yet known, allowing the functions and requirements and alternatives analyses to be continued to lower levels. Because assumptions must be validated, each enabling assumption has a corresponding issue (identified in Section 8.0). Enabling assumptions will be validated as a requirement or replaced by a validated or derived requirement.

The following are key enabling assumptions.

- All other SNF will be transferred from the Hanford Site to INEL for interim storage and final disposition.
- Sludge will be managed as fuel while in the basins.
- The *Resource Conservation and Recovery Act* is assumed not to apply to SNF.
- Basin sludge will be removed and treated as waste after being removed from the K Basins.

Table 5-1. SNFP Enabling Assumptions.

No.	Description	Functions impacted	Issue No.	Impact
A.1	SNF is inventoried in *Hanford Irradiated Fuel Inventory Baseline*, WHC-SD-SNF-TI-001, 1994. It is assumed this material is all fuel.	4.1.1.8.3 & 4.7.2	I.5 I.9	Defines SNF to be considered in systems analyses
A.2	Interim storage of K Basin SNF will be dry. CLOSED	4.7.2.5	Validated (See I.12)	Eliminates wet interim storage for the SNF
A.3	The SNFP addresses only SNF at the Hanford Site.	4.1.1.8 & 4.7.2	I.6	Limits SNFP related analyses to SNF located at Hanford
A.4	K Basins have the mission of deactivation. Deactivation of the K Basins includes operation of the K Basins during deactivation.	4.1.1.8	I.48	Initializes the functional structure; no impact on functional structure
A.5	All new Hanford Site SNF facilities will become part of the SNFP. CLOSED	4.7.2	Validated (See I.4)	No impact on functional structure or requirements analysis; SNFP scope is defined this way (scope would have to be changed)
A.6	Non-SNF projects have custodianship for SNF in their facilities. CLOSED	4.1.1.8.3	Validated (See I.2)	No impact on functional structure or requirements analysis
A.7	Sludge will be managed as fuel while in the basins.	4.1.1.8	I.3	Will determine number of categories of fuel to be considered and may impact waste declaration

Table 5-1. SNFP Enabling Assumptions.

No.	Description	Functions impacted	Issue No.	Impact
A.8	Draft DOE-HQ and DOE-RL documents will be used as a source of draft requirements until validated. CLOSED	4.1.1.8 & 4.7.2	Validated use of documents in question (See I.7)	Will impact all functions and the requirements associated with them
A.9	The K Basins will not receive any SNF, other than N and SPR fuels currently in the PUREX building. CLOSED	4.1.1.8.3.2	Validated function added	No function in 4.1.1 to receive SNF (would have to be added)
A.10	RCRA does not apply to SNF. SNF is currently a nuclear material (not waste).	4.1.1.8.3	I.10	Impact which regulatory requirements that will be followed.
A.11	All K Basin support facilities are Type I facilities.	4.1.1.8	-	Simplifying assumption; this is bounding case (other types of facilities will be worked in later revisions)
A.12	K Basin debris is classified as solid waste.	4.1.1.8.4	I.18	Impacts definition of functions
A.13	The SNFP will not actively seek additional SNF.	4.1.1.3.2 & 4.7.2.3	I.19	Impacts performance requirements that will be allocated to SNFP systems
A.14	NRC Licensing Equivalent applies to new capital projects.	4.7.2	I.11	Major impact on requirements to be imposed on these functions
A.15	Modifications to existing facilities will be in accordance with DOE Orders and requirements.	4.8.8.8 & 4.7.2	I.11	

Table 5-1. SNFP Enabling Assumptions.

No.	Description	Functions impacted	Issue No.	Impact
A.16	Forty-year dry interim storage will meet the intent of NRC licensing requirements (see SA.9)	4.7.2.5	I.11	
A.17	All other SNF will be transferred to INEL for interim storage and final disposition.	4.7.2.5.2	I.38	Impacts the need for interim storage.
A.18	Basin sludge will be removed and treated as waste after removal from the K Basins.	4.1.1.8	I.3	Impacts functions in 4.7.2 as this material is not considered.
A.19	Sludge canisterized without fuel is not considered to be canister sludge.	4.1.1.8.3	I.35	Eliminates need for further definition.

*Source: SNFP Technical Baseline Document, Vol.I (September 1994)
**Source: Hanford SNFP Recommended Path Forward (October 1994)
*+Source: SNFP Technical Baseline Document, with equivalent language in Hanford SNFP Recommended Path Forward.

6.0 PHYSICAL INTERFACES

There are three classes of interfaces that must be defined, developed, and controlled by the SNFP. These three classes are discussed in the following sections. Table 6-1 summarizes the interfaces which the SNFP has a stake in, including the interfaces between projects. This table contains interfaces that meet the three interface classes.

6.1 FACILITIES THAT CONTAIN OR WILL CONTAIN SNF

SNF is stored in a variety of facilities at the Hanford Site that are not under the control of the SNFP. A small amount of SNF eventually may be removed from the scope of the SNFP, because of its chemical state or because of formal status declaration by DOE. SNFP must ensure that the preparation, movement, and storage of SNF is consistent with the integrated site management plan, which is being developed to include all onsite SNF.

Many of the facilities have different physical and programmatic constraints which must be taken into account in developing the integrated site SNF management plan.

K Basins and future SNF facilities are interfaces that are or will be controlled by the SNFP.

6.2 WASTE MANAGEMENT SYSTEMS

Management of SNF (day-to-day preparation for transport and final disposition, and staging, stabilization, and storage before final disposition) has generated and may generate wastes to be managed by others or will result in facilities transferred to others for management. SNFP must coordinate activities within the integrated site SNF management plan to allow transfer of material and facilities to other systems. These other systems are:

- Environmental Restoration
- Repository for DOE SNF Waste
- Liquid Effluents
- Solid Waste
- Tank Waste Remediation System.

6.3 SUPPORT SYSTEMS

Management of SNF (day-to-day and transport to other onsite or offsite facilities, and construction of modifications to K Basins or of new SNF facilities) will involve interaction with various support systems.

6.3.1 Site Infrastructure

Facilities activities, including K Basins, are supported by utilities which are either supplied by other systems or pass through facilities managed by others. SNFP must coordinate activities with these other systems to allow continued efficient routine operation. Other infrastructure items, such as roads, must also be interfaced to maintain operations on site.

6.3.2 Transportation and Packaging

SNFP must coordinate the transport of SNF and other materials to ensure compliance with onsite and offsite transportation requirements.

Table 6-1. Physical Interfaces.

No.	Interface description	Interface functions (Hanford Site)	Project interface
SNFP-1	Disposition SNF to allow facility deactivation. Transfer SNF from building 308 to 400 Area Pre-Interim Storage Pad.	4.1.1.5 to 4.7.2.5.2.2	300 Area Fuels Project
SNFP-2a	Disposition SNF for facility cleanup. Transfer SNF from building 324 to 400 Area Pre-Interim Storage Pad (2000 and earlier).	4.1.1.1 to 4.7.2.5.2.2	PNL
SNFP-2b	Disposition SNF for facility cleanup. Transfer SNF from building 324 to INEL (post 2000).	4.1.1.1 to external	PNL/INEL
SNFP-3a	Disposition SNF for other facility operations. Transfer SNF from building 325 to building 324.	4.1.1.1 to 4.1.1.1	PNL
SNFP-3b	Disposition SNF for other facility operations. Transfer FFTF pins from building 325 to FFTF.	4.1.1.1 to 4.1.1.4	PNL/FFTF
SNFP-4a	Disposition SNF for other facility operations. Transfer SNF from building 327 to building 324.	4.1.1.1 to 4.1.1.1	PNL
SNFP-4b	Disposition SNF for other facility operations. Transfer FFTF pins from building 327 to FFTF.	4.1.1.1 to 4.1.1.4	PNL/FFTF
SNFP-5a	Disposition SNF to allow facility deactivation. Transfer SNF from FFTF to 400 Area Pre-Interim Storage Pad.	4.1.1.4 to 4.7.2.5.2.2	FFTF
SNFP-5b	Disposition SNF to allow facility deactivation. Transfer SNF from FFTF to INEL (Sodium-bonded fuel).	4.1.1.4 to external	FFTF/INEL
SNFP-5c	Disposition SNF to allow facility deactivation. Transfer SNF from FFTF to Plutonium Finishing Plant (PFP) ("Category I by 2030" fuel).	4.1.1.4 to 4.1.1.2	FFTF/PFP

Table 6-1. Physical Interfaces.

No.	Interface description	Interface functions (Hanford Site)	Project interface
SNFP-6	Disposition SNF for other facility operations. Transfer SNF from T-Plant to INEL.	TBD to external	T-Plant Deactivation/INEL
SNFP-7	Disposition SNF to allow facility deactivation. Transfer SNF from PUREX building to K Basins.	4.1.1.6 to 4.1.1.8.3.2	PUREX Deactivation
SNFP-8	Disposition SNF to allow facility deactivation. Transfer SNF from Plutonium Finishing Plant (PFP) Building 2736-ZB to INEL.	4.1.1.2 to external	PFP/INEL
SNFP-9	Disposition SNF to allow burial grounds D&D. Transfer SNF from Burial Grounds to 400 Area Pre-Interim Storage Pad.	TBD to 4.7.2.5.2.2	Solid Waste
SNFP-10	Disposition N Reactor and SPR SNF to allow facility deactivation. Transfer SNF from K Basins to Staging and Storage Facility.	4.1.1.8.3.4 to 4.7.2.3.2	SNFP
SNFP-11a	Transfer SNF from Staging and Storage Facility to Stabilization Facility.	4.7.2.3.6 to 4.7.2.4.2	SNFP
SNFP-11b	Transfer stabilized SNF from Stabilization Facility to Staging and Storage Facility.	4.7.2.4.7 to 4.7.2.5.1.2	SNFP
SNFP-12	Disposition SNF to allow facility deactivation. Transfer SNF from Staging and Storage Facility to ultimate disposition.	4.7.2.6.2 to external	DOE-RW
SNFP-13a	Transfer SNF for characterization. Transfer SNF from K Basins to onsite characterization facility.	4.1.1.8.2.1 to TBD	PNL or TBD

Table 6-1. Physical Interfaces.

No.	Interface description	Interface functions (Hanford Site)	Project interface
SNFP-13b	Transfer SNF for characterization. Transfer SNF from Staging and Storage Facility to onsite characterization facility.	4.7.2.3.1 and 4.7.2.5.1.1 to TBD	PNL or TBD
SNFP-13c	Transfer SNF for characterization. Transfer SNF from Stabilization Facility to onsite characterization facility.	4.7.2.4.1 to TBD	PNL or TBD
SNFP-13d	Transfer SNF for characterization. Transfer SNF from 400 Area Pre-Interim Storage Pad to onsite characterization facility.	4.7.2.5.2.1 to TBD	PNL or TBD
SNFP-13e	Transfer SNF for characterization. Transfer SNF from final disposition preparation (facility TBD) to onsite characterization facility.	4.7.2.6.1 to TBD	PNL or TBD
SNFP-14	Transfer facilities from SNFP. Transfer K Basins for D&D.	4.1.1.8.4.3 to TBD	Environmental Restoration
SNFP-15a	Transfer facilities from SNFP. Transfer 400 Area Pre-Interim Storage Pad for D&D.	4.1.1.9 to 4.6	Environmental Restoration
SNFP-15b	Transfer facilities from SNFP. Transfer Staging and Storage Facility for D&D.	4.1.1.10 to 4.6	Environmental Restoration
SNFP-15c	Transfer facilities from SNFP. Transfer Stabilization Facility for D&D.	4.1.1.11 to 4.6	Environmental Restoration
SNFP-17	Transfer solid waste. Transfer legacy solid waste from K Basins.	4.1.1.8.1.1 to 4.3	Solid Waste
SNFP-18	Transfer solid waste generated during deactivation of K Basins.	4.1.1.8.4.2 to 4.3	Solid Waste

Table 6-1. Physical Interfaces.

No.	Interface description	Interface functions (Hanford Site)	Project interface
SNFP-19a	Transfer solid waste generated during deactivation of 400 Area Pre-Interim Storage Pad.	4.1.1.9 to 4.3	Solid Waste
SNFP-19b	Transfer solid waste generated during deactivation of Staging and Storage Facility.	4.1.1.10 to 4.3	Solid Waste
SNFP-19c	Transfer solid waste generated during deactivation of Stabilization Facility.	4.1.1.11 to 4.3	Solid Waste
SNFP-21a	Transfer solid waste generated during operation and maintenance of 400 Area Pre-Interim Storage Pad.	4.7.2.5.2.7 to 4.3	Solid Waste
SNFP-21b	Transfer solid waste generated during operation and maintenance of Staging and Storage Facility.	4.7.2.3.7 and 4.7.2.5.1.6 to 4.3	Solid Waste
SNFP-21c	Transfer solid waste generated during operation and maintenance of Stabilization Facility.	4.7.2.4.8 to 4.3	Solid Waste
SNFP-22	Transfer solid waste generated during operation and maintenance of final disposition preparation (facility TBD).	4.7.2.6 to 4.3	Solid Waste
SNFP-23	Transfer liquid effluent. Transfer legacy liquid effluent from K Basins.	4.1.1.8.1.1 to 4.5	Liquid Effluent
SNFP-24	Transfer liquid effluent generated during deactivation of K Basins.	4.1.1.8.4.2 to 4.5	Liquid Effluent
SNFP-25a	Transfer liquid effluent generated during deactivation of 400 Area Pre-Interim Storage Pad.	4.1.1.9 to 4.5	Liquid Effluent
SNFP-25b	Transfer liquid effluent generated during deactivation of Staging and Storage Facility.	4.1.1.10 to 4.5	Liquid Effluent

Table 6-1. Physical Interfaces.

No.	Interface description	Interface functions (Hanford Site)	Project interface
SNFP-25c	Transfer liquid effluent generated during deactivation of Stabilization Facility.	4.1.1.11 to 4.5	Liquid Effluent
SNFP-27a	Transfer liquid effluent generated during operation and maintenance of 400 Area Pre-Interim Storage Pad.	4.7.2.5.2.7 to 4.5	Liquid Effluent
SNFP-27b	Transfer liquid effluent generated during operation and maintenance of Staging and Storage Facility.	4.7.2.3.7 and 4.7.2.5.1.6 to 4.5	Liquid Effluent
SNFP-27c	Transfer liquid effluent generated during operation and maintenance of Stabilization Facility.	4.7.2.4.8 to 4.5	Liquid Effluent
SNFP-28	Transfer liquid effluent generated during operation and maintenance of final disposition preparation (facility TBD).	4.7.2.6 to 4.5	Liquid Effluent
SNFP-29	Transfer tank waste. Transfer legacy tank waste from K Basins.	4.1.1.8.1.1 to 4.2	Tank Waste
SNFP-30	Transfer tank waste generated during deactivation of K Basins.	4.1.1.8.4.2 to 4.2	Tank Waste
SNFP-31a	Transfer tank waste generated during deactivation of 400 Area Pre-Interim Storage Pad.	4.1.1.9 to 4.2	Tank Waste
SNFP-31b	Transfer tank waste generated during deactivation of Staging and Storage Facility.	4.1.1.10 to 4.2	Tank Waste
SNFP-31c	Transfer tank waste generated during deactivation of Stabilization Facility.	4.1.1.11 to 4.2	Tank Waste
SNFP-33a	Transfer tank waste generated during operation and maintenance of 400 Area Pre-Interim Storage Pad.	4.7.2.5.2.7 to 4.2	Tank Waste

Table 6-1. Physical Interfaces.

No.	Interface description	Interface functions (Hanford Site)	Project interface
SNFP-33b	Transfer tank waste generated during operation and maintenance of Staging and Storage Facility.	4.7.2.3.7 and 4.7.2.5.1.6 to 4.2	Tank Waste
SNFP-33c	Transfer tank waste generated during operation and maintenance of Stabilization Facility.	4.7.2.4.8 to 4.2	Tank Waste
SNFP-33d	Transfer tank waste generated during operation and maintenance of final disposition preparation (facility TBD).	4.7.2.6 to 4.2	Tank Waste
SNFP-34	Infrastructure support to K Basins deactivation.	2.4 to 4.1.1.8.4	Infrastructure
SNFP-35a	Infrastructure support to 400 Area Pre-Interim Storage Pad operations and maintenance.	2.4 to 4.7.2.1.3	Infrastructure
SNFP-35b	Infrastructure support to Staging and Storage Facility operations and maintenance.	2.4 to 4.7.2.1.1	Infrastructure
SNFP-35c	Infrastructure support to Stabilization Facility operations and maintenance.	2.4 to 4.7.2.1.2	Infrastructure
SNFP-36a	Infrastructure support to 400 Area Pre-Interim Storage Pad deactivation.	2.4 to 4.1.1.9	Infrastructure
SNFP-36b	Infrastructure support to Staging and Storage Facility deactivation.	2.4 to 4.1.1.10	Infrastructure
SNFP-36c	Infrastructure support to Stabilization Facility deactivation.	2.4 to 4.1.1.11	Infrastructure
SNFP-37	Infrastructure support to operations and maintenance of final disposition preparation (facility TBD).	2.4 to 4.7.2.6	Infrastructure

Table 6-1. Physical Interfaces.

No.	Interface description	Interface functions (Hanford Site)	Project interface
SNFP-39a	Transportation support to movement of SNF from PUREX to K Basins.	2.4 to 4.1.1.6 and 4.1.1.8.3.2	Transportation
SNFP-39b	Transportation support to movement of SNF from K Basins to Staging and Storage Facility.	2.4 to 4.1.1.8.3.4 and 4.7.2.3.2	Transportation
SNFP-39c	Transportation support to movement of SNF from Staging and Storage Facility to Stabilization Facility.	2.4 to 4.7.2.3.6 and 4.7.2.4.2	Transportation
SNFP-39d	Transportation support to movement of SNF from Stabilization Facility to Staging and Storage Facility.	2.4 to 4.7.2.4.7 and 4.7.2.5.1.2	Transportation
SNFP-39e	Transportation support to movement of SNF from building 324 to 400 Area Pre-Interim Storage Pad.	2.4 to 4.1.1.1 and 4.7.2.5.2.2	Transportation
SNFP-39f	Transportation support to movement of SNF from building 308 to 400 Area Pre-Interim Storage Pad.	2.4 to 4.1.1.5 and 4.7.2.5.2.2	Transportation
SNFP-39g	Transportation support to movement of SNF from FFTF to 400 Area Pre-Interim Storage Pad.	2.4 to 4.1.1.4 and 4.7.2.5.2.2	Transportation
SNFP-39h	Transportation support to movement of SNF from 400 Area Pre-Interim Storage Pad to INEL.	2.4 to 4.7.2.5.2.6 and external	Transportation

Table 6-1. Physical Interfaces.

No.	Interface description	Interface functions (Hanford Site)	Project interface
SNFP-39i	Transportation support to movement of SNF from final disposition preparation (facility TBD) to ultimate disposition.	2.4 to 4.7.2.6 and external	Transportation
SNFP-40	Transfer of previously unidentified SNF from Environmental Restoration activities to SNFP.	4.6 to TBD	Environmental Restoration
SNFP-43	Disposition of SNF to allow facility deactivation. Transfer SNF from 400 Area Pre-Interim Storage Pad to INEL.	4.7.2.5.2.6 to external	INEL
SNFP-44	Disposition of SNF to allow facility deactivation. Transfer SNF from INEL to ultimate disposition.	external to external	INEL/DOE-RW
SNFP-45	Disposition of SNF to allow facility deactivation. Transfer Basin Sludge from K Basins to TBD.	4.1.1.8.3.5 to TBD	TBD

7.0 PRODUCT STRUCTURE AND WORK BREAKDOWN STRUCTURE (WBS)

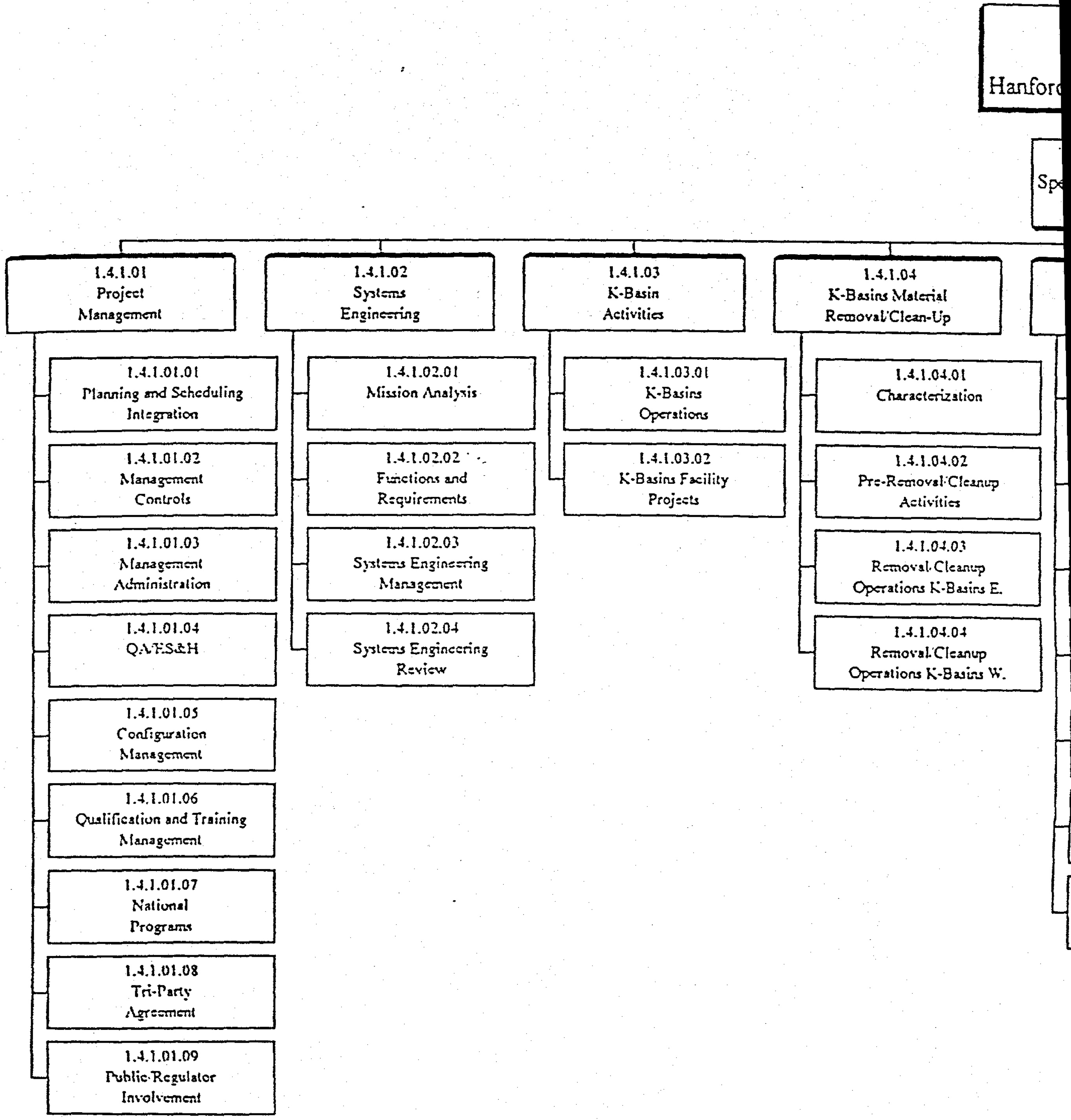
The draft SNFP Work Breakdown Structure (WBS), presented in Figure 7-1, was based on the functional analysis described in the SNFP functions and requirements document. The functional analysis resulted in a product tree presented in Figure 7-2. The product tree defines the end items required to perform the functions; therefore, the major products, or mission essential capabilities, define the individual systems needed to perform the function.

A WBS is a product-oriented hierarchical tree composed of hardware, software, services, data, and facilities. It displays and defines the products to be developed or produced, and relates the elements of work to be accomplished to each other and to the end items. Thus, there is a direct correlation between the two trees.

Table 7-1 presents a correlation between these two trees. There are no notable discrepancies between them. Since the SNFP does not have an understood charter beyond the startup of the interim storage milestone, the specifications associated with the systems to support the staging of the SNF for final disposition do not have corresponding WBS entries.

Rev. 0

SNFP


Hanford
Sp
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1.4.1.01.01 Planning and Scheduling Integration
1.4.1.01.02 Management Controls
1.4.1.01.03 Management Administration
1.4.1.01.04 QA/ES&H
1.4.1.01.05 Configuration Management
1.4.1.01.06 Qualification and Training Management
1.4.1.01.07 National Programs
1.4.1.01.08 Tri-Party Agreement
1.4.1.01.09 Public/Regulator Involvement
1.4.1.02 Systems Engineering
1.4.1.02.01 Mission Analysis
1.4.1.02.02 Functions and Requirements
1.4.1.02.03 Systems Engineering Management
1.4.1.02.04 Systems Engineering Review
1.4.1.03 K-Basin Activities
1.4.1.03.01 K-Basins Operations
1.4.1.03.02 K-Basins Facility Projects
1.4.1.04 K-Basins Material Removal/Clean-Up
1.4.1.04.01 Characterization
1.4.1.04.02 Pre-Removal/Cleanup Activities
1.4.1.04.03 Removal/Cleanup Operations K-Basins E.
1.4.1.04.04 Removal/Cleanup Operations K-Basins W.

ure 7-1

Breakdown Structure

SNF PROJECT RECOMMENDED PATH FORWARD

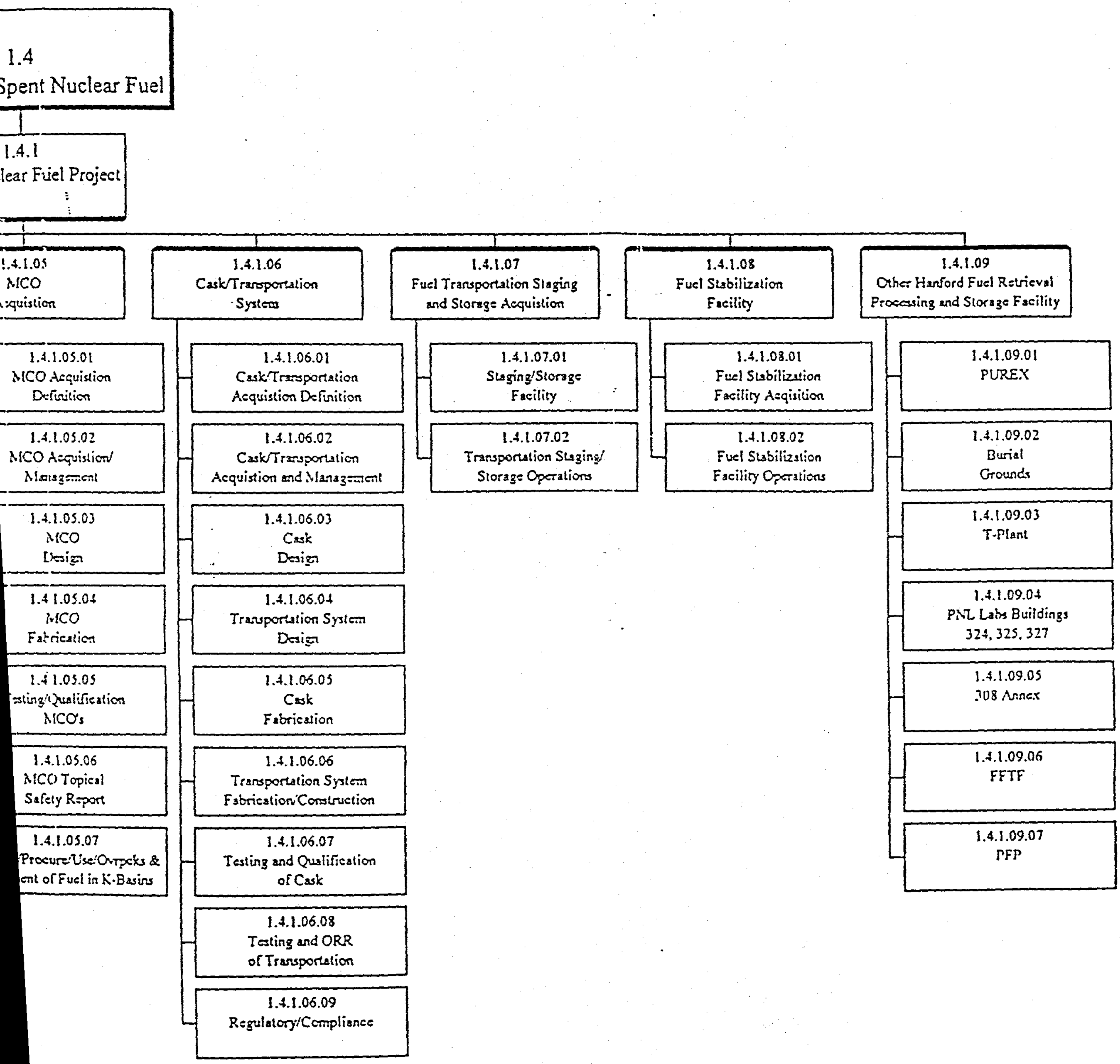
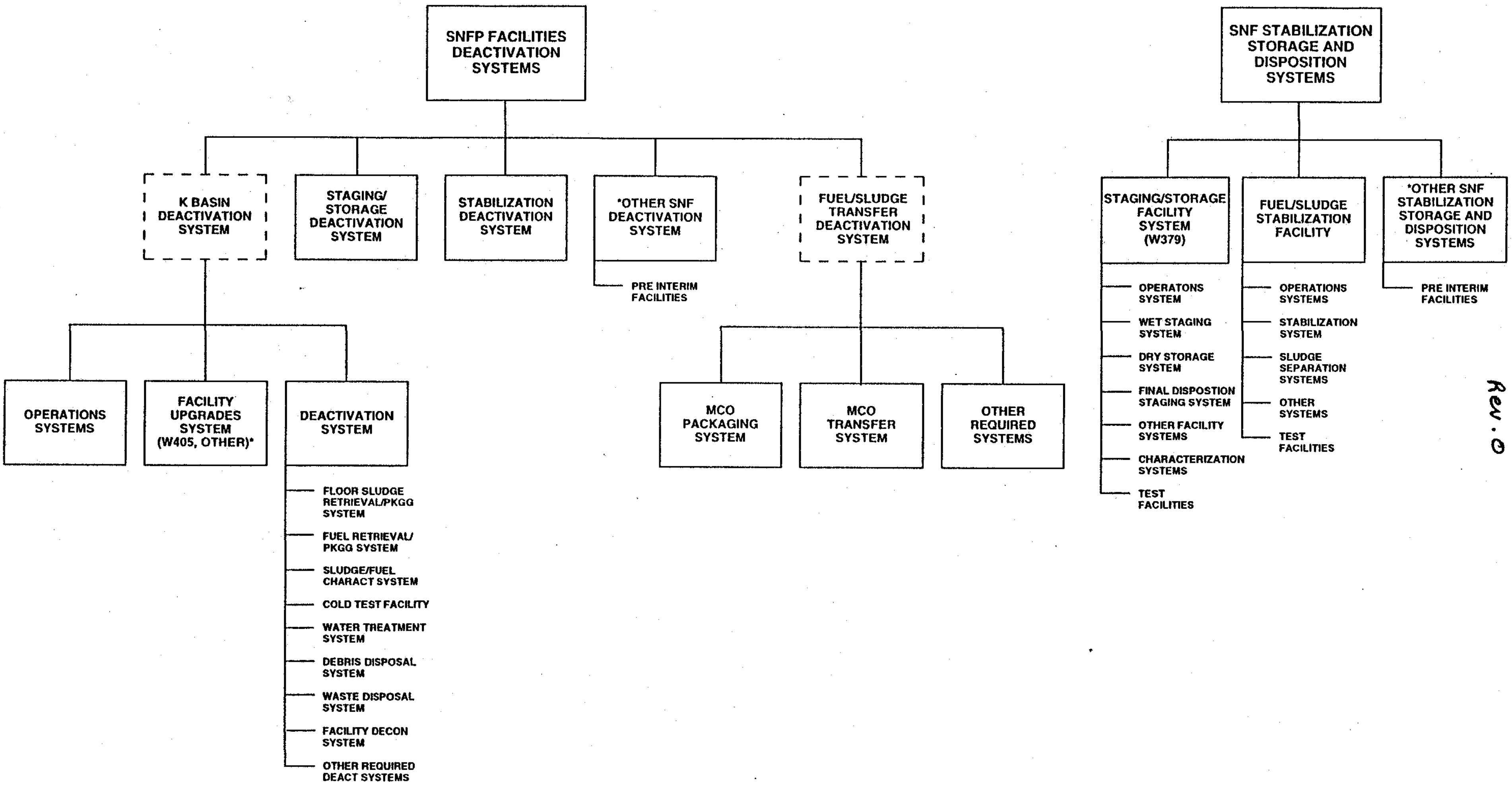


FIGURE 7-2
SNFP PRODUCT TREE



*SNF FROM PFP, FFTF, PUREX, T-PLANT, BLDG. 308, BLDG. 324, BLDG. 325, BLDG. 327, AND BURIAL GROUNDS

Table 7-1. Correlation Between Work Breakdown Structure and Product Tree.

	1.4.1.1 Project Management	1.4.1.2 Systems Engineering	1.4.1.3 K Basin Activities	1.4.1.4 K Basin Material Removal/ Cleanup	1.4.1.5 MCO Acquisition	1.4.1.6 Cask/ Transportation System	1.4.1.7 Fuel Transportation Staging and Storage Acquisition	1.4.1.8 Fuel Stabilization Facility	1.4.1.9 Other Hanford Fuel Retrieval Processing and Storage Facility
SNFP Facilities Deactivation System (4.1.1)									
K Basin Deactivation System (4.1.1.8)			X	X					
Operations Systems (4.1.1.8.1.1)			X						
Facility Upgrades System (W405, Other) (4.1.1.8.1.2.4)			X						
Deactivation System (2.4.1.7, 4.1.1.8.2, 4.1.1.8.3, 4.1.1.8.4)				X					
Floor Sludge Retrieval/Package System (4.1.1.8.3.3.2.3)				X					
Fuel Retrieval/Package System (4.1.1.8.3.3.2.2)				X					

Table 7-1. Correlation Between Work Breakdown Structure and Product Tree.

	1.4.1.1 Project Management	1.4.1.2 Systems Engineering	1.4.1.3 K Basin Activities	1.4.1.4 K Basin Material Removal/ Cleanup	1.4.1.5 MCO Acquisition	1.4.1.6 Cask/ Transportation System	1.4.1.7 Fuel Transportation Staging and Storage Acquisition	1.4.1.8 Fuel Stabilization Facility	1.4.1.9 Other Hanford Fuel Retrieval Processing and Storage Facility
Sludge/Fuel Characterization System (4.1.1.8.2.1, 4.1.1.8.3.1)				X					
Cold Test Facility (2.4.1.7.6)				X					
Water Treatment System (4.1.1.8.4.2)				X					
Debris Disposal System (4.1.1.8.4.2)				X					
Waste Disposal System (4.1.1.8.4.2)				X					
Facility Decontamination System (4.1.1.8.4.2)				X					
Other Required Deactivation Systems (4.1.1.8.4)				X					

Table 7-1. Correlation Between Work Breakdown Structure and Product Tree.

	1.4.1.1 Project Management	1.4.1.2 Systems Engineering	1.4.1.3 K Basin Activities	1.4.1.4 K Basin Material Removal/ Cleanup	1.4.1.5 MCO Acquisition	1.4.1.6 Cask/ Transportation System	1.4.1.7 Fuel Transportation Staging and Storage Acquisition	1.4.1.8 Fuel Stabilization Facility	1.4.1.9 Other Hanford Fuel Retrieval Processing and Storage Facility
Staging/Storage Deactivation System (4.1.1.10)							X		
Stabilization Deactivation System (4.1.1.11)								X	
Other SNF Deactivation System (4.1.1.9)									X
Pre-Interim Facilities (4.1.1.9)									X
Interim Facilities (TBD)									X
Fuel/Sludge Transfer System (4.1.1.8.3.4, 4.1.1.8.3.5)					X	X			
MCO Packaging System (4.1.1.8.3.4.1, 4.1.1.8.3.5.1)					X				

Table 7-1. Correlation Between Work Breakdown Structure and Product Tree.

	1.4.1.1 Project Management	1.4.1.2 Systems Engineering	1.4.1.3 K Basin Activities	1.4.1.4 K Basin Material Removal/ Cleanup	1.4.1.5 MCO Acquisition	1.4.1.6 Cask/ Transportation System	1.4.1.7 Fuel Transportation Staging and Storage Acquisition	1.4.1.8 Fuel Stabilization Facility	1.4.1.9 Other Hanford Fuel Retrieval Processing and Storage Facility
MCO Transfer System (4.1.1.8.3.4.3, 4.1.1.8.3.5.3)						X			
Other Required Systems (4.1.1.8.3.4, 4.1.1.8.3.5)					X	X			
SNF Stabilization, Storage, and Disposition System (4.7.2)									
Staging/Storage Facility System (2.4.1.1, 4.7.2.1.1, 4.7.2.3, 4.7.2.5.1, 4.7.2.6)							X		
Operations System (4.7.2.1.1.1)							X		
Wet Staging System (4.7.2.3)							X		
Dry Storage System (4.7.2.5.1)							X		
Final Disposition Staging System (4.7.2.6)							X		

Table 7-1. Correlation Between Work Breakdown Structure and Product Tree.

	1.4.1.1 Project Management	1.4.1.2 Systems Engineering	1.4.1.3 K Basin Activities	1.4.1.4 K Basin Material Removal/ Cleanup	1.4.1.5 MCO Acquisition	1.4.1.6 Cask/ Transportation System	1.4.1.7 Fuel Transportation Staging and Storage Acquisition	1.4.1.8 Fuel Stabilization Facility	1.4.1.9 Other Hanford Fuel Retrieval Processing and Storage Facility
Other Facility Systems (2.4.1.1, 4.7.2.1.1, 4.7.2.3, 4.7.2.5.1, 4.7.2.6)							X		
Characterization Systems (4.7.2.3.1, 4.7.2.5.1.1)							X		
Test Facilities (2.4.1.1.7)							X		
Fuel/Sludge Stabilization Facility (2.4.1.2, 4.7.2.1.2, 4.7.2.4)								X	
Operations Systems (4.7.2.1.2)								X	
Stabilization System (4.7.2.4)								X	
Sludge Separation System (4.7.2.4)								X	
Other Systems (2.4.1.2, 4.7.2.1.2, 4.7.2.4)								X	

Table 7-1. Correlation Between Work Breakdown Structure and Product Tree.

	1.4.1.1 Project Management	1.4.1.2 Systems Engineering	1.4.1.3 K Basin Activities	1.4.1.4 K Basin Material Removal/ Cleanup	1.4.1.5 MCO Acquisition	1.4.1.6 Cask/ Transportation System	1.4.1.7 Fuel Transportation Staging and Storage Acquisition	1.4.1.8 Fuel Stabilization Facility	1.4.1.9 Other Hanford Fuel Retrieval Processing and Storage Facility
Test Facilities (2.4.1.2.6)								X	
Other SNF Stabilization and Storage Disposition Systems (4.7.2.5.2)									X
Pre-Interim Facilities (4.7.2.5.2)									X
Interim Facilities (TBD)									X

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8.0 ISSUES

The issues that have resulted from systems engineering analyses are summarized in Table 8-1. Note that the issues are numbered for easy reference, prioritized by the team, tied back to the source functions from which each issue emanated, and assigned to a SNFP office for resolution. Issues I.1 through I.31 resulted from the September 1994 analysis. Their status has been updated for this revision, and those which have been resolved are listed as "CLOSED." The dates these issues need to be resolved can be derived from the Project Integrated Schedule, once it has been finalized. The issues identified in Table 8-1 resulted from the need to make enabling assumptions, identified conflicts in requirements, or the need to develop SNFP inter-system interfaces. The issues result in either trade studies that are noted in Table 8-1 and listed in Section 9.0, or in decisions that are defined in Table 8-1 as being needed.

The overriding issue at the beginning of FY 1995 was the need for a clear technical path forward for the SNFP. This was recommended and formally approved by the Assistant Secretary for Environmental Management.

The most significant issues at this time are associated with defining a path forward for the sludge and preparing for design of the systems defined as part of the path forward for SNF.

In FY 1995, policies and procedures will be developed for management of these issues by the SNFP.

Table 8-1. Spent Nuclear Fuel Project Issues.

No.	Title Description	Function impacted (Site Reference No.)	Priority*	Resolution approach (status)	Responsible office	Need date
I.1	Transfer of SNF to Overseas Location for Processing: Validation of the statement by DOE-HQ that the transfer of SNF to overseas alternative was eliminated is needed.	4.1.1.8.3.4	1	The directed path forward does not include transfer of SNF overseas as an alternative before final disposition. (Ref. J.L. Lytle Memo to T.A. Grumbly, *Action: Approval of Path Forward for N Reactor Spent Nuclear Fuel Interim Storage,* U.S. Department of Energy, EM-36, November 9, 1995.	Systems Integration (J.C. Womack)	CLOSED
I.2	Programs Responsibility Assumption: There is a need to validate the assumption that: projects that have possession and stewardship of SNF in their facilities share responsibility for the SNF with the SNFP. The SNFP has responsibility for interim storage and staging for final disposition.	4.1.1.8.3	4	The SNFP Charter (WHC-CM-1) resolves most of issue. Details to be worked as part of ICDs. Business as usual.	Engineering Integration (R.L. McCormack)	CLOSED

Table 8-1. Spent Nuclear Fuel Project Issues.

No.	Title Description	Function impacted (Site Reference No.)	Priority*	Resolution approach (status)	Responsible office	Need date
I.3	Sludge Assumption: What materials are classified as SNF? There is a need to validate the assumption that all sludge is considered to be SNF and not waste while it is located in the K Basins with the fuel. Once out of the basins, canister sludge (sludge associated with fuel in canisters) will be managed as SNF. K Basin sludge will be managed as waste once it has been removed from the basin.	4.1.1.8	1	Validate assumption. DOE-HQ/EM, DOE-RL J.C. Fulton letter to R.A. Holton (DOE/RL), *K Basin Sludge Classification Recommendation,* WHC, January 6, 1995.	Engineering Integration (R.L. McCormack)	ASAP
I.4	SNFP Operations Assumptions: There is a need to validate the assumption that all new SNF facilities will become part of the SNFP.	4.7.2	4	Validated in SNFP Charter (WHC-CM-1).	Project Baseline Control (J.L. Denning)	CLOSED
I.5	SNF Inventory Assumption: There is a need to validate the assumption that all SNF is inventoried in *Hanford Irradiated Fuel Inventory,* WHC-SD-SNF-TI-001, 1994.	4.1.1.8.3 & 4.7.2	2	Validate assumption.	Engineering Integration (R.L. McCormack)	ASAP
I.6	SNF Inventory Assumption: There is a need to validate the assumption that SNFP is only addressing SNF at Hanford. (What DOE site will be responsible for SNF?)	4.1.1.8 & 4.7.2	1	To be addressed in NSNFP PEIS ROD, based on direction from DOE-HQ.	Engineering Integration (R.L. McCormack)	June 95

Table 8-1. Spent Nuclear Fuel Project Issues.

No.	Title Description	Function impacted (Site Reference No.)	Priority*	Resolution approach (status)	Responsible office	Need date
I.7	Requirements Assumption: Should draft DOE-HQ and DOE-RL documents be used as requirements.	4.1.1.8 & 4.7.2	1	Draft DOE-HQ and DOE-RL documents will be used as a source of draft requirements until validated. The documents in question are no longer drafts.	Systems Integration (J.C. Womack)	CLOSED
I.8	K Basins Receiving Assumption: There is a need to validate the assumption that: The K Basins will receive N Reactor and SPR fuels in the PUREX building.	4.1.1.8.3.2	1	Validated in accordance with PUREX Deactivation Plan (TBD)	K Basins (T.B. Venezziano)	ASAP
I.9	Waste Classification: How should the materials inventoried as SNF be classified (i.e., as waste or fuel)? It is assumed to be fuel.	4.1.1.8.3	1	Requires DOE-HQ and/or DOE-RL direction or validated recommendation: R.L. McCormack letter to J.L. Daily, *Hanford Spent Nuclear Fuel Material Classifications*, WHC, November 23, 1994.	Engineering Integration (R.L. McCormack)	ASAP
I.10	RCRA Applicability: Does RCRA apply to SNF? Currently, it is assumed that it does not apply.	4.1.1.8.3	1	Requires DOE-HQ (EM), DOE-RL, EPA direction. Recommendation in work.	Regulatory Integration and Public Involvement (G.C. Mooers)	ASAP

Table 8-1. Spent Nuclear Fuel Project Issues.

No.	Title Description	Function impacted (Site Reference No.)	Priority*	Resolution approach (status)	Responsible office	Need date
I.11	Future Facilities and Operations Licensing: What regulatory framework will be selected for SNFP future activities? Is compliance required according to: • DOE Order compliance Only • NRC Licensing Equivalency: DOE Review • NRC Licensing Equivalency: NRC Review • NRC Licensing • A combination of DOE and NRC Orders	4.7.2	1	DOE-HQ, NRC, and Congress, direction based on DNFSB recommendation. Recommendation available. Partial direction received (see A.14)	Regulatory Integration and Public Involvement (G.C. Mooers)	ASAP
I.12	K Basin SNF Storage Condition: What is the optimum way to interim store K Basin SNF? (CLOSED)	4.7.2.5	2	Direction in J.L. Lytle Memo to T.A. Grumbly, *Action: Approval of Path Forward for N Reactor Spent Nuclear Fuel Interim Storage*, DOE EM-36, November 9, 1995	Engineering & Systems Integration (E.W. Gerber)	CLOSED

Table 8-1. Spent Nuclear Fuel Project Issues.

No.	Title Description	Function impacted (Site Reference No.)	Priority*	Resolution approach (status)	Responsible office	Need date
I.13	Path Forward: There is no clear path forward to final disposition of the Hanford SNF. What are the final disposition requirements for DOE-owned SNF? Currently, there is a requirement that SNF will be transferred to a geologic repository.	4.7.2.5	3	Requires DOE-HQ (EM/RW) and NRC direction.	Engineering Integration (R.L. McCormack)	To meet data requirement need
I.14	Tritiated Water Disposal: What is the path for disposal of tritiated water from the basins?	4.1.1.8.4	4	The water disposal system acquisition team will define and work recommendation. Work will be done as part of external interface definition. This will support the decision by DOE-RL and the Washington State Department of Ecology.	K Basin Engineering Projects (M.J. Wiemers)	TBD
I.15	Timely Waste Acceptance Criteria Need: Waste Acceptance Criteria (WAC) for the final disposition of the SNF would allow the SNF to be stabilized once for both interim storage and final disposition.	4.7.2.4 & 4.7.2.6	2	DOE-HQ EM-37 will resolve this issue for the national program.	Engineering Integration (R.L. McCormack)	Start of stabilization process design
I.16	What are the requirements for Deactivation (part of path through D&D)?: There is a need for turnover criteria for deactivation of facilities to be turned over to D&D. All deactivation requirements are needed for all SNFP facilities.	4.1.1.8.4	2	Develop technically and economically achievable environmental standards that protect the environment.	K Basins (T.B. Veneziano) DOE-RL EAP (DOE-RL-93-08)	FY 1996

Table 8-1. Spent Nuclear Fuel Project Issues.

No.	Title Description	Function impacted (Site Reference No.)	Priority*	Resolution approach (status)	Responsible office	Need date
I.17	Requirement for Early Removal of K Basin SNF: Will expedited removal of K Basin SNF be pursued? There is a need to know there is a requirement for expedited K Basin SNF removal.	4.1.1.8 & 4.7.2	1	Direction received in J.L. Lytle Memo to T.A. Grumbly, Action: *Approval of Path Forward for N Reactor Spent Nuclear Fuel Interim Storage*, DOE EM-36, November 9, 1995	Regulatory Integration and Public Involvement (G.C. Mooers/ J.C. Fulton)	CLOSED
I.18	K Basin Debris: There is a need to validate the assumption that debris in the K Basins is solid waste.	4.1.1.8.4	2	Validate assumption. DOE-HQ/EM, DOE-RL	K Basin Engineering Projects (M.J. Wiemers)	ASAP
I.19	Previously Unidentified SNF: It is most likely that SNF will be found as the Hanford Site environmental restoration continues. The type, condition, and quantity is unknown. Currently, this material in not on the SNF inventory.	4.1.1.8.3.2	1	Identify and develop interfaces for the receiving of this material. Recommendation part of E.W. Gerber letter to J.L. Daily, *Draft Integrated Program Plan for Spent Nuclear Fuels and Plutonium Materials*, WHC, 30 Dec 94	Engineering Integration (R.L. McCormack)	TBD

Table 8-1. Spent Nuclear Fuel Project Issues.

No.	Title Description	Function impacted (Site Reference No.)	Priority*	Resolution approach (status)	Responsible office	Need date
I.20	K Basin Encapsulation Milestone: Tri-Party Agreement target milestone M-34-00-T02, "Initiate K East Basin Fuel Encapsulation," is due (6/30/94).	4.1.1.8.3	1	Path forward direction negates this as provided in J.L. Lytle Memo to T.A. Grumbly, Action: *Approval of Path Forward for N Reactor Spent Nuclear Fuel Interim Storage*, DOE EM-36, November 9, 1995.	Regulatory Integration and Public Involvement (G.C. Mooers)	CLOSED
I.21	Notice of Intent for N Reactor Fuel Milestone: Tri-Party Agreement target milestone M-34-00-T01, "Issue notice of Intent for N Reactor Fuel EIS," is due (6/30/94).	4.1.1.8.3	1	Target milestone to be provided with coordination at DOE EM-1.	Regulatory Integration and Public Involvement (G.C. Mooers)	TBD
I.22	SNFP MYPP and System Engineering Functions Disconnect: There is no Pre-Interim Storage in the system engineering functions.	4.7.2	2	Functional hierarchy now includes a PISP. Extension of path forward and inclusion in the WBS is being developed.	Systems Integration (J.C. Womack)	CLOSED
I.23	SNFP Charter: There is a need to formalize the responsibilities and authority of the SNFP.	1.0	2	SNFP charter issued (WHC-CM-1).	Regulatory Integration and Public Involvement (G.C. Mooers)	CLOSED
I.24	SNFP Planning and Coordination: There is a need to consider consistency between SNFP, program planning, and documentation.	1.0 & 2.0	3	This is expected to be resolved with Jan 95 Project Management Plan (PMP) and WBS revision	Project Baseline Control (J.L. Denning)	CLOSED

Table 8-1. Spent Nuclear Fuel Project Issues.

No.	Title Description	Function impacted (Site Reference No.)	Priority*	Resolution approach (status)	Responsible office	Need date
I.25	Hanford Site Function 3.0: While the Site function for Obtain Public Involvement (Hanford Site Function 3.0) has recently undergone extensive analysis, there is a need for a better understanding of how the system should respond to the results of interactions with the public.	4.1.1.8	2	SNFP Technical Baseline Revision, January 1995, provides baseline for SNFP.	Regulatory Integration and Public Involvement (G.C. Mooers)	CLOSED
I.26	Hanford Site Functions 1.0, 2.0, & 5:0: These Hanford Site level functions need further definition and development.	4.1.1.8 & 4.7.2	3	Site Systems Engineering to develop functions using a multi-program team. In-work with SNFP Technical Baseline.	Systems Integration (J.C. Womack)	FY 1995
I.27	Requirements Identification and Control: Detailed requirements need to be developed and the entire requirements baseline brought under configuration control.	4.1.1.8 & 4.7.2	1	Develop SNFP configuration control system. Coordinate requirements with Hanford Site and NSNFP levels. In progress.	Systems Integration (J.C. Womack)	FY 1995
I.28	K Basin Operations Analysis: A detailed K Basins operations functional analysis and complete alternatives baseline is needed. Work on an Operational Baseline has begun.	4.1.1.8	2	K Basin Engineering developing as-built configuration.	K Basin Engineering (J.P. Schmidt)	May 95

Table 8-1. Spent Nuclear Fuel Project Issues.

No.	Title Description	Function impacted (Site Reference No.)	Priority*	Resolution approach (status)	Responsible office	Need date
I.29	Acceptance of Hanford Site Systems Engineering Process: The Hanford Site systems engineering processes and functional structure needs understanding and acceptance by DOE-RL and DOE-HQ.	All	2	Set precedence by gaining acceptance by DOE-HQ (EM-37) first. EM-37 has accepted the Hanford approach and the recognized differences. Requires continued work.	Systems Integration (J.C. Womack)	FY 1996
I.30	SNFP Systems Engineering Process Implementation: The SNFP needs to implement systems engineering policies, procedures, and training/education.	All	2	Develop and publish SNFP SEMP, Systems Engineering policies, procedures, and training plan.	Systems Integration (J.C. Womack)	FY 1995
I.31	National Spent Nuclear Fuel Program (NSNFP) Authority : Does the NSNFP EM-37 program office have authority to impose requirements regarding management and control of Hanford SNF that is not under DOE-HQ EM-37 control (e.g., FFTF is an ER facility)?	All	1	Policy issued as part of *DOE-Owned Spent Nuclear Fuel Program Strategic Plan,* DOE EM, Nov 1994	Systems Integration (J.C. Womack)	CLOSED
I.32	Impact of SNF Radioactivity Levels Reduction: The impact of the natural reduction of radioactivity levels associated with SNF on the safeguards and security requirements needs to be addressed. When will SNFP be non-self-protecting?	4.7.2	2	Definition of derived requirement to be generated.	Engineering Integration (R.L. McCormack)	April 95

Table 8-1. Spent Nuclear Fuel Project Issues.

No.	Title Description	Function impacted (Site Reference No.)	Priority*	Resolution approach (status)	Responsible office	Need date
I.33	Sludge Accountability: How will sludge be accounted for after it is separated from the fuel and removed from the K Basins?	4.1.1.8.3	2	Define approach.	Equipment Engineering (C.J. Alderman)	TBD
I.34	Fuel Accountability: How will fuel be accounted for after it is removed from the K Basins and separated from basin sludge?	4.1.1.8.3	2	Define approach.	Process Systems (J.R. Fredrickson)	TBD**
I.35	Sludge Canisterized But Not Associated With Fuel Path Forward: The sludge contained in some of the canisters in the K East Basin is not associated with fuel elements and does not fall into any of the existing definitions of sludge covered in J.C. Fulton letter to R.A. Holton, K Basin Sludge Classification Recommendation, WHC 9550053, January 6, 1995. A path forward needs to be defined.	4.1.1.8.3	3	Define and recommend path forward for this sludge.	Equipment Engineering (C.J. Alderman)	March 95
I.36	Responsibility for Final Disposition Not Clear: Function 2.7.2.6 (Prepare K Basin SNF for Final Disposition) is not included in the scope of the Staging and Storage Facility (SSF), nor in any other sub-project. It is an activity in the WBS (1.4.1.07.02.06, Stage Fuel for Disposition) under the SSF	4.7.2.6	1	Resolve the SSF project scope with the WBS.	Project Engineering and Integration (J.M. Henderson)	ASAP

Table 8-1. Spent Nuclear Fuel Project Issues.

No.	Title Description	Function impacted (Site Reference No.)	Priority*	Resolution approach (status)	Responsible office	Need date
I.37	Schedule for Transfer of Other SNF to INEL: What is the schedule for implementing the transfer of other SNF to INEL?	4.7.2	1	To be worked with INEL and EM-37	Engineering Integration (R.L. McCormack)	TBD
I.38	Secretary of Energy Decision: The Secretary of Energy has directed a solution to the path forward for other SNF. This needs to be included in the SNFP technical baseline.	4.7.2	1	Obtain Secretary's decision paper on transfer of other SNF to INEL.	Engineering Integration (R.L. McCormack)	ASAP
I.39	K Basins Tritiated Water Milestone: There is need to modify the Tri-Party Agreement milestone M-34-01 to defer removal of tritiated water to match K Basin path forward.	4.1.1.8.4	2	Obtain negotiated Tri-Party Agreement change.	Regulatory Integration and Public Involvement (G.C. Mooers)	TBD
I.40	K Basin Activities Occurring Before Integrated Deactivation Plan: There are K Basin deactivation subsystem design and test activities occurring before start of the deactivation plan.	4.1.1.8.4	2	Initiate K Basin deactivation and start detailed analysis of functions and requirements.	K Basins (T.B. Veneziano) and K Basin Engineering (M.J. Wiemers)	ASAP
I.41	MCO Configuration: There is a need to define the basic MCO configuration to allow interfaces to be defined and other projects to be scoped. The key issue is the selection of 4 vs. 5 high levels for canisters in the MCO. This impacts all elements of the path forward.	4.1.1.8.3 and 4.7.2	1	Perform study to develop points of departure (S.17).	Process Systems (J.R. Fredrickson)	March 95**

Table 8-1. Spent Nuclear Fuel Project Issues.

No.	Title Description	Function impacted (Site Reference No.)	Priority*	Resolution approach (status)	Responsible office	Need date
I.42	MCO Hot Repair/Modification: The need for an MCO and cask repair/modification capability is derived from 10 CFR 72. The capability needs and options for meeting this capability have not been defined. Therefore, this capability is not within the scope of any sub-project.	4.1.1.8.3 and 4.7.2	2	Perform study to develop needs and options for MCO hot repair (S.17).	Process Systems (J.R. Fredrickson)	April 95**
I.43	Interference of Basin Sludge, Water, Debris, and Canister Removal Activities. The optimum approach for conducting all basin-related path forward activities needs to be developed.	4.1.1.8.3	2	Perform study to determine best approach that will meet milestones (S.20).	K Basin Engineering Projects (M.J. Wiemers)	April 95**
I.44	Basin Sludge Transportation System Configuration: There is a need to define the basin sludge transportation system. This includes the sludge transporter and interfaces.	4.1.1.8.3.5	2	Perform study to define the point of departure system (S.21).	Equipment Engineering (C.J. Alderman)	April 95**
I.45	Facilities Siting: Facilities siting will be driven by the need to site the Staging and Storage Facility, but siting must be consistent with an optimum system configuration to include stabilization, preparation for final disposition, and Hanford Site future uses.	4.7.2	1	Perform site evaluation (S.22).	SSF Project (J.M. Henderson)	September 95**

Table 8-1. Spent Nuclear Fuel Project Issues.

No.	Title Description	Function impacted (Site Reference No.)	Priority*	Resolution approach (status)	Responsible office	Need date
I.46	Canister Desludge: The optimum approach to desludging the canisters has not been defined. This is needed so that the interfaces can be defined and scoped.	4.1.1.8.3 and 4.7.2.4	2	Perform study to determine best approach that meets milestones (S.23).	Process Systems (J.R. Fredrickson)	February 96**
I.47	MCO Interfaces: The interfaces of the MCO need to be defined. Issues to be resolved include venting, thermal control, and servicing. Resolution is needed so that the MCO interfaces can be defined and scoped. This has a significant impact on the SSF.	4.1.1.8.3	2	Perform study to develop these interfaces (S.24, S.25).	Process Systems (J.R. Fredrickson), SSF Project (J.M. Henderson)	June 95**
I.48	K Basin Deactivation Mission: There is a need to formally declare that the K Basins have a deactivation mission.	4.1.1.8	2	DOE-RL will develop a new K Basins mission statement; WHC will revise appropriate documents, including WBS.	K Basins (T.B. Veneziano)	ASAP

*Priority:

1. Potential high impact (major cost, schedule, safety, and/or technical impact), or lower impact but with immediate action required to preclude impacting the project. Not recoverable.
2. Significant impact (may result in a major increase in risk impact). Generally recoverable.
3. May result in increased risk and/or change. Not likely to stop project activities.
4. Business as usual (need to track), or minor impact if not resolved.

**Initial estimated date subject to change

9.0 TRADE STUDIES

Trade studies that have resulted from systems engineering analyses are presented in the form of Table 9-1. Note that the studies are numbered for easy reference, prioritized, and tied back to the issues or alternatives that generated the studies. These studies are also assigned to a SNFP office for resolution. Dates these studies need to be completed are included.

Table 9-1. Spent Nuclear Fuel Project Trade/Engineering Studies.

No.	Title Description	Function/issue addressed	Priority*	Responsible office	Need date
S.1	Beneficial Uses of K Basin Equipment and Facilities: Trade study to define the optimum beneficial uses for the K Basin facilities after removal of SNF.	Function 4.1.1.8.4.3	4	K Basin Engineering (J.P. Schmidt)	FY 1996**
S.2	Approaches to SNF Safe K Basin Storage: Study of options for the reconfiguration of the K Basin facilities. This is an in progress study. Recommendations will result from the *Spent Fuel Consolidation Study in the 105 KW Building Fuel Storage Basin* (WHC 1994)**	Function 4.1.1.8.1	1	K Basin Engineering (J.P. Schmidt)	September 30, 1994 (Closed)
S.3	Path Forward to Removal of K Basins SNF: Study to define options for expedited removal of SNF from the K Basins and storage at other locations (pre-interim storage) before interim storage is available. Results to address issues associated with cost, schedule, risk and performance, and a path forward to interim storage. (*Hanford Spent Nuclear Fuel Project Recommended Path Forward* [WHC 1994])	Function 4.7.2 and I.17	1	Engineering and Systems Integration (E.W. Gerber)	October 94 (Closed)
S.4	Fuels Consolidation Study: Study of options for the reconfiguration of K Basin west inventory to accept K Basin east inventory. This is an in-progress study. (WHC 1994f)**	Function 4.1.1.8.1	1	K Basin Engineering (J.P. Schmidt)	September 30, 1994 (Closed)
S.5	RCRA Characteristics Study: Technical evaluation of SNF materials to identify possible RCRA characteristics.	Functions 4.1.1.8.2.1 & 4.7.2, and I.10	1	Characterization Program (R.P. Omberg)	TBD

Table 9-1. Spent Nuclear Fuel Project Trade/Engineering Studies.

No.	Title Description	Function/issue addressed	Priority*	Responsible office	Need date
S.6	Tritiated Water Disposal: Trade study to evaluate options for disposing of the tritiated water at the K-East basin. This will include options to treat the water at the K-East site, and dispose of it as tank waste. Recommendations will result from the *Spent Fuel Consolidation Study, (S-4).*(WHC 1994f) (Status: Water Disposal Acquisition Team to define and work recommendation. Work as part of external interface definition. These will support decision by DOE-RL and Washington State Department of Ecology (Holt 1994)	Function 4.1.1.8.4 and I.14	2	K Basin Engineering Project (M.J. Wiemers)	TBD
S.7	Future Facilities and Operations Licensing: Trade study that will define the impacts of adopting each of the alternative regulatory frameworks for SNFP future activities. Alternatives include the following compliance requirements: • DOE Order compliance only • NRC Licensing Equivalency: DOE Review • NRC Licensing Equivalency: NRC Review • NRC Licensing • A combination of DOE and NRC Orders Results to impact DOE-HQ decision. (Status: Draft Regulatory Strategy out for coordination)	Function 4.7.2 and I.11	1	Regulatory Integration and Public Involvement (G.C. Mooers)	March 95 (Tri-Party Agreement schedule)

Table 9-1. Spent Nuclear Fuel Project Trade/Engineering Studies.

No.	Title Description	Function/issue addressed	Priority*	Responsible office	Need date
S.8	Conversion of SNF to Beneficial Use: Study of the conversion options to a form for beneficial use. (Status: Hold for the results of the PEIS)	Function 4.7.2.6	4	Regulatory Integration and Public Involvement (G.C. Mooers)	TBD
S.9	Transfer SNF to Offsite Storage or Disposition: Part of Study S.3 and PEIS options. (Reference J.L. Lytle memo to T.A. Grumbly, *Approval of Oath Forward for N Reactor Spent Nuclear Fuel Interim Storage*, DOE EM-325, November 9, 1995 (DOE 1994).	Function 4.7.2 and I.1	2	Engineering Integration (R.L. McCormack)	October 94 (Closed)
S.10	Receiving Facility Capabilities and Design Features Study: Study of the options for integrating the receiving facility into existing or new facilities. (Status: Part of SSF Studies)	Function 4.7.2.3	3	Staging & Storage Facility Project (J.M. Henderson)	June 95
S.11	Stabilization Studies: Study of stabilization approaches including possible use of stabilization in the K Basin to support storage options. Includes characterization approaches. (Status: Part of FSF studies)	Functions 4.1.1.8 & 4.7.2.4	1	Engineering Integration (R.L. McCormack)	February 96
S.12	Dry vs Wet Storage Options for Interim Storage: Trade study of approaches for storage including associated stabilization. Includes *N Fuel Dry Storage Technology Evaluation results*. Also includes characterization studies of approaches consistent with the storage approaches studied.	Function 4.7.2.5	1	Engineering Integration (R.L. McCormack)	Closed
S.13	Staging Facilities Features: Study of the options for optimum selection of new and/or existing facilities on-site and/or off-site, including at the repository. (Status: Part of the SSF studies)	Function 4.7.2	3	Staging & Storage Facility Project (J.M. Henderson)	TBD

Table 9-1. Spent Nuclear Fuel Project Trade/Engineering Studies.

No.	Title Description	Function/issue addressed	Priority*	Responsible office	Need date
S.14	SNF Materials Control Approach: Study of the alternatives for management of the various SNF materials at Hanford. This includes centralized and decentralized. (Status: Part of TPA M-033 trade study).	Function 4.7.2.6	2	Engineering Integration (R.L. McCormack)	June 95
S.15	Studies Associated with "Waste Acceptance Criteria" with DOE-RW: Studies to support options for the staging of the SNF for final disposition transportation. (Status: *Preliminary Waste Acceptance Criteria*, WINCE-1157, Draft)	Functions 4.7.2.6 & 4.1.1.8	3	Regulatory Integration and Public Involvement (G.C. Mooers)	2001
S.16	Transportation Configuration Study: Define system approach for cask transportation system. Include cask transporter and interfaces.	Functions 4.1.1.8.3 & 4.7.2.3	2	Process Systems (J.R. Fredrickson)	March 95
S.17	MCO Configuration Study: Define system approach to configuration of MCO. Define the fuel element storage capacity of the MCO. Optimize the MCO with respect to the number of canisters to be overpacked. The range is expected to be 3, 4, or 5 layers of two canisters on each layer. The tradeoff considerations include: number of transport trips, size and configuration of the SSF, size of the FSF, modifications to the K Basin loadout area, loadout worker dose and burnout, and cask size. Includes sensitivity and risk.	Functions 4.1.1.8.3 & 4.7.2 I.41	2	Process Systems (J.R, Fredrickson)	March 95
S.18	Safeguards Options for Non-Self-Protecting SNF: Study to identify what fuel is not self-protecting, the impact of this, and the options to meet the safeguard requirements.	Functions 4.7.2.5 and I.32	2	Nuclear Materials Management (R.R. Boorish)	June 95

Table 9-1. Spent Nuclear Fuel Project Trade/Engineering Studies.

No.	Title Description	Function/issue addressed	Priority*	Responsible office	Need date
S.19	MCO Hot Repair/Modification Capability: Study to identify capability needs and options for meeting this capability need, including identification of new and/or existing equipment, and/or facilities.	Function 4.7.2 I.42	2	Process Systems (J.R. Fredrickson)	April 95
S.20	Sequence of Basin Floor Sludge, Debris, and Canister Sludge and Fuel Removal: Study to define the optimum sequence of removing basin sludge, debris, and canister sludge and fuel, to minimize interference.	Function 4.1.1.8.3 I.43	2	Process Systems (J.R. Fredrickson)	July 95
S.21	Sludge Transportation System: Define the system approach to sludge transportation, to include transporter and interfaces.	Function 4.1.1.8.3.5 I.44	2	Equipment Engineering (C.J. Alderman)	April 95
S.22	Facilities Siting: Study of siting of the SSF, FSF, and preparation for final disposition facilities. Study to include siting for each facility and combined integrated facilities.	Function 4.7.2 I.45	2	SSF Project (J.M. Henderson)	July 95
S.23	Canister Desludge: Study of the optimum approach and location for desludging the canisters containing fuel and sludge. Establish the location of the canister desludging operations	Functions 4.1.1.8.3 and 4.7.2.4	2	Equipment Engineering (C.J. Alderman)	June 95
S.24	MCO Interfaces: Study to define the interfaces to the MCO, including venting, thermal control, and servicing.	Functions 4.1.1.8.3 & 4.7.2 I.46	2	K Basin Engineering Project (M.J. Wiemers)	June 95
S.25	Time/Dose Study: Study to determine the Time/Dose requirements imposed by K-Basin SNF on personnel involved in the handling and transportation of SNF from the K Basins.	Functions 4.1.1 & 4.7.2 I.47	2	Process Systems (J.R. Fredrickson)	June 95

Table 9-1. Spent Nuclear Fuel Project Trade/Engineering Studies.

No.	Title Description	Function/issue addressed	Priority*	Responsible office	Need date
S.26	Canister Water Fill: Evaluate the need to water fill the K-West canisters prior to transfer. The water fill operation of K-East canisters impacts the transport safety analysis and the need to fill the canisters at the SSF prior to the staging period.	Functions 4.1.1.8.3 and 4.7.2.4	2	Process Systems (J.R. Fredrickson)	Jun 95**
S.27	Shipment of fuel in Wet or Damp Environment: Define the fuel environment during shipping from the K Basins. The evaluation includes the technical evaluation currently in progress. Other considerations include K Basin equipment, transportation equipment, MCO configuration, and SSF receiving operations.	Function 4.1.1.8.3	2	Process Systems (J.R. Fredrickson)	Mar 95** S.28
S.28	MCO Configuration for Passivation: Establish if the MCO internals and/or head will be ret operation. stabilization the o prior placed MCO. per cost higher probable a at resolution more later, versus process design project the in early parameters design MCO all specifying involves off trade evaluation The impacted.be will facility and process FSF the of design The	Function 4.7.2.3	2	Process Systems (J.R. Fredrickson)	Jul 95**
S.29	Use of Corrosion Inhibitor: Determine if use of a corrosion inhibitor in the MCO during the staging period provides technical and cost benefits. The use of an inhibitor could modify the MCO and SSF designs. The impact relative to the stabilization operation must also be evaluated.	Function 4.7.2.3	2	Process Systems (J.R. Fredrickson)	Jul 95**
S.30	Canister Sludge Processing Methods: Identification of a design path to condition canister sludge for storage. Definition of a design path impacts the stabilization process facility and equipment and the SSF storage configuration.	Function 4.7.2.4	2	Engineering Integration (R.L. McCormack)	Jul 96**

Table 9-1. Spent Nuclear Fuel Project Trade/Engineering Studies.

No.	Title Description	Function/issue addressed	Priority*	Responsible office	Need date
S.31	Specification of Common Operations Design Basis: Determination of standard philosophy for operations, maintenance, process control, radiation control, criticality control, and safeguards.	Functions 4.1.1.8 and 4.7.2	2	K Basins (T.B. Veneziano)	TBD
S.32	Storage of Other SNF at SSF: Disposition of other SNF relative to the path forward basis.	Function 4.7.2.3	2	Engineering Integration (R.L. McCormack)	Jul 95**
S.33	Sludge Path Forward: Develop a path forward for the sludge components for the K Basins.	Function 4.1.1.8.3	2	Equipment Engineering (C.J. Alderman)	TBD

Table 9-1. Spent Nuclear Fuel Project Trade/Engineering Studies.

No.	Title Description	Function/issue addressed	Priority*	Responsible office	Need date

*Priority

1. Study addresses potential high impact (major cost, schedule, safety, and/or technical impact) or lower impact but with immediate action required to preclude impact to project. Not recoverable.
2. Study addresses significant impact. May result in major risk impact. Generally recoverable.
3. Study addresses an issue or alternative selection that may result in risk and/or change. Not likely to stop project activities.
4. Study is business as usual, or addresses minor impact if not resolved.

**Initial estimated date subject to change

***References:

DOE-RL, 1994, R.G. Holt letter to D.R. Sherwood (U.S. Environmental Protection Agency, and J. Stohr, Washington State Department of Ecology, *Completion of Hanford Federal Agreement and Consent Order Target M-34-00-T04*, DOE-RL 94-NMD-047, U.S. Department of Energy Richland Operations, Richland, Washington.

KHC, 1994, *Spent Fuel Consolidation in the 105 KW Building Fuel Storage Basin, Project N-040,* WHC-SD-N40-ES-001, Rev O, ICF Kaiser Hanford Company, Richland, Washington.

WHC, 1994a, *105 KE to 105 KW Basin Fuel and Sludge Transfer, Final Report*, WHC-SD-SNF-ES-002, Rev 0, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994b, *Hanford Spent Nuclear Fuel Project Recommended Path Forward*, WHC-EP-0830, 2 Vols., Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994c, *Options for Disposal of KE-Basin Water*, WHC-SD-SNF-ES-005, Rev 0, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994d, *Options for Disposition of KE-Basin Water*, WHC-SD-SNF-PD-007, Rev 0, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994e, *Scheduling for Final Disposal of Contaminated K-East Basin Water*, WHC-SD-SNF-PD-007, Rev 0, Westinghouse Hanford Company, Richland, Washington.

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10.0 RISK

Because of the emphasis on regulatory agency and stakeholder involvement in Hanford Site activities, the primary risk concerns in the SNFP are risks to the public and worker health and safety, and environmental risks. However, significant technical and programmatic uncertainty risks do exist. These areas of risk can impact system performance, cost, and/or schedule. Risk management is a process to assess and analyze risks and develop and implement approaches to mitigate them. It is an integral part of the systems engineering process as well as a management tool. Risk is central to the Hanford risk-based decision management system, as described in the Hanford Site systems engineering management plan (DOE-RL 1994c). A SNFP risk management plan will be developed in FY 1995.

The first step in risk management is the identification of potential risk areas. The primary SNFP risk areas that have been identified from several sources during the systems engineering analysis include:

- Public and worker health and safety effects include:
    - Worker injuries and exposures
    - Existing and potential USQs
    - Potential for further source term releases to air, soil, and groundwater (public visibility and concern will remain high until the source terms are mitigated or eliminated).
- Environmental risks are associated with contamination of groundwater, river waters, soil, and air.
- Programmatic risks include:
    - No clear path forward for the final disposition of SNF from interim storage
    - No funded plan for the safe and economical storage, stabilization, and transfer of SNF (low risk, path forward defines)
    - SNF compatibility with repository acceptance criteria uncertain
    - Schedule risks associated with Tri-Party Agreement milestone due dates
    - SNF material waste classification effects on the scope of SNF disposition (draft)

  - Type and amount of previously unidentified SNF found onsite and impact on the project requirements (current assumed to have small effect on SNF)
  - Schedule risk associated with underfunding
  - Schedule and cost risk associated with need for selective waivers to DOE Orders
  - Uncertainties associated with transfer of other SNF to other DOE sites
  - Failure to support the SNF mission if significant upgrade programs are not implemented to change the present condition of K Basins infrastructure
  - Unknown impacts of the NEPA process: DOE-HQ Spent Nuclear Fuel Programmatic EIS and Hanford Site NEPA actions

- Technical

  - SNF not adequately characterized in K Basin facilities
  - New equipment and facilities upgrades needed for stabilization, storing, and transporting SNF
  - No demonstrated stabilization technology for the N and SPR SNF (sludge and fuel)
  - Loss of Hanford Site infrastructure and technical resources
  - No demonstrated dry storage.

11.0 MEASURES OF EFFECTIVENESS

The measures of effectiveness selected relate the SNFP to the ability to meet the SNFP objectives.

11.1 SAFE EXISTING STORAGE

11.1.1 Objective

Provide safe existing storage, identify and resolve vulnerabilities, and remedy unsafe conditions.

- Organize and manage so that safety and security envelopes are maintained at all times.
- Stabilize and consolidate in new facilities as required.

11.1.2 Measures of Effectiveness

- Number of outstanding and resolved USQs
- Number of outstanding and resolved NOVs
- Number of potential USQs
- Number and types of injuries and exposures
- Number of unsafe conditions and unsafe facilities identified and eliminated
- Degree of impact on the public
- Worker dose exposure
- Number and size of source term releases to the air, soil, and water

11.2 OBTAIN PUBLIC INVOLVEMENT

11.2.1 Objective

Obtain public involvement for both SNFP temporary, interim, and final disposition program.

- Proactively interact with stakeholders obtaining their advice and ensuring their buy-in.
- Involve stakeholders in a manner that develops trust.
- Develop an agreed-upon regulatory strategy.

11.2.2 Measures of Effectiveness

- Degree of environmental protection and safety
- Risk mitigation (technical and programmatic)
- Degree of public involvement in process
- Lack of adverse public impact on project
- Degree of execution of public involvement in decisions.

11.3 INTERIM STORAGE

11.3.1 Objective

Design, construct, operate, and maintain interim storage facilities until final disposition of SNF is determined.

11.3.2 Measures of Effectiveness

- Costs to providing and operating stabilizing, transfer, and interim storage facilities are below or meet allocated SNFP budgets
- Schedule meets established milestones (e.g., Tri-Party Agreement)

- Technical performance meets imposed requirements
- Degree of risk mitigation.

11.4 FINAL DISPOSITION

11.4.1 Objectives

Stage the SNF for final disposition once direction is received.

11.4.2 Measures of Effectiveness

- Costs of staging SNF are below allocated SNFP budgets
- Schedule meets TBD milestones
- Technical performance meets imposed requirements
- Degree of risk mitigated.

11.5 COMPLIANCE ISSUES

11.5.1 Objectives

All SNFP activities are to be accomplished safely, securely, efficiently, and in compliance with applicable laws, regulations, and directives.

11.5.2 Measures of Effectiveness

- Decreased number of notices of violations by appropriate governmental agencies
- Improved quality of studies defining the path forward
- Selected technologies effectively meet the objective
- Formal evaluations by DOE.

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12.0 REFERENCES

58 FR 178, "*Final Environmental Impact Statement for the Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington*," Record of Decision, *Federal Register*, Vol. 58, pp. 178 (September 16).

Bergsman, K. H. 1994, *Hanford Spent Fuel Inventory Baseline*, WHC-SD-SNF-TI-001 Rev. 0, Westinghouse Hanford Company, Richland, Washington.

DOE, Draft, *Spent Nuclear Fuel Requirements Document*, EM-37, U.S. Department of Energy, Washington, D.C.

DOE, 1993, *Final Environmental Impact Statement for the Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington*, DOE/EIS-0119F, U.S. Department of Energy, Washington. D.C.

DOE, 1994, *Approval of Path Forward for N Reactor Spent Nuclear Fuel Interim Storage*, Letter from J. E. Lytle to T.P Grumbly, dated November 9, U.S. Department of Energy, Washington, D.C.

DOE-RL, 1993, *Hanford Mission Plan, Volume 1, Site Guidance*, DOE/RL-93-08, U.S. Department of Energy Richland Operations Office, Richland, Washington.

DOE-RL, 1994a, *Spent Fuel Characterization Plan,* Letter 9402752B from J. L. Dailey to ________________, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1994b, *Systems Engineering*, RLPD 4900.1, U.S. Department of Energy Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE, 1994, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Fulton, J. C., 1994, *Spent Nuclear Fuel Characterization Management Plan,* with attached "Document Characterization Program Management Plan for Hanford Spent Nuclear Fuel," Letter 9402752B R2 to _______________, Westinghouse Hanford Company, Richland, Washington.

Gerber E. W., 1994, *Draft Hanford Site Integrated Program Plan*, (Letter 9458720 to J. L. Daily, U.S. Department of Energy, Richland, Operations Office), dated December 30, Westinghouse Hanford Company, Richland, Washington.

PNL, 1994, *The Characterization Plan for Hanford Spent Nuclear Fuel*, Document Number: __________, Pacific Northwest Laboratories, Richland, Washington.

WHC, 1994a, *Spent Nuclear Fuel Project Mission Analysis Report (Rev. A)*, WHC-EP-0790, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994b, *Spent Nuclear Fuel Project, FY 1995 Multi-Year Program Plan WBS 1.4*, WHC-SP-1104, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994c, *Systems Engineering Functions and Requirements for the Hanford Cleanup Mission: First Issue, (Rev. 0)*, WHC-EP-0722, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994d, "Hanford Site Systems Engineering Management Plan, (Rev. 0)," Attachment to ____________________, Letter 9454364 from ____________ to ______________, Westinghouse Hanford Company, Richland, Washington.

Author's name, Draft, *Strategic Plan for Managing Spent Nuclear Fuel on the Hanford Site*, Westinghouse Hanford Company, Richland, Washington.

13.0 GLOSSARY

DEFINITIONS OF TERMS

Alternative. A candidate solution that satisfies all its requirements and/or constraints.

Basin Sludge. The sludge located on the floor of the K Basins which is not contained in canisters with fuel elements. This includes sludge in canisters without fuel elements.

Canister. Container that holds fuel/single; 3 kinds:
MK - Mesh Screen Bottom/Open Top
MKI - East Basin, no lids, open top
MKII - West Basin with Lids (contained)
Dimensions (nominal) 8" x 30" tall = groups of two

Canister Sludge. Sludge contained in canisters with spent nuclear fuel elements.

Capstone. The complete Hanford Site top-level functional structure that encompasses all functions required for the clean-up of Hanford.

Cask. Shielded transfer container for MCOs containing either SNF from the K Basin or SNF units from other SNF.

Cask Transporter. Vehicle designed to move casks.

Conditioning. Processing of SNF by physical, chemical or mechanical means to prepare the SNF to meet predetermined requirements for safe and compliant storage or disposal. Does not include packaging.

Configuration. The functional and/or physical characteristics of hardware, firmware, software, or any other items as described in technical documentation and achieved in a product.

Constraints. Restrictions or limitations that must be met. Constraints are used to screen alternative strategies and are always nontradable by the designer (as opposed to requirements which are tradable).

Cost Baseline. A budget that has been developed from the cost estimate resulting from the designation of a configuration baseline. The cost baseline is referred to as a baseline since it is integrated with the technical and schedule baselines and subject to formal change control.

Cost Risk. The risk to a program in terms of overrunning the program cost baselines.

Deactivation. The process of removing a facility from DOE operations, with the intent of conversion to another use or permanent shutdown; by the removal of fuel, draining and/or de-energizing of systems, removal of stored radioactive and hazardous materials and other actions to place the facility in a safe and stable condition so that a Surveillance and Maintenance program will prevent any unacceptable risk to persons or the environment until ultimate disposition of the facility. DOE Office of Environmental Restoration, in their Decontamination and Decommissioning Guidance Document (draft - 14 January 1994).

Debris. Material found in the K Basins that is neither canisters, spent fuel, or sludge.

Dry Storage Cask. Above ground storage device/facility for other spent fuel.

Encapsulation. The process of packaging the SNF directly into a primary container.

Final Disposition. Off-site final disposal and/or beneficial reuse (use in lieu of "Permanent Disposition" or "Ultimate Disposition").

Foreign Spent Fuel. Non-Hanford source spent fuel - not within scope of SNFP

Function. Specific actions, activities, or processes that achieve or support the achievement of the mission. "What" must be achieved by the collective effects of all constituent parts. It is synonymous with "purpose".

Functional Analysis. Functional analysis identifies the functions that must be performed in order to meet the mission. These functions can then be allocated at increasingly greater levels of detail in order to provide an increasingly explicit depiction of the mission statement.

Goals. Statements describing the desired end point.

IDEF. Integrated DEFinition Method. A modeling method used to describe systems/ A system is represented in and IDEF model by boxes and arrows. The boxes represent functions. The information or physical entities necessary to carry-out the function and the information and products produced by the function are represented by arrows.

Interface. System boundary across which material, data, and/or energy passes.

Interim Facilities. Facilities associated with interim storage or preparation of SNF for interim storage including stabilization and handling of SNF.

Interim Storage. Hanford storage of SNF for an extended period,until final disposition of the SNF. (Use in lieu of "Long Term Storage.")

Licensed Equivalent Facility. Facilities that meet the appropriate requirements for the stabilization, transfer, and/or storage of SNF. This may or may not be NRC or other licensing regulations.

Made to Work. The operating configuration of a system which has been changed from the original drawings.

Measure of Effectiveness. A measure of how well the problem is being solved; i.e., how well the mission is being accomplished and its end state achieved.

Multicanister Overpack (MCO). Item to house canister - configuration to be determined. Designed specifically for K Basin fuels only.

NSNFP. National Spent Nuclear Fuel Program (DOE-HQ-EM-37).

Objectives. Discrete, measurable events that, if accomplished, will contribute to achieving a goal.

Operational Baseline. The technical baseline consisting of the "made to work" redlines, and operations and maintenance documents. This is the baseline associated with an operating system.

Other Spent Fuel. Spent fuel from other Hanford Site locations other than K Basins including FFTF, T-Plant, N Reactor, PUREX, TRIGA Reactor, 300 area fuel

Overpack. Temporary container to house breached MCOs.

Path Forward. Integrated activities to achieve a defined strategy for final disposition of SNF.

Performance. A quantitative measure characterizing a physical or functional attribute relating to the execution of a mission or function. Performance attributes include quantity (how many or how much), quality (how well), coverage (how much area, how far), timeliness (how responsive, how frequent), and readiness (availability, MTBF). Performance is an attribute for all system personnel, products and processes including those for development, production, verification, deployment, operations, support, training, and disposal.

Physical Interface. The physical boundary, including facilities and projects, across which material, data, and/or energy passes.

Pre-Interim Storage. Storage in an existing facility other than K Basins, until interim storage becomes available. (Use in lieu of "Alternate Storage.")

Prepare. Stabilization and handling of Spent Nuclear Fuel.

Problem Statement. A declaration of what is wrong and needs to be corrected to improve a situation.

Programmatic Risk. The risks involved in obtaining and using applicable resources and activities that are outside of the program control, but can affect the program's direction.

Public Involvement. A process by which the stakeholders' views are integrated into the DOE's decision-making process. The stake-holders' issues, concerns, and values will be understood and considered when making decisions. Public involvement is a dialogue between DOE and the stakeholders. This interaction goes beyond the public receiving information and providing comments after the decision is made.

Requirement. Requirements define how well a function must perform. Requirements set limits on functions and also limits on the outputs from functions. The description of a mandatory condition under which a function must be performed. Requirements are documented in technical specifications, statutes, regulations, Secretary of Energy Notices, DOE orders, or RL Directives or other official direction from the DOE customer.

Requirements Analysis. Requirements analysis identifies the requirements associated with each function. Requirements are allocated to each functional allocation in order to provide greater detail of the requirements.

Risk. A measure of uncertainty of attaining a goal, objective, or requirement pertaining to technical performance, cost, and schedule. Risk level is categorized by the probability of occurrence and consequences of occurrence. Risk is assessed for program, product, and process aspects of the system. This includes the adverse consequences of process variability. The sources of risk include technical (e.g. feasibility, operability, producibility, testability, and systems effectiveness); cost (e.g. estimates, goals); schedule (e.g. technology/material availability, technical achievements, milestones); and programmatic (e.g. resources, contractual).

Risk Analysis. Activities performed to determine the probability of events and the consequences associated with these potential actions that could affect the program. The purpose of risk analysis is to discover the cause, affect, and magnitude of the risk perceived in order to develop and examine alternative options.

Risk Assessment. The process of identifying areas of potential risk and prioritizing these risks. Risk assessment will identify the nature of , and measure the significance of the risks.

Risk Handling. The development and implementation of techniques and methods to reduce or control risk.

Risk Identification. The process of identifying and documenting program uncertainties with potentially detrimental effects.

Risk Management. An organized, analytical process to identify risks, analyze risks, and develop and implement approaches to handle the risks.

Risk Management Plan (RMP). Description of the risk management program that describes the approach and activities for risk management. The technical risk management plan is an essential part of the SEMP.

Safety Risk. Risks that may have adverse effects on worker or public health.

Schedule Baseline. The time-phased plan with logical sequence of interdependent activities, milestones, and events necessary to complete the program. The schedule baseline is integrated with the cost and technical baselines and is subject to formal change control.

Schedule Risk. The risk to a program of project of not meeting the major milestones on time.

Shroud. Shielded cover used for transferring MCOs within confines of the building.

Siamese. 2 canisters/unit; side by side; 18" across

Sludge. Spent Nuclear Fuel pieces and degradation products plus all other solid debris including concrete grit. Sludge material is finer than 1/4 in. in size.

Sludge Transporter. Vehicle designed to move sludge without canisters or casks.

Spent Nuclear Fuel. Nuclear fuel that has been withdrawn from a nuclear reactor following irradiation and the constituent elements that have not been separated by reprocessing.

Stabilization. The combination of conditioning and/or packaging of the SNF. Process to convert metal fuel from K Basins to stable (non-reactive) form.

Staging. Holding MCO's prior to stabilization of SNF

Stakeholder. A person or group that is potentially affected by actions at the Hanford Site.

Storage. Post stabilization holding of MCOs

Storage Pad. Location outside of SSF to locate spent fuel storage casks for dry storage of other spent fuel and/or stabilized K Basin fuel

System Acquisition Team (SAT). A multi-functional team tasked with developing each SNFP individual system. Each team is responsible for product, scope, cost, schedule, and performance of its system.

Systems Engineering. The systematic approach used to transform technical goals, and objectives into an optimized, operational, physical system that achieves its mission.The iterative technical and management process applied throughout a system life cycle that produces and maintains a well defined and documented system technical baseline.

Systems Engineering Management Plan (SEMP). The document that defines the technical plan for the conduct of the fully integrated SNFP engineering effort.

Systems Engineering Process. A comprehensive, iterative problem solving process that: (a) transforms validated customer needs and requirements into a description of a life-cycle balanced solution set of people, products, and processes; (b) generates information for decision makers; and (c) provides information for follow-on technical efforts.

Technical Baseline. The documented functions, requirements, and configuration from which the program will acquire an operational system. The technical baseline is maintained under configuration control, and is the basis for technical performance measurement.

Technical Performance Measurement (TPM). The continuing verification of the degree of anticipated and actual achievement of technical parameters. Confirms progress and identifies deficiencies that might jeopardize meeting a system requirement. Assessed values falling outside established tolerances indicated a need for evaluation and corrective action.

Technical Risk. The risk associated with the possibility of a system failing to meet the requirements as described in the technical baseline.

Temporary Storage. The present SNF storage in the K Basins. (Use in lieu of "current storage")

Trade Study. (1) The process of comparing or trading the strengths and weaknesses of alternative approaches or attributes; (2) a feedback process for resolving inconsistencies between steps or levels; (3) the analysis of the ability of a design solution to meet its stated objectives as inputs are varied.

Transfer. Movement of materials within the confines of the DOE controlled Hanford site.

Transport. Movement of materials off of the DOE controlled Hanford site, subject to regulation b y other governmental agencies.

Treat. Any chemical or physical process required to render the SNF acceptable for storage. Does not include packaging.

Treatment. Act of processing SNF to render it acceptable for storage, not including packaging.

Uncertainty. Lack of technical, schedule, cost, or institutional information that could adversely impact a program's outcome or ability to accomplish the mission.

Vault. 1.) Single large structure within everything included within -- can be above grade or below grade -- may encompass pools, cells or modular segments -- as defined in ANSI 57.9. 2.) Shielded facility to handle/house multiple MCOs for wet or dry cooling.

Verification and Validation. Verification involves determining the extent to which a system was implemented in accordance with its specifications. Validation involves assessing the effectiveness of a verified system in accomplishing and sustaining its mission. For either class of testing, all critical performance characteristics will be identified and required performance will be evaluated.

Water Treatment. Act of processing the tritiated water in the basins to render it acceptable for disposal as liquid effluent.

Work Breakdown Structure (WBS). A product-oriented family tree composed of hardware, software, data, and facilities which result from systems engineering efforts during the development and production of a system, and which completely defines the program or project. Displays and defines the product(s) to be developed or produced, and relates the elements of work to be accomplished to each other and to the end product.

ACRONYMS

ADA	Americans with Disabilities Act
ALARA	As Low as Reasonably Achievable
AMSE	American Society of Mechanical Engineers
ANS	American Nuclear Society
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration/Air-Conditioning Engineers
AWS	American Welding Society
CFR	Code of Federal Regulations
D&D	Decontamination and Decommissioning
DQO	Data Quality Objectives
EA	Environmental Assessment
EIS	Environmental Impact Statement
EM-30	DOE-HQ, Office of Waste Management
EM-40	DOE-HQ, Office of Environmental Restoration
EM-50	DOE-HQ, Office of Technology Development
EM-60	DOE-HQ, Office of Facility Transition
FFTF	Fast Flux Test Facility
IDEF	Integrated DEFinition Method
IEEE	Institute of Electrical & Electronics Engineer HPS Hanford Plant Standard
EIS	Environmental Impact Statement
KE	K East Basin
KW	K West Basin

MCO	Multi-Canister Overpack
MTU	Metric Tons Uranium
NOV	Notice of Violation, Washington State Department of Health
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety & Health
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety & Health Administration
PEIS	Programmatic EIS
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SAT	System Acquisition Team
SCD	Standard Design Criteria
SMACNH	Sheet Metal & Air Conditioning National Association?
SNF	Spent Nuclear Fuel
SNFP	Spent Nuclear Fuel Project (Hanford Site)
SPR	Single Pass Reactor
S/RID	Standards/Requirements Identification Document
SSF	Staging & Storage Facility
TPA	Tri-Party Agreement
UBC	Uniform Building Code
UMC	Uniform Mechanical Code

UPC	Uniform Plumbing Code
WAC	Washington Administrative Code
USQ	Unreviewed Safety Question

14.0 BIBLIOGRAPHY

105 K-East and 105 K-West Basin Fuel and Sludge Consolidation Study -- Summary Report, Columbia Energy and Environmental Services, Inc., 30 June 1994

105-KE Basin Spent Nuclear Fuel Pilot Run Relocation, WHC-SD-SNF-PD-001, Westinghouse Hanford Company, June 1994

105-KE Basin Spent Nuclear Fuel Pilot Run - Functions and Requirements (Rev. A), WHC-SD-SNF-FRD-002, Westinghouse Hanford Company, June 1994

J. Abrefah, et al, *Characterization Plan for Hanford Spent Nuclear Fuel,* Pacific Northwest Laboratories, September 1994

Appendix B Environmental Statutes, Regulations and Orders Applicable to Westinghouse Hanford Company, WHC-CM-7-5, Westinghouse Hanford Company, 15 July 1993

Approval of Path Forward for N Reactor Spent Nuclear Fuel Interim Storage, DOE Letter Dated 9 November 1994, to T.P Grumbly, from J.E. Lytle

K. H. Bergsman, *Hanford Irradiated Fuel Inventory Baseline*, WHC-SD-CP-TI-175 Rev. 1, Westinghouse Hanford Company, 29 January 1993

K. H. Bergsman, *Hanford Spent Fuel Inventory Baseline*, WHC-SD-SNF-TI-001 Rev. 0, Westinghouse Hanford Company, 15 July 1994

R.W. Carpenter, *100-K Area Technical Baseline Report, (Rev. 0)*, WHC-SD-EN-TI-239, Westinghouse Hanford Company, 12 April 1994

John T. Conway, *Recommendation 90-2 to the Secretary of Energy*, Defense Nuclear Facilities Safety Board, 8 March 1990

John T. Conway, *Recommendation 94-1 to the Secretary of Energy*, Defense Nuclear Facilities Safety Board, 26 May 1994

R. A. Cox, C. R. Miska, et al, *N Fuel Dry Storage Technical Evaluation*, Westinghouse Hanford Company, 7 June 1994

J. L Daily, *Spent Fuel Characterization Plan,* DOE-RL letter 9402752B, 29 April 1994

Defense Nuclear Facilities Safety Board, *Annual Report to Congress*, February 1994

Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement, Volume 1 Appendix A, Hanford Site Spent Nuclear fuel Management Program, DOE/EIS-0203, U.S. Department of Energy, June 1994

DOE Spent Nuclear Fuel Technology Integration Plan, SNF-PP-FS-002, Rev. 0, U.S. Department of Energy, EM, Office of Spent Fuel Management and Special Projects, December 1994

DOE-Owned Spent Nuclear Fuel Strategic Plan, U.S. Department of Energy, Office of Environmental Restoration and Waste Management, EM-37, December 1994, Attachment to DOE Memorandum dated 23 December 1994

Dry Storage of N Reactor Fuel, Independent Technical Assessment, vol. 1, MAC Technical Services Co., September 1994

B. G. Edgerton, *Spent Nuclear Fuel Program Systems Engineering Initial Systems Analysis*, OPE-SNF-BGE-94044, U.S. Department of Energy Idaho Operations Office, 29 April 1994

Engineering Study of the Transfer of Irradiated Fuels on the Hanford Site, WHC-SD-TP-ES-001, Rev 0, Westinghouse Hanford Company, 20 April 1993

Existing Alternate Storage Locations for Irradiated N-Reactor Fuel At Hanford, (Rev. 0), WHC-SD-NR-ES-010, Raytheon Engineers & Constructors, Inc. 23 September 1993

Expedited Fuel and Sludge Removal from the 105-K Basins (predecisional draft), ESI-94-028, Westinghouse Hanford Company, 24 June 1994

Expedited Fuel Removal Initiative Independent Review/Expedited Fuel Removal Process Systems Presentation, Westinghouse Hanford Company, 19 July 1994

Facility Decommissioning Process Strategy Tri-Party Agreement, Fourth Amendment, Section 14.0, Draft, 9 September 1994

Federal Register Vol. 58, No. 178, Record of Decision, *Final Environmental Impact Statement for the Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington*, 16 September 1993

L. V. Feigenbutz, *Functions and Requirements for 105-KE Basin Sludge Retrieval and Packaging*, WHC-SD-SNF-FRD-003 Rev. B, Westinghouse Hanford Company, 19 October 1994

Final Environmental Impact Statement for the Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington, DOE/EIS-0119F, May 1993

Fiscal Year 1995 Hanford Mission Plan, Volume I, Site Guidance, DOE/RL-93-102, Department of Energy, Richland Operations Office, September 1994

J. R. Frederickson, *K-East Basin Pilot Run*, Presentation Westinghouse Hanford Company, June 1994

J. R. Frederickson, *K-East Basin Pilot Run - Presentation to Defense Nuclear Facility Safety Board*, Westinghouse Hanford Company, 13 April 1994

J. C. Fulton Letter to R. A. Holton, *K Basin Sludge Classification Recommendation*, WHC 9550053, 6 June 1993

J. C. Fulton, *Spent Nuclear Fuel Characterization Management Plan,* Letter, Westinghouse Hanford Company, Attaches Document "Characterization Program Management Plan for Hanford Spent Nuclear Fuel", 9402752B R2, 29 April 1994

E. W. Gerber Letter to J. L. Daily, *Draft Hanford Site Integrated Program Plan*, WHC 9458720, 30 December 1994, as modified 16 January 1995

E. W. Gerber, *Expedited K Basins Fuel and Sludge Removal,* Presentation Westinghouse Hanford Company, June 1994

T. M. Grumbly, *National Spent Nuclear Fuel Decision Paper*, January 1995

Hanford Facility Agreement and Consent Order - Fourth Amendment (Tri-Party Agreement [TPA]), U.S. Department of Energy, 89-10 Rev. 3 January 1994

Hanford Federal Facility Compliance Agreement and Consent Order - Fourth Amendment (Tri-Party Agreement [TPA]), U.S. Department of Energy, 89-10 Rev. 3 January 1994

Hanford Mission Plan, Volume 1, Site Guidance, DOE/RL-93-08, U.S. Department of Energy, August 1993

Hanford Site Spent Nuclear Fuels Project Draft Project Plan, U.S. Army Corps of Engineers/Project Time & Cost, Inc., 30 June 1994

Hanford Site Systems Engineering Management Plan, (Rev. 0), Westinghouse Hanford Company, 23 June 1994, Attachment to WHC Letter 9454364

Hanford Site Systems Engineering Configuration Management Plan, Attachment to WHC Letter 9451937, Westinghouse Hanford Company, 18 March 1994

Hanford Site Systems Engineering Manual -- Mission Analysis Interim Process Description -- Spent Nuclear Fuel Project, (draft), Westinghouse Hanford Company, 12 May 1994

Hanford Site Systems Engineering Manual, (draft), Westinghouse Hanford Company, 12 August 1994, Attachment to WHC Letter 945534

Hanford Site Waste Management Plan, DOE/RL-89-32, U.S. Department of Energy, December 1989

Hanford Spent Nuclear Fuel Project, Presentation to DNFSB, Westinghouse Hanford Company, 4 May 1994

Hanford Spent Nuclear Fuel Project Recommended Path Forward, WHC-EP-0630, Westinghouse Hanford Company, October 1994.

Hanford Strategic Analysis Study, WHC-EP-0549, Draft, vol I, Westinghouse Hanford Company, November 1993

J. J. Holmes, *Architecture Synthesis Basis for the Hanford Cleanup system: First Issue*, Westinghouse Hanford Company, WHC-EP-0779 DRAFT, June 1994

J. J. Holmes, K. B. Bailey, J. L. Collings A. B. Hubbard, T. M. Niepke, *Systems Engineering Product Description Report for the Hanford Cleanup Mission: First Issue (Draft)*, Westinghouse Hanford Company, WHC-EP-0783 DRAFT, June 1994

INSIDE ENERGY/with FEDERAL LANDS, "Grumbly Rules Out Possibility U.S. Would Ship Spent Fuel Overseas", 27 June 1994

Issue Paper on the Application of Resource Conservation and Recovery Act to Spent Nuclear Fuel, Westinghouse Hanford Company, 15 July 1994

Issue Paper on the Interpretation of Department of Energy Order 5820.2A, Westinghouse Hanford Company, 15 July 1994

K Basin Path Forward Regulatory Approach, Draft, Westinghouse Hanford Company, December 1994

L. A. Lawrence and K. S. Redus, *Spent Nuclear Fuels Project Data Quality Objectives Strategy (draft)*, Westinghouse Hanford Company, June 1994

Letter, R. D. Denney, Idaho National Engineering Laboratory to J. C. Fulton, Westinghouse Hanford Company, "DOE Spent Nuclear Fuel Inventory", RDD-07-94, 18 April 1994

List of Published CM Manuals/Abstracts, Westinghouse Hanford Company, 27 June 1994

R. L. McCormack Letter to J.L. Daily, *Hanford Spent Nuclear Fuel Material Classifications*, WHC 9457909, 22 November 1994

R. L. McCormack, *National Spent Nuclear Fuel Program*, Presentation Westinghouse Hanford Company, June 1994

R. L. McCormack, *N Reactor Irradiated Fuel Dry Storage Technical Evaluation*, Westinghouse Hanford Company, 13 April 1994

Military Standard Systems Engineering, MIL-STD-499B, Draft, U.S. Department of Defense, 6 June 1992

Minutes of the Environmental Impact Statement (EIS) Executive Committee (EEC) Meeting No. 8 Held December 14, 1994 (OPE-EIS-94.799), DOE-Idaho Operations Office, 27 December 1994

M. J. Monthey, K. H. Bergsman, *Commercially Available Dry Storage Systems for Storage of Irradiated Fuel on the Hanford Site*, WHC-SD-CP-ES-155, REV 0, Westinghouse Hanford Company, 17 March 1994

R. P. Omberg, *Fuel and Sludge Characterization*, Presentation Westinghouse Hanford Company, June 1994

Overview of SNF Program, Presentation U.S. Department of Energy, 13 July 1994

K. A. Peterson, *Facility Transition and Decommissioning Process Strategy Definitions for Negotiations on The Hanford Federal Facility Agreement and Consent Order Tri-Party Agreement (draft)*, Westinghouse Hanford Company, 22 June 1994

Plan of Action to Resolve Spent Nuclear Fuel Vulnerabilities, Phase III, .S. Department of Energy Office of Environmental Restoration and Waste Management, October 1994

Preliminary Waste Acceptance Criteria, WINCO-1157, Rev. 1, Draft, Lockheed Idaho Technologies Company, September 1994

Project Activity Reference Guide, WHC-CM-6-2, Appendix C, Westinghouse Hanford Company, 2 August 1994

Project Management System, U.S. Department of Energy, DOE 4700.1, 2 June 1992.

Public Participation Program Plan for the Department of Energy-Owned Spent Nuclear Fuel Program, Draft, U.S. Department of Energy Office of Spent Nuclear Fuel Management

Radioactive Waste Management, U.S. Department of Energy, DOE 5820.2A, 26 September 1994

RLID 0000.1A, *Directives Checklist*, U.S. Department of Energy - Richland Operations Office, 1 April 1994

RLPD 4900.1, "Systems Engineering", U.S. Department of Energy Richland Operations Office, 23 May 1994

Jim Saylor, *Issue Paper #1 on the Application of RCRA to Spent Nuclear Fuel*, Idaho National Engineering Laboratory, 2 June 1994

J. P. Schmidt, "PUREX Fuel Shipments", Internal memo, Westinghouse Hanford Company, 22 December 1993

D. Smith, *DOE EM Spent Nuclear Fuel Program Draft Strategic Plan What, Why, When*, Presentation U.S. Department of Energy Headquarters, 17 May 1994

SNF Engineering Projects Near Term Tasks and Objectives Presentation Hanford SNF Meeting, Westinghouse Hanford Company, 12 July 1994

Spent Fuel Consolidation in the 105-KW Building Fuel Storage Basin, WHC-SD-N040-ES-001, Rev. 0, ICF Kaiser Hanford Company, September 1994

Spent Fuel Working Group Report on Inventory and Storage of the Department's Spent Nuclear Fuel and other Reactor Irradiated Nuclear Materials and Their Environmental, Safety and Health Vulnerabilities, Volume 1, U.S. Department of Energy, November 1993

Spent Nuclear Fuel Activities Task Team (charts), Westinghouse Hanford Company, 25 March 1994

Spent Nuclear Fuel Engineering Characterization - Presentation to the Defense Nuclear Facilities Safety Board, Westinghouse Hanford Company, 12 April 1994

Spent Nuclear Fuel Program Requirements Document, SNF-RD-PM-001, U.S. Department of Energy, EM-37, October 1994

Spent Nuclear Fuel Project Characterization Data, Data Quality Objective Strategy, WHC-EP-0795, Rev. 0, Westinghouse Hanford Company, December 1994

Spent Nuclear Fuel Project Functions and Requirements Document (Draft), Westinghouse Hanford Company, August 1994

Spent Nuclear Fuel Project FY 1995 Multi-Year Program Plan, WBS 1.4, Westinghouse Hanford Company, WHC-SP-1104, 23 September 1994

Spent Nuclear Fuel Project K Basins Path Forward Acquisition Strategy, WHC-SP-1144, Westinghouse Hanford Company, December 1994

Spent Nuclear Fuel Project Multi Year Program Plan, Westinghouse Hanford Company, September 1994

*Spent Nuclear Fuel Project Mission Analysis Report (*Rev. A), WHC-EP-0790, Westinghouse Hanford Company, September 1994

Spent Nuclear Fuel Project Technical Baseline Document, WHC-SD-SNF-SD-002, 4 vols., September 1994

Spent Nuclear Fuel Strategic Plan, (draft), U.S. Department of Energy, May 1994

Strategic Plan for Managing Spent Nuclear Fuel on the Hanford Site, (draft), Westinghouse Hanford Company, March 1994

Systems Engineering Functions and Requirements for the Hanford Cleanup Mission: First Issue, (Rev. 0), WHC-EP-0722, Westinghouse Hanford Company, January 1994

Systems Engineering Management Plan, YMP/CC-0007, Rev. 4, Department of Energy, March 1994

Systems Engineering Management Policy and Guidance (draft), U.S. Department of Energy - Office of Environmental Restoration and Waste Management, EM-37, 1 July 1994

Systems Engineering Product Breakdown Structure for the Hanford Cleanup Mission, First Issue, WHC-EP-0801, Draft, Westinghouse Hanford Company, August 1994

Tank Waste Remediation System Decisions and Risk Assessment, WHC-EP-0768, Westinghouse Hanford Company, September 1994

Waste Management Current Strategy and Program Plan, Section 8 (Spent Nuclear Fuel) and Section 9 (Transuranic Waste), U.S Department of Energy, 26 July 1994

WHC-CM-1, *Company Policies and Charters*, Spent Nuclear Fuel Project Charter, December 5, 1994