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Volume 1

DNFSB Recommendation 94-1 Hanford Site Integrated Stabilization Management Plan

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Assistant Secretary for Environmental Management

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Richland, Washington

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DNFSB RECOMMENDATION 94-1
HANFORD SITE INTEGRATED STABILIZATION
MANAGEMENT PLAN

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) has developed an Integrated Program Plan (IPP) to address concerns identified in Defense Nuclear Facilities Safety Board Recommendation 94-1. The IPP describes the actions that DOE plans to implement at its various sites to convert excess fissile materials to forms or conditions suitable for safe interim storage. The baseline IPP was issued as DOE's Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 94-1 Implementation Plan (IP), which was transmitted to the DNFSB on February 28, 1995. The IPP was subsequently supplemented with an Integrated Facilities Plan and a Research and Development Plan, which further develop complex-wide research and development and long-range facility requirements and plans. These additions to the baseline IPP were developed based on a systems engineering approach that integrated facilities and capabilities at the various DOE sites and focused on attaining safe interim storage with minimum safety risks and environmental impacts.

Each affected DOE site has developed a Site Integrated Stabilization Management Plan (SISMP) to identify individual site plans to implement the DNFSB Recommendation 94-1 IPP. The SISMPs were developed based on the objectives, requirements, and commitments identified in the DNFSB Recommendation 94-1 IP. The SISMPs supported formulation of the initial revisions of the Integrated Facilities Plan and the Research and Development Plan. The SISMPs are periodically updated to reflect improved integration between DOE sites as identified during the IPP systems engineering evaluations.

This document constitutes the Hanford SISMP. This document includes the planned work scope, costs and schedules for activities at the Hanford Site to implement the DNFSB Recommendation 94-1 IPP.

Materials within the scope of this SISMP include spent nuclear fuel (SNF) and plutonium-bearing materials currently located at the Hanford Site. The Hanford Site SISMP is comprised of two volumes. Volume 1 identifies the plans for placing these materials in safe interim storage, and Volume 2 provides integrated schedules for completing the planned work scope identified in Volume 1.

The plans identified in the Hanford SISMP will result in removal of SNF from the 105-K Basins (K Basins) by December 1999, consistent with the DNFSB's recommendation "*that the program be accelerated to place the deteriorating reactor fuel in the K-East Basin at the Hanford Site in a stable configuration for interim storage until an option for ultimate disposition is chosen.*" The plans will also result in removal of all sludge from the K Basins by December 2000. Additionally, the plans will place Hanford Site plutonium-bearing materials in safe interim storage by May 2002.

The cost of achieving safe interim dry storage of the K Basins SNF is estimated at $472 million. This cost is based on current budget estimates and includes the costs to retrieve, package, cold vacuum dry, transport, stage, condition and implement dry interim storage (i.e., characterize SNF, acquire facilities, etc.) and disposition K Basins sludge. The projected cost to manage the K Basins SNF until hot conditioning is completed is $612 million. This cost includes operations at the K Basins in addition to the costs to achieve safe interim dry storage. The $612 million estimated cost does not include the program costs associated with K Basins deactivation. These costs are based on remaining costs for the activities from the beginning of fiscal year (FY) 1996 until completion.

The cost to achieve safe interim storage of the plutonium-bearing materials is estimated at $145 million to $160 million. This plan assumes that DOE will reallocate resources to provide the budgets necessary to attain safe interim storage within schedule commitments.

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BWR	Boiling Water Reactor
CCC	Core Component Container
CSB	Canister Storage Building
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DOE-HQ	U.S. Department of Energy, Headquarters
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FFTF	Fast Flux Test Facility
FSAR	Final Analysis Safety Report
FY	Fiscal Year
GPP	General Plant Project
IAEA	International Atomic Energy Agency
INEL	Idaho National Engineering Laboratory
IP	Implementation Plan
IPP	Integrated Program Plan
ISA	Interim Storage Area
ISC	Interim Storage Cask
LAMPRE	Los Alamos Molten Plutonium Reactor Experiment
LLBG	Low-Level Burial Ground
LOI	Loss On Ignition
LWR	Light Water Reactor
MCO	Multi Canister Overpack
MTU	Metric Tons Uranium
NEPA	National Environmental Policy Act
OSU	Oregon State University
PFP	Plutonium Finishing Plant
PNNL	Pacific Northwest National Laboratory
PRF	Plutonium Reclamation Facility
PUREX	Plutonium-Uranium Extraction
PWR	Pressurized Water Reactor
RCRA	Resource Conservation and Recovery Act
RL	U.S. Department of Energy, Richland Operations Office
ROD	Record of Decision
RSB	Reactor Service Building
SAS	Safeguards and Security
SISMP	Site Integrated Stabilization Management Plan
SNF	Spent Nuclear Fuel
SNFP	Spent Nuclear Fuel Project
SPR	Single Pass Reactor
TRIGA	Training Reactor, Isotopes, General Atomics
TRU	Transuranic
WHC	Westinghouse Hanford Company
WT%	Weight Percent
WIPP	Waste Isolation Pilot Plant

1.0 INTRODUCTION

1.1 BACKGROUND

In May 1994, the Defense Nuclear Facilities Safety Board (DNFSB) issued DNFSB Recommendation 94-1 (Conway 1994), which identified concerns related to U.S. Department of Energy (DOE) management of legacy fissile materials remaining from past defense production activities. The DNFSB expressed concern about the existing storage conditions for these materials and the slow pace at which the conditions were being remediated. The DNFSB also expressed its belief that additional delays in stabilizing these fissile materials would be accompanied by further deterioration of safety and unnecessary increased risks to workers and the public.

In February 1995, DOE issued the *DNFSB Recommendation 94-1 Implementation Plan* (O'Leary 1995) to address the concerns identified in DNFSB Recommendation 94-1. The Implementation Plan (IP) identifies several DOE commitments to achieve safe interim storage for the legacy fissile materials, and constitutes DOE's baseline DNFSB Recommendation 94-1 Integrated Program Plan (IPP). The IPP describes the actions DOE plans to implement within the DOE complex to convert its excess fissile materials to forms or conditions suitable for safe interim storage. The IPP was subsequently supplemented with an Integrated Facilities Plan and a Research and Development Plan, which further develop complex-wide research and development and long-range facility requirements and plans. The additions to the baseline IPP were developed based on a systems engineering approach that integrated facilities and capabilities at the various DOE sites and focused on attaining safe interim storage with minimum safety risks and environmental impacts.

Each affected DOE site has developed a Site Integrated Stabilization Management Plan (SISMP) to identify individual site plans to implement the DNFSB Recommendation 94-1 IPP. The SISMPs were developed based on the objectives, requirements, and commitments identified in the DNFSB Recommendation 94-1 IP. The SISMPs also supported formulation of the initial revisions of the Integrated Facilities Plan and the Research and Development Plan. The SISMPs are periodically updated to reflect improved integration between DOE sites as identified during the IPP systems engineering evaluations.

The Hanford Site SISMP includes plans to address DNFSB Recommendation 94-1 concerns related to management of SNF and plutonium-bearing materials at the Hanford Site. The following Hanford Site-related concerns were identified in DNFSB Recommendation 94-1:

- *"The K-East Basin at the Hanford Site contains hundreds of tons of deteriorating irradiated nuclear fuel from the N Reactor. This fuel has been heavily corroded during its long period of storage under water, and the bottom of the basin is now covered by a thick deposit of sludge containing actinide compounds and fission products. The basin is near the Columbia River. It has leaked on several occasions, is likely to leak again, and has design and construction defects that make it seismically unsafe."*

- *"There are thousands of containers of plutonium-bearing liquids and solids at the Rocky Flats Plant, the Hanford Site, the Savannah River Site, and the Los Alamos National Laboratory. These materials were in the nuclear-weapons manufacturing pipeline when manufacturing ended. Large quantities of plutonium solutions are stored in deteriorating tanks, piping, and plastic bottles. Thousands of containers at the Rocky Flats Plant hold miscellaneous plutonium-bearing materials classed as "residuals", some of which are chemically unstable. Many of the containers of plutonium metal also contain plastic and, in some at the Rocky Flats Plant, the plastic is believed to be in intimate contact with the plutonium. It is well known that plutonium in contact with plastic can cause formation of hydrogen gas and pyrophoric plutonium compounds leading to a high probability of plutonium fires."*

The plans in the Hanford Site SISMP have been developed consistent with the DNFSB recommendations, including the following recommendations directly affecting the Hanford Site:

> *"That the program be accelerated to place the deteriorating reactor fuel in the K-East Basin at the Hanford Site in a stable configuration 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."*
>
> *"That an integrated program plan be formulated on a high priority basis, to convert within 2-3 years the materials addressed in the specific recommendations below, to forms or conditions suitable for safe interim storage. This plan should recognize that remediation will require a systems engineering approach, involving integration of facilities and capabilities at a number of sites, and will require attention to limiting worker exposure and minimizing generation of additional waste and emission of effluents to the environment. The plan should include a provision that, within a reasonable period of time (such as eight years), all storage of plutonium metal and oxide should be in conformance with the draft DOE Standard on storage of plutonium now being made final."*

Consistent with commitments in the DNFSB Recommendation 94-1 IP, schedule acceleration will result in removal of SNF from the 105 K East Basin (KE Basin) by December 1999 and will result in placement of plutonium-bearing materials at the Hanford Site Plutonium Finishing Plant (PFP) into safe interim storage by May 2002.

1.2 PURPOSE

This document comprises the Hanford SISMP. This document describes the DOE's plans at the Hanford Site to address concerns identified in DNFSB Recommendation 94-1. This document also identifies plans for other SNF inventories at the Hanford Site which are not within the scope of DNFSB Recommendation 94-1 for reference purposes because of their interrelationship with plans for SNF within the scope of DNFSB Recommendation 94-1. The SISMP was also developed to assist DOE in initial formulation of the Research and Development Plan and the Integrated Facilities Plan.

1.3 SCOPE

Materials within the scope of this SISMP include SNF and plutonium-bearing materials currently located at the Hanford Site as identified in DOE's DNFSB Recommendation 94-1 IP. The Hanford SISMP is comprised of two volumes. Volume 1 provides the plans for placing the SNF and plutonium-bearing materials into safe interim storage, and Volume 2 provides integrated schedules for completion of the planned work scope identified in Volume 1.

1.4 ORGANIZATIONAL RESPONSIBILITIES

Multiple organizations will support implementation of planned activities identified in this SISMP. The U.S. Department of Energy-Headquarters (DOE-HQ) general organizational roles and responsibilities and interfaces with the DOE field offices for DNFSB 94-1-related activities are defined in the DNFSB 94-1 Implementation Plan (O'Leary 1995).

At the U.S. Department of Energy, Richland Operations Office (RL), the Spent Nuclear Fuel Project Division (SFD) has responsibility for the overall management, administration, and performance of the SNF Project to ensure the required levels of quality, safety, and environmental compliance are achieved within established technical, cost, and schedule baselines. The SFD is also responsible for management of the Hanford Site development of the SISMP and verifying performance to SNF related aspects of the SISMP schedule, cost, and technical baselines.

The Westinghouse Hanford Company (WHC) SNF Project is responsible for implementing the K Basins path forward and integrating interim storage activities for other Hanford SNF inventories. The WHC SNF Project is also responsible for developing the Hanford Site SNF related input to the SISMP and providing contractor input on performance of SNF related schedule, cost, and technical baselines to the RL SFD. Specific responsibilities and authorities for management of Hanford Site SNF activities are identified in WHC-SD-SNF-PMP-011, Hanford Site Spent Nuclear Fuel Project Management Plan (WHC 1995a).

The RL Transition Project Division (TPD) has responsibility for management of the Plutonium Finishing Plant (PFP) that is similar to SFD's responsibilities for SNF management. The TPD's PFP Transition Project Office provides oversight on the performance of WHC with respect to schedules, costs, and technical baseline for the RL Transition Projects Division. The WHC PFP Transition Project provides the management and organization necessary for PFP to stabilize, store, and dispose of those materials covered by this SISMP until final disposition. The WHC PFP Transition Project ensures that PFP is managed in a safe, efficient, and environmentally sound manner to achieve the objectives of this SISMP. Responsibilities and standards of operation required in the performance of all work at PFP are identified in WHC-CM-5-8, *Plutonium Finishing Plant Administration, Volume 1.*

The responsible RL and WHC Recommendation 94-1 Program Managers are as follows:

<u>Spent Nuclear Fuel</u>		
RL	O. M. Holgado	509-373-0589
WHC	R. L. McCormack	509-376-7057
<u>Plutonium Bearing Materials</u>		
RL	D. W. Templeton	509-373-2966
WHC	T. E. Huber	509-373-1503

1.5 SUMMARY

The plans identified in the Hanford Site SISMP will result in removal of SNF from the K Basins by December 1999, consistent with the DNFSB's recommendation *"That the program be accelerated to place the deteriorating reactor fuel in the K-East Basin at the Hanford Site in a stable configuration for interim storage until an option for ultimate disposition is chosen."* Additionally, plutonium bearing materials will be placed in safe interim storage by May 2002. A summary schedule for planned activities is provided in Figure 1-1.

The cost of achieving safe interim dry storage of the K Basins SNF, including hot conditioning, is estimated at $472 million. This cost is based on current budget estimates and includes the costs to retrieve, package, cold vacuum dry, transport, stage, condition and implement dry interim storage (i.e., characterize SNF, acquire facilities, etc.) and disposition K Basins sludge. The projected cost to manage the K Basins SNF until hot conditioning is completed is $612 million. This cost includes operations at the K Basins in addition to the costs to achieve safe interim dry storage. The $612 million estimated cost does not include the program costs associated with K Basins deactivation. These costs are based on remaining costs for the activities from the beginning of FY 1996 until completion.

The cost to achieve safe interim storage of the plutonium-bearing materials is estimated at $145 million to $160 million. This plan assumes that DOE will reallocate resources to provide the budgets necessary to attain safe interim storage within schedule commitments.

The budget profiles are summarized in Table 1-1.

Figure 1-1. Summary Schedule.

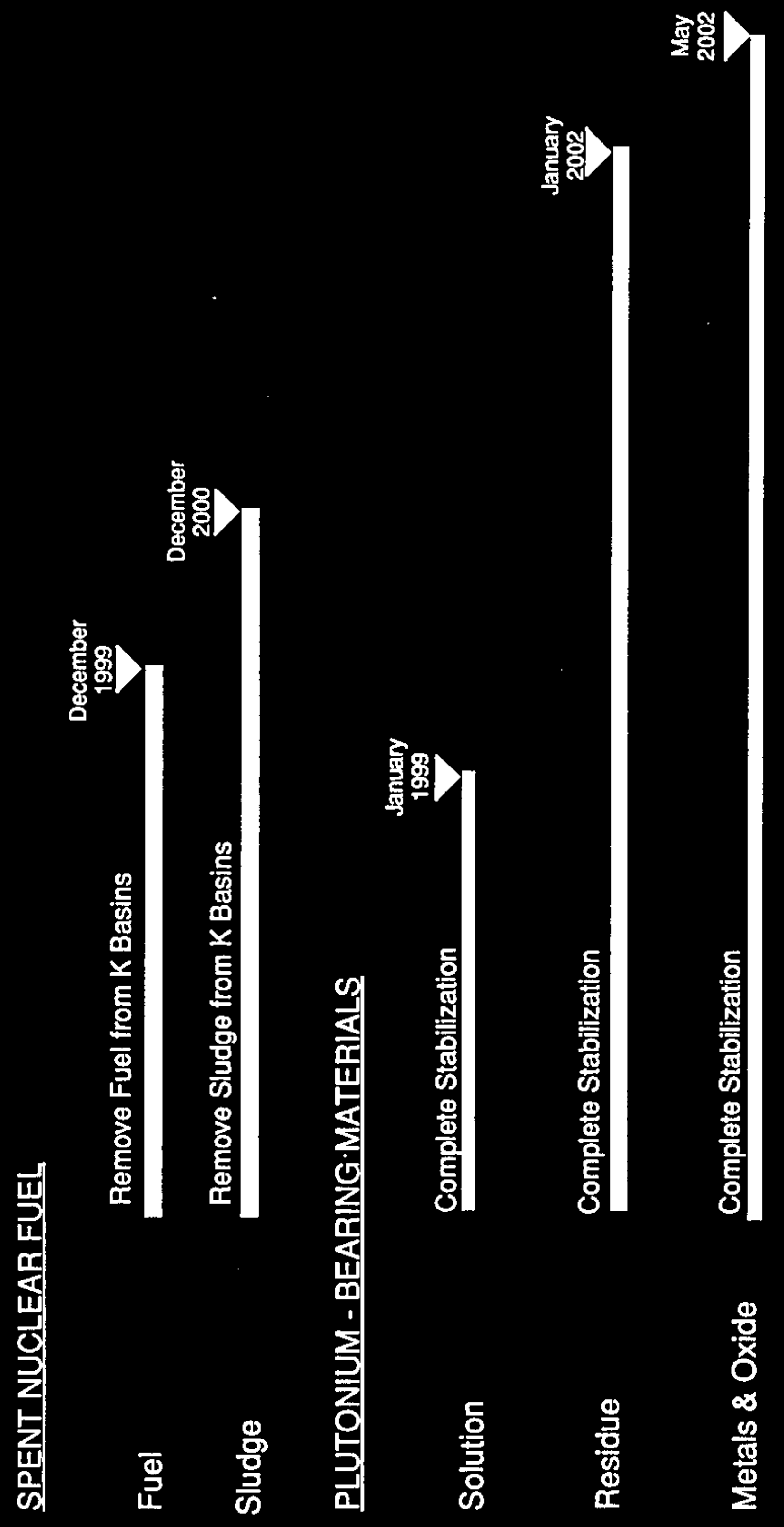


Table 1-1. Budget Profile. (Dollars in Millions)

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002
K Basins Total*	136.9	174.7	122.7	100.5	64.8	12.0	-
- Actions to Achieve Dry Interim Storage	106.8	148.1	96.2	74.0	39.8	6.7	-
- Other K Basins Project Activities	30.1	26.6	26.5	26.5	25.0	5.3	-
Plutonium-Bearing Materials	20.5	27.4	31.3	21.0	19.8	15.8	14.7

* Actions to achieve dry interim storage of K Basins SNF include fuel retrieval, packaging, cold vacuum drying, transport, staging, hot conditioning, and emplacement into dry storage (i.e., characterization, facility acquisitions, etc.). Other K Basins project activities include on-going K Basins operations. Costs associated with other Hanford Site SNF management and K Basins deactivation are not included in the K Basins Total cost estimate.

PFP cost estimates reflect the fiscal year 1996 Multi-Year Program Plan and do not necessarily reflect the change outline in the text of this document.

2.0 HANFORD SITE SPENT NUCLEAR FUEL

The Hanford Site's Spent Nuclear Fuel (SNF) Project was formed in early 1994 to manage the Hanford Site's SNF and to address the urgent need to move the SNF from its present degraded storage conditions at the K Basins to safe interim storage until final disposition. Additionally, the SNF Project was chartered to integrate management of all SNF within the Hanford Site, to interface with the DOE-Owned Spent Nuclear Fuel Program, and to integrate Hanford Site SNF management with DOE complex-wide SNF management.

Activities conducted to manage Hanford Site SNF inventories are focused on remedying the DNFSB Recommendation 94-1 concern at the KE Basin. Consistent with SNF Project objectives and the DNFSB Recommendation 94-1 IPP systems engineering approach, plans to place other Hanford Site SNF into safe interim storage are being integrated with the KE Basin plans and with Hanford Site activities that manage other legacy materials. Additionally, all Hanford Site SNF inventories are included within the scope of the DOE-Owned Spent Nuclear Fuel Program, which is developing plans for integrated interim storage and technology development for all DOE-owned SNF.

Sections 2.1 and 2.2 of the Hanford Site SISMP identify DOE's plans for remedying near-term safety concerns and achieving safe interim storage of K Basins SNF and other Hanford Site SNF, respectively. Issues and plans common to all Hanford Site SNF are addressed in Sections 2.3 through 2.5. Current Hanford Site SNF storage locations are shown in Figure 2-1. The SNF inventories at each facility, and current management concerns, are identified in Table 2-1.

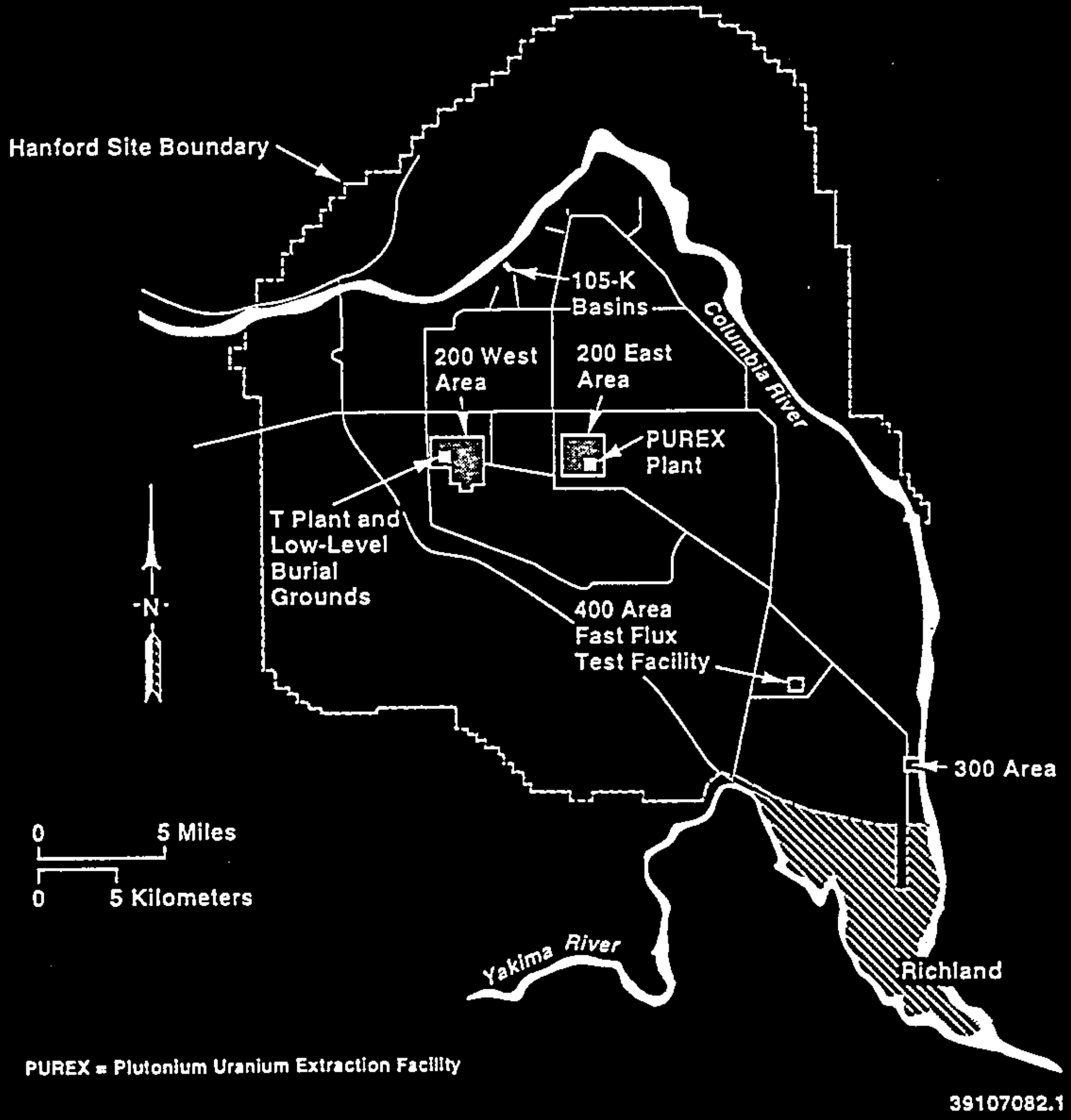
More comprehensive descriptions of the fuel storage facilities and the fuel inventories are available in WHC-SD-SNF-TI-001, *Hanford Spent Fuel Inventory Baseline* (Bergsman 1994).

2.1 K BASINS SPENT NUCLEAR FUEL

2.1.1 Scope

The scope of this portion of the Hanford SISMP includes plans to remedy the urgent safety concerns at the K Basins and place the K Basins SNF into safe interim storage. The KE and 105 K West (KW) Basins store approximately 2,100 metric tons of uranium (MTU) of defense (or "materials") production reactor SNF, primarily N Reactor SNF. The K Basins inventory includes defense production reactor SNF which was transferred from the PUREX Plant to the KW Basin in October 1995. The inventory also assumes a small quantity of defense production reactor SNF (i.e., <0.5 MTU) will also be transferred from the N Reactor Basins in 1996 during deactivation of that facility. Transfer of the PUREX Plant and N Reactor Basins SNF inventories to the K Basins is discussed in Section 2.2.

Figure 2-1. Location of Hanford Spent Nuclear Fuels.



PUREX = Plutonium Uranium Extraction Facility

39107082.1

Table 2-1. Hanford Spent Nuclear Fuel Inventories.

Material Group	Storage Location	Quantity (Metric Tons of Heavy Metal)	Material/Packaging Concerns
Materials Production Fuels - N Reactor - Single-Pass Reactor	KE Basin	 1145.7 0.4	Seriously deteriorated storage conditions; lack of containment; corroding fuel; seismic vulnerability; aging facility
Materials Production Fuels - N Reactor - Single-Pass Reactor	KW Basin	 954.1 3.0	Corroding fuel; seismic vulnerability; aging facility
Research Reactor Fuel - Fast Flux Test Facility	Fast Flux Test Facility	11.0	No significant material concern; facility deactivation requires alternate storage
Materials Production Fuels	PUREX Plant	N/A	Material transferred to KW Basin on 10/12/95.
Special Case - Shippingport	T Plant	15.8	Aging facility; inefficient wet storage; facility mission necessitates alternate storage
Miscellaneous Special Case and Research Reactor Fuels	324, 325, 327 Buildings	2.3	Dispersible material clean-up and facility vulnerability corrective actions necessitate alternate fuel storage; safety authorization not to current standards
Specialty Fuels - TRIGA Fuel	400 Area Interim Storage Area	0.02	Recently transferred to 400 Area from 308 Building to support facility deactivation
Specialty Fuels - LAMPRE Fuel - Univ. of Washington Fuel	Plutonium Finishing Plant	 0.008 8.4×10^{-5}	LAMPRE fuel repackaging may be required for interim storage
Specialty Fuels - TRIGA Fuel	Low-Level Burial Grounds	0.02	Material buried with TRU waste in solid waste management system. Retrieval in parallel with solid waste retrieval planned to minimize personnel exposure/risks.
TOTAL	Hanford Site	2,132	

2.1.2 Remediation Objective

The objectives of the plans in this SISMP, in regard to management of K Basins SNF inventories, are:

1) Resolve the safety and environmental concerns associated with the deteriorating SNF in the K Basins, including those identified in DNFSB Recommendation 94-1 and in the November 1993 document, *DOE Spent Fuel Working Group Report on Inventory and Storage of the Department's Spent Nuclear Fuel and other Reactor Irradiated Nuclear Materials and the Environmental, Safety, and Health Vulnerabilities* (DOE 1993); and

2) Attain safe, environmentally sound, and economic dry interim storage of the K Basins SNF.

Safe dry interim storage for the K Basins SNF will be attained when the SNF is stored in a manner that satisfies dry interim storage requirements for DOE-owned SNF as defined in the Office of Spent Fuel Management's Functions and Requirements Document (DOE 1994b) and that achieves nuclear safety equivalent to comparable Nuclear Regulatory Commission (NRC) licensed facilities.

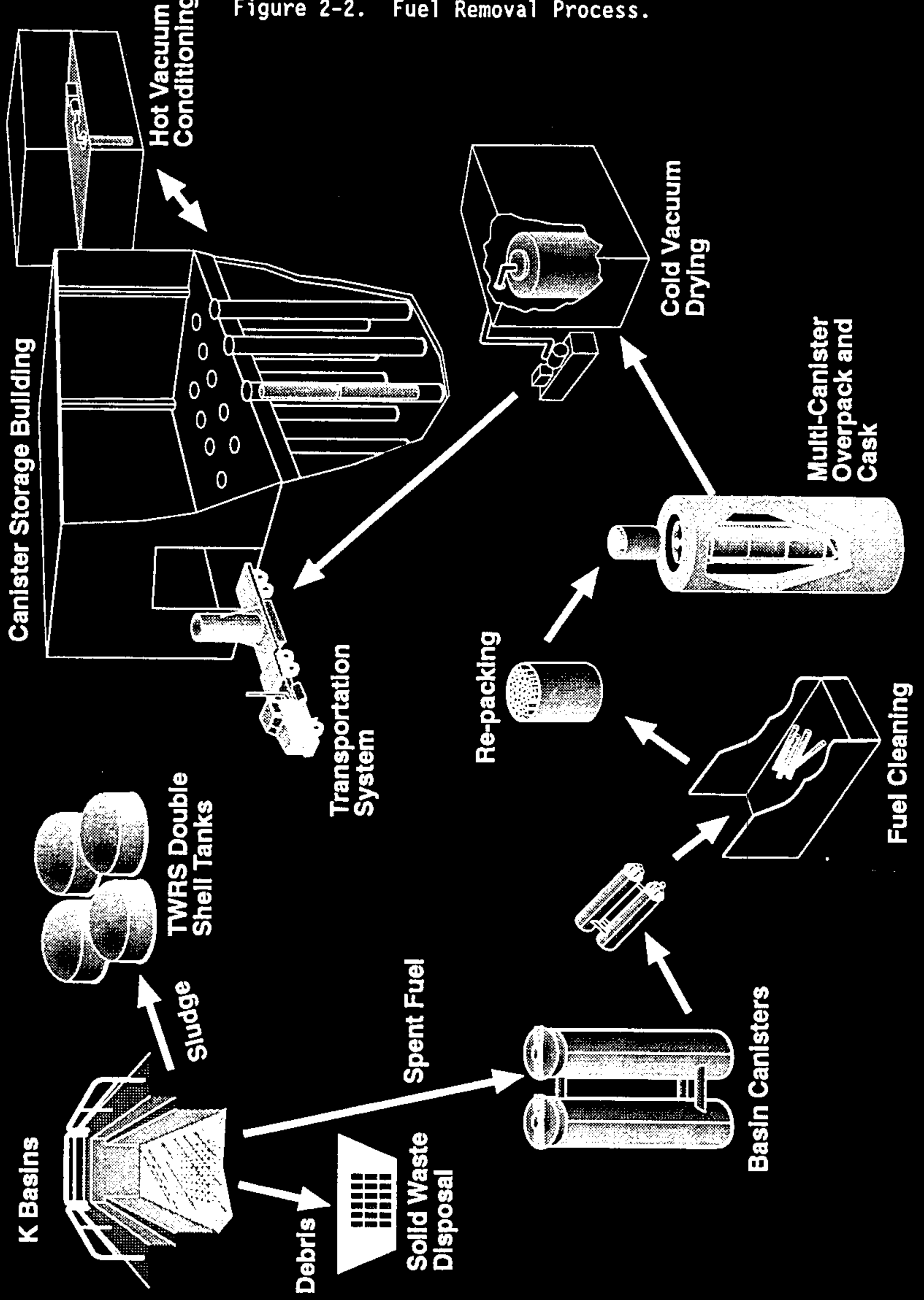
2.1.3 Remediation Process

Fuel removal from the K Basins and implementation of safe dry interim storage will be achieved consistent with the general approach identified in the October 1994 WHC report, WHC-EP-0830 (Fulton 1994), as refined by the integrated process strategy for K Basins SNF approved by RL in July 1995 (DOE 1995a). Sludge will be dispositioned consistent with the RL approved K Basins sludge disposition strategy (DOE 1995b), contingent on regulatory approval and Tank Waste Remediation System acceptance. The fuel and sludge removal process is depicted in Figure 2-2. Near-term safety and environmental concerns at the K Basins will be addressed in parallel with long-term actions to achieve dry interim storage.

The primary steps of the remediation process are as follows:

- The K Basins SNF will be desludged and placed in racks within Multi-Canister Overpacks (MCOs) and vacuum dried at low temperature to remove free water. The "cold vacuum dried" SNF, contained in MCOs, will be shipped to 200 East Area for storage in the Canister Storage Building (CSB), which was originally designed and construction initiated for storage of vitrified high-level waste from the Hanford Waste Vitrification Plant. The SNF will also be dried at a higher temperature to remove bound water, and reactive sites on the surface of the SNF will be oxidized, as necessary, to reduce reactivity. The initial "cold vacuum drying" step will satisfy requirements for SNF removal from the K Basins, consistent with the December 1999 commitment. The subsequent "hot conditioning" step will further improve the safety posture of storage at the CSB for the interim storage period.

Figure 2-2. Fuel Removal Process.



The "hot conditioning" step will be performed in an annex to the CSB and will be implemented as early as practical.

- The K Basins sludge will be retrieved, characterized, and transferred to the 200 Area tank farms for disposition with tank farm waste, contingent on regulatory approval and Tank Waste Remediation System acceptance. The sludge will be managed as SNF while at K Basins and until the determination is completed, based on characterization results, that the sludge satisfies tank waste acceptance criteria.

The SNF will be stored at the CSB in a manner that results in nuclear safety equivalent to comparable NRC licensed SNF storage facilities.

The actions are consistent with the Record of Decision from the Environmental Impact Statement for Management of SNF from the K Basins at the Hanford Site, Richland, Washington (K Basins EIS), which was issued in March 1996.

2.1.3.1 Preparation. During the preparation period for fuel removal, near-term actions will be completed to improve the safety and environmental protection posture of the K Basins in parallel with actions to remove the SNF and sludge and to achieve safe dry interim storage of the SNF. The following activities have been completed since issuance of DNFSB Recommendation 94-1 or are in progress to improve the safety and environmental protection posture at the K Basins:

- Installation of seismic isolation barriers (e.g., cofferdams) between the KE Basin and the discharge chute to isolate the basin from the suspected leak site located in the unreinforced construction joint in the discharge chute. This action minimizes the potential for environmental release of radioactive contaminants either directly through the leak into the ground or by airborne release, should the basin be drained as a consequence of a seismic event and the sludge dry to a powder. Basin draining and sludge dry-out could also result in significant radiological exposure to personnel during recovery actions. Similarly, installation of seismic isolation barriers at the KW Basin reduces environmental and safety risks, although the consequences of leakage should be less than at the KE Basin due to fuel and sludge containment and water quality at the KW Basin. Physical installation and successful completion of acceptance testing of the seismic isolation barriers were completed to fulfill the requirements of "IP-3.6-016; Complete cofferdam installation in KW Basin" and "IP-3.6-017; Complete cofferdam installation in KE Basin."

- Establishment and maintenance of a formal Conduct of Operations program at the K Basins to improve safety of ongoing operations.

- Completion of essential facility systems recovery actions necessary for continued safe operations and personnel protection, such as electrical, potable water, fire protection, and maintenance systems.

- Reduction of personnel exposure in keeping with as-low-as-reasonably-achievable (ALARA) practices by improving dose reduction measures and reducing the radioactive source term from cesium-contaminated concrete basin walls and pipe runs.

- Removal of debris from the KE Basin such as unused canisters and discarded tools. This waste will be cleaned and compacted, as necessary, prior to shipment to the solid waste management area to minimize the waste volume.

- Improvement of water cleanup, including minimizing transuranic (TRU) loading of the ion exchange modules and providing redundant systems to ensure that adequate ion exchange capability is always available.

To prepare for SNF removal from the K Basins, the following activities will be completed:

- Development of plans, including funding strategies and schedules, for acquiring systems required to implement the path forward for fuel removal from the K Basins. An acquisition strategy and funding options were developed as an initial step in implementing the November 1994 approved path forward for fuel removal from the K Basins to fulfill the requirements for completion of "IP-3.6-014; Develop K Basin potential funding options and acquisition strategy, as necessary." An integrated schedule was subsequently issued, which reflected the acquisition strategy, to fulfill the requirements of "IP-3.6-020; Issue K Basin integrated schedule detailing major systems acquisitions and material movements." Subsequent schedule refinements to reflect the integrated process strategy and to reduce project schedule risks are reflected in the schedule provided in Volume 2.

- Completion of NEPA review for SNF and sludge removal from the K Basins. The NEPA review was implemented by issuing the K Basins EIS Notice of Intent in the Federal Register, which fulfilled requirements of "IP-3.6-015; Issue K Basins EIS Notice of Intent." The NEPA review was completed with issuance of the Record of Decision, which fulfilled the requirements of "IP-3.6-010; Issue K-Basins EIS ROD."

- Acquisition of systems required for SNF removal, including the SNF retrieval system, MCOs, cask/transport systems, the "cold vacuum drying" system, and the CSB. Individual sub-projects have been initiated to support acquisition of these systems. Acquisition activities are reflected in the schedule provided in Volume 2, including sub-project authorizations, design, procurement, construction and/or fabrication, safety authorization basis development, and operational readiness.

- Characterization of SNF and process development to support both SNF and sludge removal. Data will be acquired that supports assessment of fuel condition, the degree of hydriding, and the makeup of the sludge. The data will also support safety analyses for fuel transport and development of fuel conditioning. Initiation of characterization activities in the 300 Area hot cells will fulfill the requirements of "IP-3.6-018; Start K Basin fuel characterization in hot cells."

To prepare for sludge removal from the K Basins, a path forward for sludge removal will be developed and sludge removal systems acquired. The sludge path forward will address both the sludge contained in the fuel canisters, which is primarily the result of fuel corrosion, and the sludge on the K Basins floors, which is believed to consist of blow sand, structural material oxides, and concrete spallation products. The sludge in canisters will be separated from the fuel during the fuel retrieval operation to reduce the amount of free and bound water within an MCO. The material characteristics of the sludge materials will be considered during development of the path forward. The sludge path forward will also be integrated with K Basins debris removal, water treatment, and fuel retrieval due to the interrelationship of the activities. As an initial step in assessing sludge retrieval and to support cofferdam installation, sludge was transferred from the discharge chute in the KE Basin during the cofferdam installation. Completion of this activity fulfilled the requirements of "IP-3.6-019; Initiate sludge retrieval demonstration in conjunction with cofferdam installation."

To enable completion of activities for safe, compliant and economic dry interim storage, a hot conditioning system will be acquired in parallel with activities to remove SNF from the K Basins. The hot conditioning facility will be an addition to the CSB to minimize fuel handling requirements and system costs. An option was included in the CSB construction contract for construction of the hot conditioning facility to recognize economies and enhance schedule for completing acquisition of the hot conditioning system. Process development activities, such as generation and application of drying curves, will be completed to support system design.

Consistent with the IPP, readiness activities for the systems will be conducted to ensure compliance with DOE Order 5480.31. The readiness process will focus on the adequacy of physical systems, personnel, and the administrative process necessary to support and maintain safe operations. After the readiness process is completed and readiness is verified, written authorization to proceed with system operations will be provided to plant management. Completion of the readiness process ends the preparation activities required prior to startup of systems for fuel removal from the K Basins. Completion of the readiness process also responds to DOE's policy that facilities will be started or restarted in accordance with DOE Order 5480.31.

To ensure that these systems/facilities are acquired and operations completed within technical and schedule commitments identified in the IPP, the following project management strategy has been defined and is being implemented:

- Establish a dedicated DOE project office for executing the K Basins SNF path forward and maximizing delegation of authority to the project office;

- Expedite project authorizations, including consolidation of key decisions;

- Establish a focused regulatory team and independent review team to streamline the process for establishing a safety authorization basis for the new storage system and achieving safety equivalence to comparable NRC-licensed facilities. The safety equivalence will be accomplished by applying technical requirements based on those applied by the NRC to comparable licensed facilities and by adopting appropriate features of the NRC licensing process, in addition to applicable DOE Orders and requirements.

Further, actions for both removal of SNF and sludge from the K Basins and SNF conditioning were addressed in the K Basins EIS. Including both steps in the K Basins EIS enables acceleration of the second step that would not have been possible with the two step NEPA review process identified in WHC-EP-0830.

2.1.3.2 Production. Fuel removal will be initiated in December 1997 and completed in December 1999. The production phase for fuel removal will include operational activities to retrieve, package, cold vacuum dry, and transport the SNF and emplace the SNF into storage at the CSB. The fuel removal phase does not include hot conditioning of the SNF. Initial fuel removal will be performed at the KW Basin to optimize production activities in an environment with low radiological exposure prior to full scale production in both basins. Initiation of fuel retrieval activities in the KW Basin will fulfill the requirements of "IP-3.6-012; Begin SNF and sludge removal from K Basins. Removal of the final MCO of SNF from both basins will fulfill the requirements of "IP-3.6-001; Complete fuel removal from K Basins."

Sludge removal from the K Basins will be completed by December 2000. Sludge will be accumulated in the K Basins weasel pits during fuel retrieval operations. For sludge removal, sludge will be transferred to a transport package, then samples acquired and analyzed. Assuming tank waste acceptance criteria are satisfied, sludge will be transported to the 200 Area and transferred to underground storage tanks for disposition with existing tank waste. The approximately 52 cubic meters of sludge will be removed from the K Basins. Completion of the sludge removal campaign will fulfill the requirements of draft milestone "IP-3.6-201; Complete removal of all sludge from the K-Basins."

"Hot conditioning" will be conducted as soon as practical. For hot conditioning, a loaded MCO will be removed from a storage tube and transferred to a hot conditioning station located in an addition to the CSB. The SNF will be conditioned at an elevated temperature within the MCO to remove bound water. The MCO will then be returned to a storage tube within the CSB vault. Hot conditioning operations will be initiated by October 1998. The schedule duration for hot conditioning operations will be finalized after further process development. The cost and schedule estimates within the SISMP assume a two year production period for hot conditioning, pending finalization of a schedule for hot conditioning operations.

2.1.4 Schedule Objectives

Consistent with the IPP, the schedule objective for relocating K Basins SNF to safe, compliant storage is December 1999 or earlier. Additionally, SNF removal from the K Basins will be initiated by December 1997. To reflect the integrated process strategy for fuel removal from the K Basins, a separate milestone to complete sludge removal from the K Basins by December 2000 has also been proposed to supplement the existing IPP schedule commitments.

Schedule commitments identified in the IPP to remedy seismic concerns at the K Basins and to ensure early progress on the path forward for fuel removal from the K Basins have been satisfied on or ahead of schedule. These IPP commitments include:

- Develop potential funding options and an acquisition strategy as appropriate by the end of March 1995.
- Issue Notice of Intent for K Basins EIS in March 1995.
- Complete cofferdam installation in K West Basin by February 1995 and in K East Basin by April 1995.
- Start fuel characterization in hot cells by April 1995.
- Initiate sludge retrieval demonstration in conjunction with cofferdam installation by April 1995.
- Issue a K Basins integrated schedule by May 1995 that includes the following:
    - Complete NEPA process;
    - Submit project validation package;
    - Initiate development for N Reactor fuel conditioning process;
    - Finalize site identification and initiate site characterization for facilities;
    - Place contract(s) for necessary equipment and facilities;
    - Begin fuel removal from K Basins;
    - Design MCOs;
    - Begin MCO manufacture;
    - Start and complete construction of CSB;
    - Start and complete construction of conditioning facility;
    - Start and complete fuel conditioning;
    - K Basin fuel in dry storage.

The IPP also required issuance of the K Basins EIS Record of Decision by December 1995. The Record of Decision was issued in March 1996. To ensure that the schedule commitment to initiate SNF removal from the K Basins will not be impacted by late issuance of the Record of Decision, multi-shift construction of the CSB and an alternate CSB deck construction approach are being implemented. These actions are reflected in the schedule provided in Volume 2.

In addition to the existing IPP commitments, DOE is identifying supplemental schedule commitments to the DNFSB based on the K Basins integrated schedule. The proposed schedule commitments include the following:

- Authorize fuel retrieval system procurement (i.e., Critical Decision-3) by October 1996
- Authorize Key Decision 3B for CSB construction by March 1996
- Present cask design Critical Decisions - 1/2 package by October 1996
- Present cold vacuum drying system design Critical Decisions - 1/2 package by April 1996
- Initiate fuel drying/conditioning testing by May 1995
- Complete site evaluation study for cold vacuum drying by February 1996
- Award MCO fabrication contract by March 1997
- Award cask/transport design purchase order by January 1996
- Award CSB construction contract by January 1996
- Issue MCO Phase II design review report by June 1997
- Start fabrication of initial MCO order by March 1997
- Start construction of CSB by March 1996
- Complete construction of CSB by November 1997
- Begin construction of hot conditioning facility by October 1996
- Complete process equipment installation for hot conditioning system by July 1998
- Start hot conditioning system operation by October 1998
- Establish a commitment date for completion of hot conditioning system operation by October 1996.

Schedule commitments identified in the October 1994 document, *Plan of Action to Resolve Spent Nuclear Fuel Vulnerabilities (Phase III)* (DOE 1994a) will also be satisfied.

2.1.5 Assumptions

The scope, schedule, and costs identified in the Hanford Site SISMP for K Basins SNF plans are based on several key assumptions:

- The technical scope and approach to implement the path forward for fuel removal from the K Basins will be consistent with the general technical approach identified in the integrated process strategy.
- Sludge will be dispositioned at the Tank Waste Remediation System.
- Budget and manpower resources will be available in support of critical path activities.
- Current onsite transportation requirements identified in DOE RL 5480.3 will not change.
- Resource Conservation and Recovery Act (RCRA) permitting and NRC licensing (or NRC review) will not be required for new storage or conditioning systems required to implement the path forward for fuel removal from K Basins.
- Current safeguards and security requirements identified in DOE Order 5333.2 will not change.

2.1.6 Issues and Problems

Critical issues that must be resolved to identify or implement actions at the Hanford Site and items that could limit schedule performance for K Basins SNF include:

- Sludge management plans, including Tank Waste Remediation System acceptance, must be approved by affected organizations. Schedule impacts would occur if the planning basis is not correct.
- The detailed regulatory criteria for attaining safe, compliant dry interim storage must be finalized. A regulatory review team and an independent review process have been established to support finalization of detailed regulatory criteria.
- Hanford Site SNF must be characterized and process development supported sufficiently to evaluate and implement management options.
- Onsite transportation requirements must be maintained to enable onsite transport of SNF within schedule objectives.
- Adequate funding levels for SNF management must be maintained.

2.1.7 Alternatives

A formal systems engineering process is being used to establish and maintain a technical baseline for SNF management. The functions and requirements developed by the Hanford Site systems engineering process are based on site-specific requirements and high-level SNF management requirements established by the DOE Office of Spent Fuel Management. The Hanford SNF Project technical baseline and functions and requirements are identified in WHC 1995c.

The systems engineering process resulted in identification of the following alternatives for the K Basins fuel removal path forward:

Alternative 1: Alternative 1 overpacks the fuel stored in the KE Basin and maintains storage of overpacked fuel at KE Basin and encapsulated fuel at KW Basin until a fuel conditioning and interim storage system is available. For comparison purposes, the fuel conditioning process is assumed to be based on repackaging and passivation of the fuel once it is received in the Fuel Conditioning Facility. The repackaged/passivated fuel is then transferred to an interim storage facility that is assumed to be based on a vault storage concept. This alternative also includes upgrading the existing K Basins (retrofit and life extension).

Alternative 2: Alternative 2 overpacks the fuel stored in both K Basins and transfers the overpacked fuel to a wet pre-interim (an existing facility modified for wet storage), or to a new wet storage facility. The fuel is stored in this wet storage facility until a conditioning and interim storage system is available. For comparison purposes, the fuel conditioning process is assumed to be based on a fuel passivation concept proposed by a DOE independent technical assessment team. The process transfers the fuel from the overpacks selected for the pre-interim wet storage to the package configuration developed for the passivation system, within the pre-interim wet storage facility. The repackaged fuel is then transferred to the Fuel Conditioning Facility for passivation. The passivated fuel is then transferred to the dry interim storage facility that is based on a vault storage concept. In this alternative, the principal driver is the prompt removal of the SNF from the K Basins to another location for some period of pre-interim wet storage.

Alternative 3: Alternative 3 uses the passivation process identified in Alternative 2, without pre-interim wet storage. This alternative offers a possible method of early SNF conditioning with a potential for early achievement of interim dry storage. The SNF processing may be performed within a new addition to the K Basins or at a location associated with the dry interim storage facility.

Alternative 4: In this alternative, custody of the packaged SNF is transferred to a foreign enterprise that assumes responsibility for transoceanic transport and for processing to stable residues (conditioned wastes). In the preferred configuration, the residues are returned to the Hanford Site for interim dry storage to await final disposition. Alternative 4 includes packaging N Reactor SNF, assumes shipping the fuel to the British Nuclear Fuel Laboratories' Sellafield Plant located in the United Kingdom, and assumes processing the fuel at the Sellafield Plant and return of the residues to the Hanford Site for interim dry storage. The low- and intermediate-level wastes would be retained in the United Kingdom. Primary options within this alternative include: (1) shipping of unencapsulated damaged fuel in a British Nuclear Fuel Laboratories' cask instead of containerization of damaged fuel prior to cask loading; and (2) retention of conditioned waste/residue in the United Kingdom instead of returning it to the Hanford Site for interim dry storage.

The K Basins path forward alternatives were evaluated using a multi-attribute decision process as described in the Westinghouse Hanford Company report WHC-EP-0830 (Fulton 1994). The evaluation process included scoping analyses of cost, schedule, safety and regulatory drivers; normalization of key assumptions and the bases for comparison; independent assessments by outside experts; and the use of decision analysis techniques to assure a comprehensive, balanced treatment of the pros, cons and uncertainties associated with the various alternatives. An important aspect of this process was the identification of vulnerabilities, their potential impacts and how they might be mitigated. For example, the impacts on related issues such as disposal of the water and debris, worker exposure, minimizing the cost and risks of continued operations in the K Basins, etc., were considered in selecting the recommended path forward.

The evaluation process resulted in selection of the path forward identified in the Hanford Site SISMP, which combines the best attributes of the various alternatives to accelerate fuel removal from the K Basins. DOE formal approval of the path forward is documented in Lytle (1994). Subsequent assessments have resulted in refinements to plans defined in the path forward, as reflected in the work scope, costs and schedules identified in the SISMP. Notably, the integrated process strategy (WHC 1995b) was developed to define an integrated approach for fuel removal, transport, staging, conditioning, and dry storage of the K Basins SNF. Additionally, the potential environmental impacts of the above alternatives were evaluated in the K Basins EIS, which resulted in a Record of Decision consistent with the plans identified in the SISMP.

Alternatives considered in the K Basins path forward decision process will not enable fuel removal from the KE Basin within 2-3 years, but will satisfy schedule commitments identified in the IPP. Actions to improve the safety posture at the basin, such as installation of seismic isolation barriers, will reduce the risk of continued storage beyond three years.

2.1.8 Technology Development

Technology development needs for implementing the K Basins SNF path forward are identified in the Hanford SNF Project Technology Acquisition Plan. To the extent practical, technology will be acquired through the use of commercially available technologies, including technologies from foreign and domestic sources.

The technology development activity will be focused on handling, cold vacuum drying, and conditioning process(es) for dry storage of defense production reactor SNF. Detailed technology needs are being further refined and verified through the systems engineering process and incorporated into design engineering. Identified technology development activities included the following:

- Chemical reactivity, including ignition theory, is being modeled for accident analyses associated with fuel handling and conditioning processes to support a systems engineering approach directed toward storage methods. Fuel pyrophoricity concerns are being addressed to assist in establishing optimum safety authorization bases for activities to achieve dry storage of the K Basins SNF.

- Evaluations are being completed to understand the effects of chemical corrosion and hydrogen generation on achieving and maintaining safe dry interim storage. The evaluations are used as a basis for refining the conditioning process, will systematically evaluate potential sludge and fuel particle corrosion or other reactions in waste tanks, and are assisting in establishing safety authorization bases for SNF and sludge management.

- Process phenomena that define water removal, process time, ignition accidents of uranium metal, and long-term stability of the K Basins SNF are being analyzed and tested. Thermal-hydraulic modelling results will support the definition of acceptable product criteria and processing limits.

Activities will utilize technical analysis and experience to the extent practical. Fuel characterization and process development will be used to provide information that cannot otherwise be obtained.

Technology development activities will be integrated with development activities at other DOE complexes through the DOE-Owned Program's Technology Integration Plan (DOE 1994b). For example, cold vacuum drying system development tests will be supported by the Idaho National Engineering Laboratory (INEL) and will utilize systems developed for implementing dry storage of INEL SNF inventories.

The cost of technology development for the K Basins SNF is included within Table 2-2. Schedule and cost risks for SNF removal from the K Basins resulting from technology development activities have been significantly reduced through decisions to desludge, repackage, and cold vacuum dry the K Basins SNF prior to transport to the CSB.

2.2 OTHER HANFORD SITE SPENT NUCLEAR FUEL

2.2.1 Scope

Plans to attain safe interim storage for Hanford Site SNF that is currently located at facilities other than the K Basins (i.e., "other SNF") are included in the SISMP for information, due to the potential for utilizing common facilities with DNFSB Recommendation 94-1 materials at the Hanford Site and other DOE sites. The facilities where the other SNF inventories are currently located and the respective facility missions are as follows:

- The T Plant, which serves as a beta-gamma decontamination facility and provides other solid waste management services in addition to storage of Shippingport Pressurized Water Reactor (PWR) Core 2 fuel.
- The Fast Flux Test Facility (FFTF), which provided testing capability for the U.S. fast breeder reactor program, notably irradiation and evaluation of different types of fuel assemblies and materials for fuel assembly construction. The FFTF also produced materials such as medical isotopes. The FFTF test mission recently ended and the facility is currently implementing deactivation plans.
- The 400 Area Interim Storage Area, which is adjacent to the FFTF. The 400 Area ISA includes a concrete storage pad, fencing, and lighting for cask storage of SNF. Currently six Neutron Radiography Facility (NRF) Training Reactor, Isotopics, General Atomics [TRIGA] SNF casks and two Department of Transportation Specification 6M containers are stored in a vault at the 400 Area ISA. Additionally, cask storage of FFTF SNF at the 400 Area ISA pad has been initiated.
- The 325 Building Shielded Analytical Laboratory (and 325-A Radiochemical Facility), which support process demonstration and analytical chemistry requirements for a variety of DOE programs.
- The 324 Building, which is a shielded chemical processing laboratory used for development of chemical processes from laboratory to pilot scale and for examination and mechanical testing of irradiated specimens. The 324 Building contains laboratory, support facilities, and office space.
- The 327 Building, also known as the Post-Irradiation Testing Laboratory (PITL), which provides shielded, ventilated, and specially equipped laboratories for physical and metallurgical examination and testing of irradiated fuels, concentrated fission products, and structural materials. The long-term mission of the facility is not certain. Near-term activities at the 327 Building include SNF characterization.

- The PFP in the 200 West Area, which supported plutonium metal production for the defense program. PFP is described in Section 3.0. SNF at PFP is currently stored at the 2736-ZB storage vault and in a storage module in the yard area.

- The 200 Area Low-Level Burial Ground (LLBG), which supports management of solid waste materials at the Hanford Site. The SNF at the LLBG is being managed consistent with requirements for remote-handled transuranic waste per DOE Order 5820.2A.

Legacy defense production reactor SNF (i.e., N Reactor and Single-Pass Reactor SNF) was previously stored at the Plutonium-Uranium Extraction (PUREX) Plant. The PUREX Plant SNF inventory was shipped to the KW Basin in October 1995 and will be managed consistent with the other K Basins SNF inventory.

Additionally, up to 0.5 metric tons heavy metal of N Reactor SNF may be remaining in the sludge at the floor of the N Basins. SNF recovered during N Basins deactivation will be transferred to the KW Basin for consolidated management with other N Reactor SNF.

The inventories and storage concerns associated with the other Hanford Site SNF inventories were identified previously in Table 2-1. A brief description of the facilities is provided in Appendix A.

2.2.2 Remediation Objective

The objectives of the plans in this SISMP for other Hanford Site SNF inventories are to:

1) Complete interim actions to remove fuel from existing facilities to support current facility missions and corrective actions to vulnerabilities identified in the November 1993 document, *DOE Spent Fuel Working Group Report on Inventory and Storage of the Department's Spent Nuclear Fuel and other Reactor Irradiated Nuclear Materials and the Environmental, Safety, and Health Vulnerabilities* (DOE 1993); and

2) Attain safe, environmentally sound, and economic interim storage of all Hanford Site SNF pending establishment of a national SNF strategy and criteria for final disposition of DOE-owned SNF.

Interim actions will be performed and vulnerability corrective actions completed as identified in the October 1994 DOE document, *Plan of Action to Resolve Spent Nuclear Fuel Vulnerabilities (Phase III)* (DOE 1994a). Safe interim storage for the other Hanford Site SNF inventories will be attained when these materials are stored in a manner that satisfies dry interim storage requirements for DOE-owned SNF as defined in the Office of Spent Fuel Management's Functions and Requirements Document (DOE 1994b).

2.2.3 Remediation Process

The near-term management and interim storage activities will be integrated to minimize SNF handling and resultant exposure and waste generation. Actions to attain safe interim storage of other Hanford SNF inventories are currently being revised based on the recent settlement agreement (Idaho 1995) between the U.S. Department of the Navy, DOE, and the State of Idaho on the Record of Decision for the DOE Programmatic SNF Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environemental Impact Statement. The settlement agreement will result in continued storage of the other Hanford SNF inventories at the Hanford Site until preparation for final disposition, except for sodium bonded FFTF SNF which will be transferred to Argonne National Laboratory-West for treatment after December 2000.

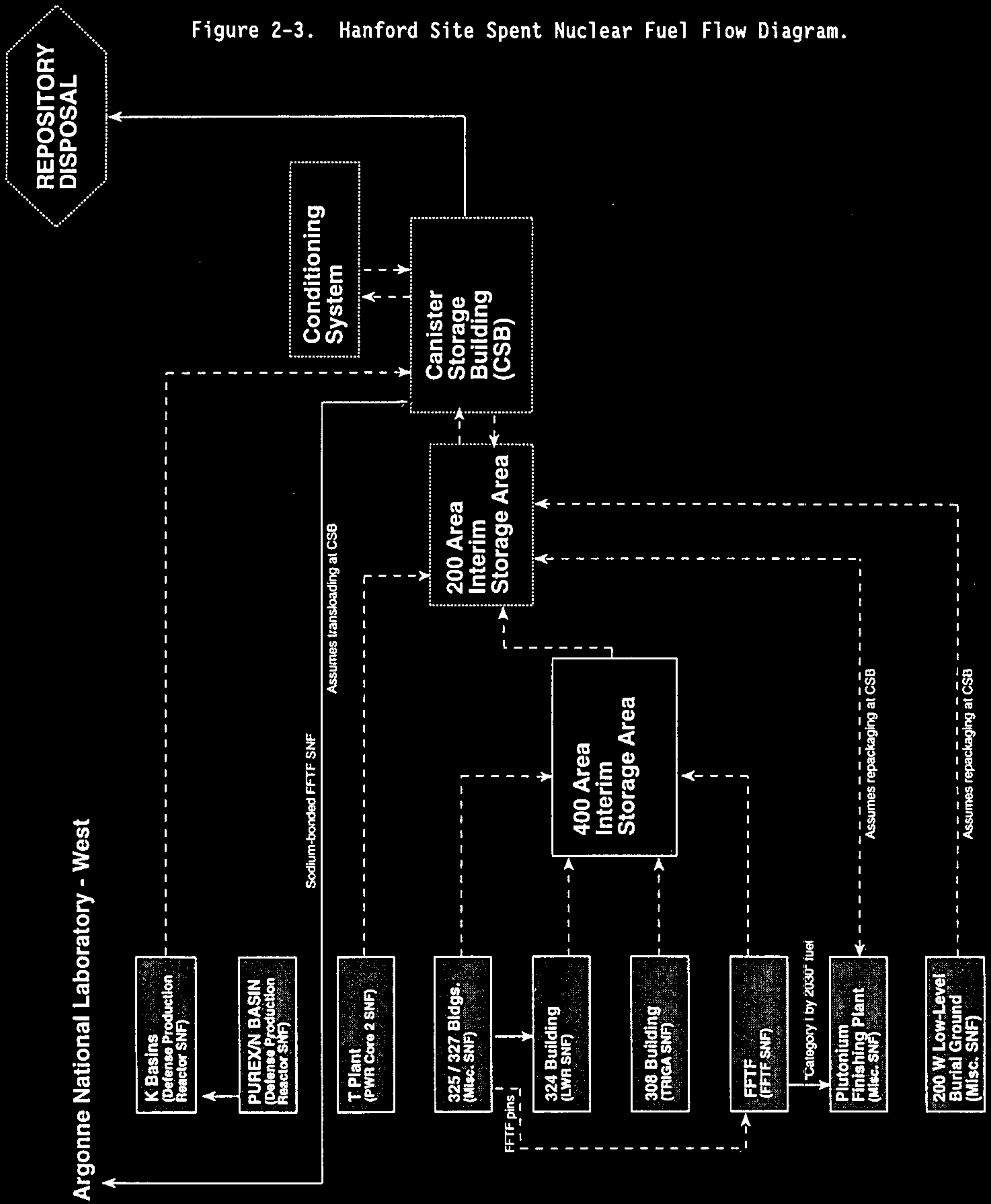
Preliminary plans for management of the other Hanford, based on the settlement agreement, are depicted in Figure 2-3. These actions include near-term consolidation of most SNF currently in the 300 and 400 Areas at the 400 Area ISA to support deactivation missions and vulnerability corrective actions at the FFTF and the 324/325/327 Buildings. After construction of the CSB, a 200 Area ISA will be installed adjacent to the CSB. The SNF at the 400 Area ISA and most 200 West Area SNF will be transferred to the 200 Area ISA or to the CSB to minimize storage costs and enable deactivation of 400 Area facilities. The CSB will be used to transload SNF for transfer off-site, as final disposition is implemented. SNF requiring enhanced safeguards and security will be stored at PFP.

2.2.3.1 FFTF SNF. The FFTF SNF inventory will be removed from in-sodium storage at the FFTF to enable facility deactivation. The SNF will be transferred from FFTF to one of three near-term locations dependent on the SNF characteristics.

Sodium bonded FFTF SNF will be shipped to ANL-W in T-3 Casks for consolidation with similar SNF. The sodium bonded FFTF SNF will be initially stored in Interim Storage Casks (as described below) and later transloaded into T-3 Casks at FFTF or the CSB, pending the results of an on-going evaluation. The DOE Certificate of Compliance (CoC) for the T-3 Cask is being amended to accommodate full assemblies or an increased number of pins to curtail the number of shipments to ANL-W. The total number of SNF shipments will be eight, consisting of six assemblies and two pin containers.

The remaining FFTF SNF will be washed in the FFTF Interim Examination and Maintenance (IEM) Cell to remove sodium. The assemblies will then be placed in unshielded Core Component Containers (CCC's) made from stainless steel and Inconel®. Abottom loading shielded fixture called the Solid Waste Cask will be used to remove each CCC from the IEM Cell and take the CCC to the adjacent Reactor Service Building (RSB), where each CCC will be inserted into an FFTF Interim Storage Cask (ISC) that has been previously loaded into the Cask Loading Station.

Figure 2-3. Hanford Site Spent Nuclear Fuel Flow Diagram.



A CCC is designed to hold six assemblies or pin containers. By removing the stainless steel end portion of an assembly, a seventh assembly will be added to each CCC, provided that the decay heat of the SNF placed in the CCC does not exceed 1,500 watts. Only six pin containers may be placed in a CCC. Approximately 50 ISC's will be required by implementing this approach.

An ISC consists of a steel inner container bonded to concrete shielding using weld studs. The ISC's will function as secondary confinement. After each ISC is closed, the ISC will be inerted and moved to the adjacent 400 Area ISA, except for two or three ISC's that will be placed inside the protected area at PFP to satisfy safeguards requirements. The 400 Area ISA pad is surrounded by a locked fence and lighting fixtures.

The initial ISC was delivered in June 1995 and loading of this prototype cask and transfer to the 400 Area ISA was completed in January 1996. The last ISC is scheduled to be placed on the 400 Area ISA pad in late 1998. The ISCs will subsequently be transferred to the 200 Area ISA for storage until transfer off-site.

2.2.3.2 NRF TRIGA SNF. TRIGA® SNF previously stored at the 308 Building annex was loaded into six NRF TRIGA® Casks and transferred to the 400 Area ISA for storage in December 1995. TRIGA® Fuel Follower Control Rods were shipped at the same time and are being stored in two DOT 6M containers. The NRF TRIGA Casks and DOT 6M containers are stored in a vault module at the 400 Area ISA.

The NRF TRIGA Casks were designed with the intention of securing a DOE CoC to enable shipment of the casks to INEL without repackaging. The DOT 6M casks are specification packages, and can be used for offsite shipment. The concrete vault will provide enhanced shielding during storage to meet the 400 Area ISA fence line maximum dose rate requirement of 0.5 mrem/hr.

Current plans are to transfer the NRF TRIGA casks, DOT 6M containers and vault to the 200 Area ISA consistent with the FFTF SNF.

2.2.3.3 324/325/327 Building SNF. The two BWR assemblies and five PWR assemblies and miscellaneous pins and pieces stored primarily in the 324 Radiochemical Engineering (RE) Cells will be encapsulated and transferred to dry storage casks. Encapsulation is required because the cladding on the fuel cannot be verified to be intact and will be contaminated with cesium and strontium from a melter experiment upset condition. LWR SNF pins and pieces from the 325 and 327 Building hot cells will be transferred to the 324 Building RE Cells for decontamination and inclusion in the encapsulation. The fuel will be transferred to storage casks in the RE Cells' Air Lock and shipped to the 400 Area ISA for storage.

Casks are currently being procured that will be qualified for both on-site shipping and storage of the LWR SNF. The casks will be shipped to the 400 Area ISA for storage. PNL has accelerated activities to complete removal of the B Cell SNF by the end of 1996. The casks will later be relocated to the 200 Area ISA consistent with the FFTF SNF.

FFTF pins and pieces remaining at the 327 building will be returned to FFTF for disposition with the remainder of the FFTF SNF.

2.2.3.4 T Plant SNF. The 72 Shippingport PWR Core 2 assemblies stored at T Plant will be retrieved and placed in storage casks at the 200 Area ISA or within the CSB vault in containers similar to the K Basins SNF MCOs. Because this SNF is compatible with storage and transport systems certified for commercial PWR SNF, dual purpose systems being developed for commercial SNF are being considered for use to minimize life-cycle handling of the SNF.

2.2.3.5 PFP SNF. Three dissimilar fuel types are or will be stored at PFP: LAMPRE SNF, FFTF SNF, and University of Washington High-Enriched Uranium SNF. Because of physical differences, the storage systems for each of these SNF types will vary. The planning basis assumes that these SNF inventories will remain at PFP until transport for final disposition.

Currently, the LAMPRE SNF is packaged in three EBR-II casks, which have primarily been used as on-site transportation casks. The SNF was initially managed as Remote-Handled Transuranic material and has only recently been relocated to the protected area at PFP. The three casks are stored inside a concrete vault to provide an additional security barrier and supplement the casks' lead shielding. A review of the cask for continued dry storage will be completed by September 1996. The LAMPRE SNF will be repackaged prior to transport off-site for final disposition. The repackaging would occur at the CSB.

A small amount of highly enriched uranium fuel from the University of Washington is stored in a 55 gallon drum inside the 2736-ZB Building, also located in the protected area. This SNF will be repackaged prior to transport off-site and likely at the same time as the LAMPRE SNF.

The ISC's containing FFTF SNF designated for storage at PFP will be transported to an outdoor location inside PFP's protected area for storage on a precast concrete pad. This transfer is expected to take place by November 1998, but may be sooner depending on the staging of fuel for cleaning in the FFTF IEM Cell and the completion and approval of the onsite Safety Analysis Report for Packaging.

2.2.3.6 Burial Ground SNF. The thirteen drums of Oregon State University (OSU) TRIGA® SNF are buried under four feet of soil in Trench 7 of the 218-W-4C Burial Facility of the 200 West Area LLBG in TRIGA® Standard Fuel Element Storage Drums. Each drum contains either six or seven TRIGA® elements for a total of 90.

The SNF at the LLBG will be exhumed simultaneous with solid waste retrieval, which is currently anticipated in 2005. The NRF TRIGA® Cask designed for the 308 Building annex SNF will be used for interim storage and transport of the OSU TRIGA® SNF once the drums are exhumed.

The OSU TRIGA® fuel will be repackaged at the CSB, consistent with the LAMPRE SNF. The casks will be staged at the 200 Area ISA until shipment off-site for final disposition.

2.2.4 Schedule Objectives

Schedule objectives to achieve safe interim storage of other Hanford Site SNF include removal of SNF from the following existing storage facilities to support the Hanford Site cleanup mission:

- **Fast Flux Test Facility.** Complete activities to offload FFTF fuel currently stored in sodium to dry storage casks by October 1998 to enable facility deactivation.
- **324/325/327 Buildings.** Complete packaging and transfer of 324 Building B Cell SNF to storage casks by December 1996. Complete removal of remaining SNF inventories currently in the buildings by September 1999.
- **T Plant.** Complete activities to remove SNF from T Plant by December 2000 to support the T Plant solid waste management mission.

Additional schedules are identified in the October 1994 document, *Plan of Action to Resolve Spent Nuclear Fuel Vulnerabilities (Phase III)* (DOE 1994a).

2.2.5 Assumptions

The scope identified in the Hanford Site SISMP for other Hanford SNF inventories are based on several key assumptions:

- Budget and manpower resources will be available in support of critical path activities.
- Current onsite transportation requirements identified in DOE-RL Order 5480.3 will not change.
- RCRA permitting and NRC licensing (or NRC review) will not be required for new storage systems for other Hanford Site SNF.
- Current safeguards and security requirements identified in DOE Order 5333.2 will not change.
- Interim storage will be implemented consistent with the DOE-Owned Spent Nuclear Fuel Program's Interim Storage Plan (DOE 1995d).

2.2.6 Issues and Problems

Critical issues that must be resolved to identify or implement actions at the Hanford Site, and items that could limit schedule performance, include the following:

- Onsite transportation requirements must be maintained to enable onsite transport of SNF within schedule objectives. Offsite transportation capabilities must be developed to implement shipments off-site.

- Adequate funding levels and funding stability for SNF management must be established.
- Programmatic ownership of materials after removal from current storage systems must be defined.

2.2.7 Alternatives

A formal systems engineering process is being used to establish and maintain a technical baseline for SNF management as described in Section 2.1.6. The systems engineering process scope includes other Hanford Site SNF inventories. Alternatives will be evaluated, when needed, using the systems engineering process.

Alternatives that are being evaluated, and in some cases have been dismissed, for other Hanford Site SNF include:

- Locating the SNF on a common storage pad in the 200 Area or 400 Area;
- Utilizing the CSB for storage of other SNF;
- Transfer of commercial LWR SNF off-site for leased storage at an NRC licensed commercial SNF storage facility.
- Repackaging and staging SNF storage within the current storage facilities until transfer off-site for final disposition.

As a planning basis, the plan assumes storage of most of the FFTF SNF, the NRF TRIGA SNF, and the 324/325/327 Building SNF at the 400 Area ISA and subsequent relocation to the 200 Area ISA prior to shipment off-site. To satisfy physical security requirements, the FFTF SNF which will be Category I prior to 2030 and the PFP SNF are planned for continued storage at PFP until transfer off-site for final disposition.

Current planned actions and potential alternatives will be evaluated based on requirements established in the Hanford Site SNF Project Technical Baseline. Current planned actions will be supported, modified, or alternative approaches implemented based on the results of the evaluation. Transport and storage logistics for potential off-site shipments will be considered in conjunction with the DOE-Owned SNF Program's Interim Storage Plan.

2.2.8 Technology Development

Technology development will be required to support ultimate disposition of other Hanford Site SNF. However, readily available commercial technologies are sufficient to achieve safe interim storage of most of this SNF. Technology development will be limited primarily to qualifying the defense production reactor SNF at the K Basins, as described in Section 2.1.8, for dry storage. Detailed technology development needs will be finalized through the systems engineering process. Technology development activities will be integrated with other DOE complex development activities through the DOE-Owned SNF Program's Technology Integration Technical Working Group and documented in the DOE Spent Nuclear Fuel Technology Integration Plan (DOE 1994b).

2.3 RESOURCES

Funding will be required to support expense-related activities and acquisition of four major systems related to the K Basins path forward. Actions to implement interim storage of other Hanford Site SNF inventories are not within the scope of DNFSB Recommendation 94-1 and, therefore, the associated costs are not identified in the SISMP.

Funding requirements to meet DNFSB Recommendation 94-1 IPP commitments for the K Basins SNF are shown in Table 2-2. The total project costs, including continued K Basins operations and maintenance, are also identified for reference purposes.

2.4 WORK PLAN

Cost and technical baselines for the activities defined in the Hanford SISMP will be monitored on a monthly basis, and variance reports will be submitted to RL by the Spent Nuclear Fuel Project on the seventh of each month. The variance report will cover any variation between the baseline and actual schedule for DNFSB Recommendation 94-1 commitments or actions that affect those commitments. Explanation of the variance and plans for necessary corrective action will be provided. The technical baseline is subject to formal change control.

The baseline schedule is provided in Volume 2 of the SISMP. DNFSB Recommendation 94-1 commitments are identified.

2.5 STAKEHOLDER INVOLVEMENT

Hanford Site stakeholders are involved in decisions related to Hanford Site SNF management through three separate, but related, venues:

- The Office of Spent Fuel Management's stakeholder involvement program, which deals primarily with higher-level SNF management policy issues;
- NEPA review public involvement activities, particularly those that support Hanford site-specific SNF management, but also public involvement meetings for the SNF and INEL EIS;
- The Hanford Site SNF Project's site-specific stakeholder involvement program, which has focused significantly on the K Basins path forward decision process.

Table 2-2. Funding Requirements. (Cost in thousands of dollars.)

Program Element	Fund Type	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001
Project Integration	Expense	9,375	9,616	8,856	8,186	6,488	4,449
	Capital						
System Integration	Expense	15,221	10,619	8,720	2,633	1,487	
	Capital	88					
K Basins Material Removal/ Clean-Up	Expense	25,628	37,125	28,511	29,732	18,300	540
	Capital	170		531			
MCO Acquisition	Expense	3,005	5,189	17,404	11,312		
	Capital	47					
Cask Transport System	Expense	2,959	1,734	452			
	Capital	2,641	10,629	1,600			
Canister Storage Building	Expense	2,064	5,131	8,669	9,275	5,466	1,758
	Capital	39,747	40,994	1,498			
Conditioning System	Expense	2,718	5,670	12,561	12,833	8,030	
	Capital	3,101	21,366	7,419			
Subtotal for K Basins SNF Path Forward	Expense	60,970	75,084	85,173	73,971	39,771	6,747
	Capital	45,794	72,989	11,048	0	0	0
	Total	106,764	148,073	96,221	73,971	39,771	6,747
K Basins Maint. and Operations	Expense	30,067	26,599	26,499	26,481	24,993	5,300
	Capital	42					
Total with K Basins	Expense	91,037	101,683	111,672	100,452	64,764	12,047
	Capital	45,836	72,989	11,048	0	0	0
	Total	136,873	174,672	122,720	100,452	64,764	12,047

Note: Data are consistent with February 2, 1996, approved Integrated Process Strategy for the Hanford Spent Nuclear Fuel Project. Budget associated with the deactivation of the K Basins and Fuel Conditioning Facilities and non-K Basins Hanford SNF is not included in this table.

The major Hanford Site stakeholders include: three major tribal governments (the Yakama Indian Nation, the Nez Perce Tribe, and the Confederated Tribes of the Umatilla Indian Reservation); the Hanford Advisory Board, which is primarily comprised of representatives from key Northwest public interest groups; and Hanford Site regulators, notably the State of Washington Department of Ecology and the U.S. Environmental Protection Agency. During the K Basins fuel removal path forward decision process, input was requested from several stakeholder organizations, including the three major tribal governments and the Hanford Advisory Board's Major Safety and Waste Management Issues Working Group. Stakeholder feedback on subsequent refinements to the path foward decision has been and will continue to be requested on a routine basis.

3.0 PLUTONIUM-BEARING MATERIALS

This portion of the Hanford SISMP covers the stabilization and storage or disposal of plutonium-bearing material in inventory at the Westinghouse Hanford Company-operated facilities at the Hanford Site and those materials (non-waste) arising from terminal cleanout of Hanford Site facilities. The work is in response to Defense Nuclear Facilities Safety Board Recommendation 94-1, dated May 26, 1994. This SISMP also includes specific corrective actions identified in the Plutonium Vulnerability Management Plan (DOE 1995c).

For stabilization considerations, plutonium-bearing material has been grouped into the following three categories:

- Solutions
- Residues and Oxides (<50 weight percent [wt%] Pu)
- Metals and Oxides (>50 wt% Pu)

The Plutonium Finishing Plant (PFP) can stabilize and store or dispose of as transuranic waste all of these materials in the current inventory, and from the Hanford Site's terminal cleanout operations, with additions of glovebox-scale processing capability. Some development work will be required, depending on the final selection of stabilization technology. The current capability at PFP is small, limited to two muffle furnaces in one glovebox currently stabilizing plutonium residues at about 20 to 30 items per month.

Processing enhancements needed to complete the Hanford Site stabilization program in response to Recommendation 94-1 by May 2002 have been identified; these enhancements are covered in more detail in this SISMP. The SISMP also covers specific corrective actions from the Plutonium Vulnerability Management Plan. The capability from the PFP processing systems would be available for other U.S. Department of Energy sites and/or other Hanford Site requirements, if necessary, after completion of this program.

Sections 3.2 and 3.3 identify DOE's plans for remedying near-term safety concerns for plutonium-bearing solutions and residues. Section 3.4 identifies DOE's plans to stabilize plutonium-bearing metals and oxides. Materials identified in sections 3.2, 3.3, and 3.4 will be stabilized and packaged for safe storage to DOE standard or criteria.

Schedules and funding profiles are included in this SISMP. A total of $145 to $160 million above routine facility surveillance and maintenance costs over 7 years will be required to execute this plan. Three site specific concerns have been identified:

- Radiological dose to personnel associated with the work
- NEPA and RCRA compliance and permitting constraints
- Interaction with the International Atomic Energy Agency (IAEA)

3.1 INTRODUCTION

3.1.1 Scope

The SISMP encompasses WHC-held plutonium-bearing materials at the Hanford Site, and includes the items currently and previously held by Pacific Northwest National Laboratories (PNNL). PNNL is currently preparing 1.2 kgs of its inventory for grouting and disposal by July 1996, per the Hanford Waste Acceptance Criteria. The remaining PNNL material, 1.8 kgs has been packaged and shipped to PFP for stabilization and storage. Table 3-1 shows that the WHC material totals about 4 metric tons, net weight, of plutonium distributed among approximately 8,038 items. The items constitute a wide range of chemical and physical properties, including metals, oxides, ash, sludges, solutions, combustibles, and other residues. Figure 3-1 displays the stabilization and storage material flow for the DNFSB 94-1 baseline plan. Figure 3-2 illustrates the PFP building layout and the location of processing equipment. Table 3-2 lists the milestones identified for DOE to complete the commitments outlined in the DNFSB Recommendation 94-1 Implementation Plan.

Necessary storage capability for the stabilized material from the processing operations is also included in the SISMP. The storage of the FFTF unirradiated fuel assemblies is addressed in this plan but no actions are required. These assemblies are considered stable and suitable for 50-year storage as is.

Table 3-1. Inventory of Plutonium-Bearing Materials.

Material Type	No. of Items	Pu in Kgs
Metals and Oxides addressed by DOE-STD-3013-94		
Metal	352	736
Oxides > 50 wt% Pu	2647	1849
Mixed Oxides < 50 wt% Pu	2635	381
Subtotal	5634	2966
Materials to be converted to meet DOE-STD-3013-94		
Solutions	459	335
Polycubes	251	34
Subtotal	710	369
Materials to be addressed by the Residue Policy, Trade Studies, & Interim Storage Criteria		
Oxide <50 wt% Pu	553	91
Ash	551	81
Slag and Crucible	266	43
Compounds	27	4
Other/Miscellaneous	107	6
Other Combustibles	22	1
Subtotal	1526	226
Materials stored in exception to either standard		
Fuel Pin Assemblies	168	714
Grand Total	8038	4274

Figure 3-1. Material Flow for DNFSB 94-1 Baseline Plan.

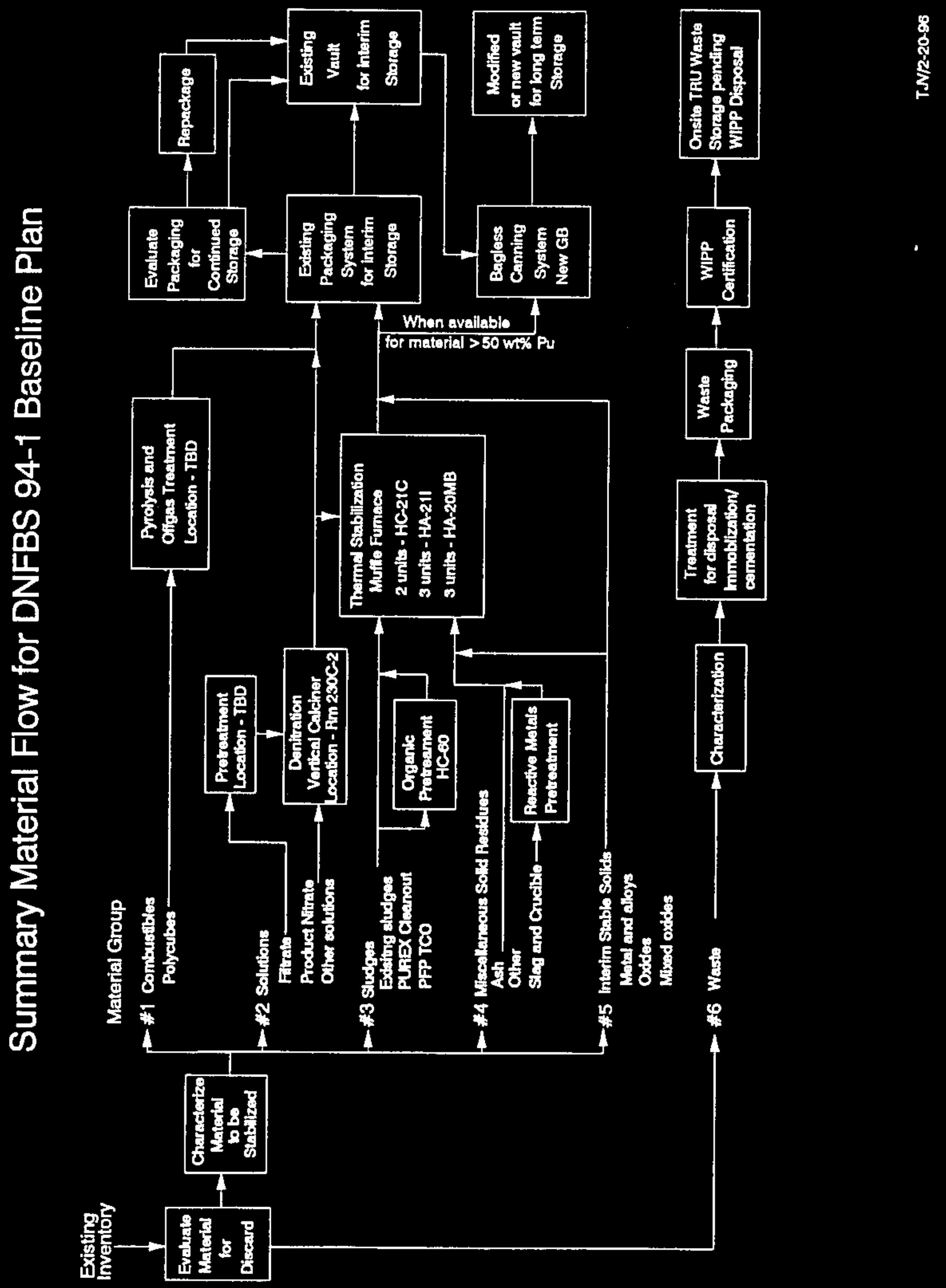


Figure 3-2. PFP Building Layout - Location of Process Areas.

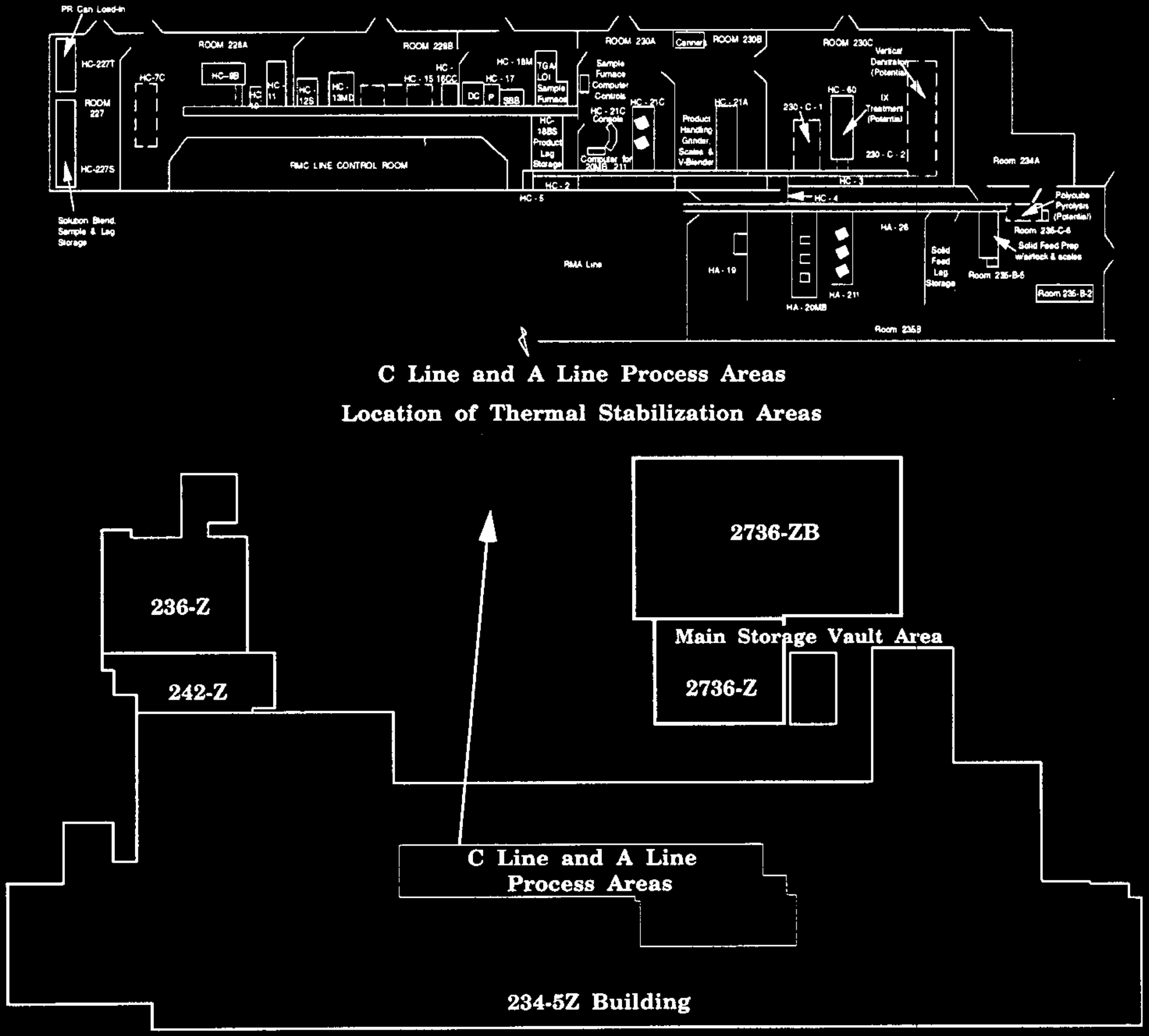


Table 3-2. Milestone Summary.

Activity	Milestone	Comments
Issue Material Characterization Plan	March 1995	Completed March 1995
Initiate and complete transfer of PUREX solutions to tank farms for disposal.	August 1995	IP-3.1-023 & IP-3.1-024; Completed April 1995.
Start engineering studies of a new repackaging line at Hanford	September 1995	IP-3.2-028; Completed July 1995 The studies have been replaced by the consolidated procurement effort.
Stabilize sludge residue inventory.	September 1995	IP-3.3-031; Completed June 1995.
Stabilize high-risk solutions	September 1995	IP-3.1-015; 220 liters (27 items) containing chlorides and fluorides in PFP Process Support Laboratory. Completed September 1995
Verify venting of solution containers	December 1995	IP-3.1-014; Completed May 1995.
Stabilize high-risk incinerator ash	March 1996	IP-3.3-032; 46 items of reactive incinerator ash Completed January 1996
Complete solution technology development at PFP	March 1996	IP-3.1-021; 6 stabilization methods under evaluation.
Provide Hanford convenience container	May 1996	Organic-free container suitable for insertion into DOE Standard boundary container
Feasibility of Calciner Modification	March 1996	Impacts decision on use of new vs. existing development model
Issue Dose Evaluation Study	June 1996	Impacts design of process systems
PFP EIS-ROD	June 1996	IP-3.1-016
Begin processing solutions at PFP	June 1997	IP-3.1-022
Project Validation New Packaging and Storage System	July 1997	CDR & cost estimate completed
Complete detailed design, equipment procurement, and installation of a new repackaging system at Hanford	December 1998	IP-3.2-029
Complete stabilizing remaining solutions	January 1999	IP-3.1-017; 4,800 liters, 450 items of solution
Start restabilizing high assay oxides at PFP	July 1999	IP-3.2.033
Begin stabilization of polycubes.	July 1999	IP-3.3-028
Train staff, prepare procedures, perform operational readiness testing (prior to commencing operations)	September 1999	IP-3.2-030
Commence repackaging operations at Hanford	October 1999	IP-3.2-031
Complete stabilize reactive solid residues	January 2000	IP-3.3-026; Sand, slag, & crucible, and poorly characterized items
Complete metal repackaging at Hanford.	September 2000	IP-3.2-032
Complete stabilization of polycubes.	January 2001	IP-3.3-029
Complete stabilize remaining residues	January 2002	IP-3.3-027; Items currently meeting Hanford Site 1.0 wt% LOI at 450°C
Complete stabilize high-assay oxides	January 2002	Items currently meeting Hanford Site 1.0 wt% LOI at 450°C

Activity	Milestone	Comments
Complete recovery of non-waste plutonium	January 2002	Approximately 56 kg of plutonium is held up in process systems and support equipment
Complete thermally stabilize and repackage all plutonium oxide to meet the metal and oxide storage standard.	May 2002	IP-3.2-018; IP-3.2-034
Complete stabilizing and packaging all remaining residues.	May 2002	IP-3.3-033

3.2 SOLUTIONS

3.2.1 Scope

The scope of this portion of the Hanford SISMP, addressing remediation of solutions, is the current inventory of plutonium-bearing solutions at PFP and PUREX. The inventory at PFP consists of approximately 4,804 liters of solution: 4,564 liters of nitrate solutions; 220 liters of chloride and miscellaneous solutions; and 20 liters of organic solutions. These solutions are in 10-liter containers in storage in the 234-5Z Building. The chloride and fluoride solutions were considered to be the greatest risk to container integrity, and therefore are received early attention.

The 10-liter solution containers in storage have been inspected, and all containers are vented. The 220 liters of chloride solutions have been stabilized in testing by Ion Exchange and Magnetic Oxide Separation in the PFP Plutonium Process Support Laboratory (PPSL).

All related solutions at PUREX have been discarded to Hanford waste tanks.

3.2.2 Remediation Objectives

The objective is to transform the current inventory of solutions to a stable form suitable for 50-year storage. Additionally, this remediation effort will ensure that the solution containers are properly vented until they are emptied and stabilized. The product form for the stabilized solutions will be plutonium oxide fired to the temperature (1000 °C) necessary to meet the DOE standard for 50-year storage. Most of the stabilized material will be >50 wt% plutonium requiring that the stabilized material be packaged in accordance with the DOE Standard, DOE-STD-3013-94. Concurrent with the development of a packaging system that will comply with DOE-STD-3013-94, Hanford Site personnel will develop a convenience container that will ensure the stabilized plutonium-bearing materials will remain suitable for overpack in the DOE-STD-3013-94 boundary container without repackaging. This involves the development of a food-pack-style container of proper size that is free of organics and is hermetically sealed.

Consideration will be given to immobilizing and discarding the 20 liters of organic solution as well as other miscellaneous solutions that are not compatible with the planned processing capability without extensive pretreatment.

3.2.3 Remediation Process

Hanford Site laboratory personnel are currently performing developmental testing of equipment and processes to determine the appropriate method for stabilizing the solutions. Of greatest interest are direct calcination using a continuously operating vertical calciner, and a batch-operated precipitation/filtration/thermal stabilization process. The vertical calciner may also need a downstream thermal treatment step to meet the 1000 °C criterion, and the plan assumes that all of the vertical calciner product will be treated in a muffle furnace. An engineering study will be conducted in close concert with the above development program to determine the appropriate process improvements and to select the location within the 234-5Z Building. Should this process prove unsatisfactory, the method of stabilization will be magnesium oxide precipitation with a downstream thermal treatment step to meet the 1000 °C criterion.

All liquid waste generated from the solution stabilization process will be routed through existing systems and disposed of to the Hanford Site waste tanks in accordance with the current waste tank acceptance criteria.

3.2.3.1 Preparation. The preparation phase for solution stabilization at PFP addresses near-term actions to mitigate risks identified with the continued storage of solutions in 10-liter containers that may not be in properly vented containers. Laboratory-scale developmental testing will evaluate solution stabilization technologies and the actions that are prerequisite to the startup of solution processing.

Solutions stored in 10-liter containers were inspected to ensure that all containers are properly vented to preclude the potential for pressurization caused by the generation of hydrogen gas. This inspection activity completed the actions necessary to fulfill the requirements of Milestone "IP-3.1-014, All bottles of plutonium solutions at Hanford inspected to ensure proper venting." Milestone IP-3.1-014 was completed in May 1995. Completion of this milestone was documented by letter to DOE.

Six (6) stabilization technologies were evaluated by PPSL personnel at PFP for stabilizing a variety of plutonium-bearing solutions. The processing technologies identified for evaluation were:

- Cation Exchange (Eichrom)
- Inorganic Ion Exchange
- Anion Exchange
- Direct Denitration (Vertical Calciner)
- Magnesium Oxide Precipitation
- Magnetic Separation

The evaluation of the six stabilization technologies resulted in two technologies,(Anion Exchange and Magnetic Separation) being eliminated from further consideration. The remaining four technologies were accepted for solution.developmental testing. Feed materials for the stabilization technologies testing will include the ~220 liters of chloride and fluoride solutions, as well as, an indeterminate number of containers of plutonium nitrate solutions. The chloride and fluoride solutions were stabilized by precipitation of the plutonium with magnesium oxide followed by calcination at 1000 °C in a muffle furnace. The material was packaged to the interim storage criteria. The stabilization and storage of chloride and fluoride solutions completed the actions necessary to fulfill the requirement of Milestone "IP-3.1-015; 220 liters of chloride solutions at Hanford stabilized." Milestone IP-3.1-015 was completed in September 1995. Continued testing is underway of the Cation Exchange (Eichrom) and Inorganic Ion Exchange processes for cleanup of flush and analytical laboratory solutions to satisfy both the vertical calciner or precipitation process feed pretreatment requirements.

One technology will be chosen by March 1996 for stabilization of solutions.

Direct denitration (vertical calciner) was selected as the "base case" system to stabilize plutonium solutions for purposes of schedule formulation. Magnesium Oxide Precipitation followed by muffle furnace calcination was selected as the alternate process if direct denitration proved unsatisfactory. Test plans will be prepared and approved for those technologies accepted for developmental testing. The outcome of the developmental test program will be a decision report in March 1996 documenting the results of the testing and providing recommendations as to: (1) the preferred process technology to be used for pretreatment and stabilization of the inventory of solutions at PFP, (2) operating parameters for a production-scale processing system, and (3) developing operating and maintenance procedures for the selected process system. Completion of this developmental program, and the issuance of the test report will fulfill the requirement of Milestone "IP-3.1-021; Complete solution technology development at Hanford Plutonium Finishing Plant (PFP). Completion of this milestone will be documented by letter to DOE.

The DOE has identified a purpose and need to take action that will mitigate risks associated with the continued presence of unstable forms of plutonium in the PFP. The issuance of the PFP EIS Record of Decision (ROD) in June 1996 will allow implementation of the stabilization processes identified in this SISMP. Issuance of the of the PFP ROD will fulfill the requirement of Milestone "IP-3.1-016; ROD issued for PFP Clean-out and Stabilization EIS."

The engineering study and location assessment were started concurrently, with the location assessment intended to be completed first. The engineering study relies substantially on the solution developmental testing effort for the technical information required to complete this task. Issuance of the solution development test report will complete the requirements for the engineering study. The period allocated for design will include those activities necessary to design the test solution stabilization equipment, and will use that basis to continue on with the design for the production solution stabilization equipment. Safety analysis for the solution stabilization process will ensure safe operation and provide the proper safety documentation to comply with DOE orders (DOE 5480.22 and DOE 5480.23) and WHC management policies (WHC-CM-4-46). Compliance with these requirements will help ensure the protection of the environment and the employees; members of the general public are not subject to undue risk. Fabrication, procurement, and site preparation will start concurrently. Readiness assessment scoping is necessary to establish the breadth and depth of the assessment in May 1997 prior to startup of the solution stabilization process. The solution stabilization equipment installation and the procedure development then begins. Training of the operating personnel and testing of the stabilization process starts and ends before the readiness process.

A readiness assessment will be conducted by WHC for the solution stabilization process in accordance with established WHC readiness process procedures that ensure compliance with DOE Order 5480.31. This readiness process shall focus on the adequacy of hardware, personnel, and the administrative process necessary to support and maintain the safe operation of the stabilization activity. After the readiness process is completed and readiness is verified, written authorization to proceed with the solution stabilization program work will be provided to plant management. Completion of the readiness process ends the preparation activities required prior to startup of the solution stabilization process. Completion of the readiness process also responds to DOE's policy that facilities will be started or restarted in accordance with DOE Order 5480.31.

3.2.3.2 Production. Startup of solution stabilization will be initiated in June 1997. The start of solution stabilization fulfills the requirement of Milestone "IP-3.1-022; Begin processing solutions at PFP." Completion of this milestone will be documented by letter to DOE. Solutions will be processed through the vertical calciner with a projected throughput of 275 liters of feed per month to transform the current inventory of solutions to a stable form to meet the DOE standard for 50-year storage. Solution processing will be completed in January 1999. Completion of solution processing fulfills the requirement of Milestone "IP-3.1-017; Stabilization of 4,800 liters at PFP completed." Completion of this milestone will be documented by letter to DOE.

3.2.4 Schedule Objectives

Schedule details for solution stabilization are shown in Appendix B of Volume 2 of this report. The current developmental testing effort began on the vertical calciner in June 1995, is projected to be completed in March 1996. Tests on the precipitation/filtration process are already underway. The engineering study will begin concurrently with the start of vertical calciner testing; completion will result in a decision on the selection of one technology in March 1996. Design of the selected system will proceed concurrently with the public review and comment period on the draft PFP NEPA document(s), starting May 1996.

Procurement and installation of the selected system will begin upon issuance of the approved NEPA documentation in June 1996. Initial startup of the new system is anticipated in June 1997 with the projected throughput of 275 liters of feed per month reached by January 1998. With this throughput, stabilization of the solutions is projected to be completed in January 1999. Concurrent with the denitration of the solutions will be additional thermal treatment of the calciner product (if required). The discardability of various solutions in forms suitable for disposal as TRU waste is not expected to be determined before September 1996. Other important activities are:

1. Contents of the two organic solution containers will be evaluated for immobilization in small batches or for disposal as TRU solid waste.

Should disposal be approved by DOE, disposal would be completed within 90 days.

2. The chloride and miscellaneous solutions (including fluoride solutions) have been stabilized in the PFP Process Support Laboratory as a result of the test program to demonstrate alternative technologies for stabilization of solutions.

3.2.5 Assumptions

The following assumptions were considered in the development of the solution portion of the Hanford SISMP:

1. Dose rates associated with the solution stabilization effort will be manageable given the WHC/DOE administrative limit of 1,500 mrem exposure per year. A dose evaluation, discussed below in Section 3.6, will be completed to confirm this assumption or to identify the changes needed to achieve an acceptable dose. This concern is being reviewed by the PFP EIS and a record of decision is due in June 1996.

2. The current laboratory development program will identify and resolve any technology and equipment development issues and will serve as an adequate basis for design of the selected process system.

3. Facility modifications needed for packaging and storage of plutonium containers to the DOE Standard (DOE-STD-3013-94) are scheduled to be operational, with special funding dispensation, by June 1998. The Hanford convenience container, suitable for overpacking to the DOE Standard, will be available by May 1996. Stabilized high-assay (>50 wt% plutonium) solution material produced after the latter date will be retrieved from storage and overpacked for 50-year storage. No further processing or repackaging will be required. Vault modifications will be required to store the DOE standard container.

4. Operations will be on a 24-hour-per-day, 5-day-per-week basis, and personnel and funding will be provided to support this level of effort.

3.2.6 Issues and Problems

The following issues and problems have been identified that could affect the ability of the solution stabilization program to meet its objectives:

1. Until the processing activities are defined and an integrated system dose evaluation is completed in June 1996, worker exposure cannot be accurately determined. Results of the dose evaluation may identify a need for additional shielding, automation, or an entirely new system to meet the WHC/DOE administrative guideline of 1,500 mrem per year.

2. An upgrade of the PFP Analytical Laboratory is needed to facilitate characterization of the plutonium-bearing material for processing or disposal, to provide better process control of the various stabilization

operations, and to meet Waste Isolation Pilot Plant (WIPP) and RCRA criteria for TRU waste.

3. To expedite the disposal process, approval authority for deleting safeguards for items designated as waste needs to be transferred to the Field Offices. Additionally, to avoid problems in the future associated with the ultimate disposal of the TRU waste, the Field Offices must be given a space allocation in WIPP.

3.2.7 Alternatives/Impacts

Currently, six processes to be utilized in the stabilization of aqueous solutions are being evaluated in the PFP Process Support Laboratory. The six processes are: (1) Cation Exchange (Eichrom) (2) Inorganic Ion Exchange (3) Anion Exchange (4) Direct Denitration (Vertical Calciner) (5) Magnesium Oxide Precipitation (6) Magnetic Separation. Two of these processes are preferred pending final laboratory results expected by March 1996; one of these methods will be selected at that time as the preferred option to be discussed in the PFP EIS:

1. A continuously operated vertical calciner that will produce a solid plutonium oxide product from aqueous nitrate feed. The calciner product would be further stabilized in a muffle furnace.

2. A batch precipitation/filtration system that will produce a filter cake suitable for thermal stabilization in a muffle furnace.

Neither of the above processes is suitable for the organic solutions. The only practicable alternatives are to immobilize the solution in a solid absorbent and package the material as TRU solid waste, or to stabilize the solutions in very small batches using thermal stabilization. The latter alternative would require a safety appraisal to establish the safe batch size. The issue of discarding plutonium-bearing material as TRU waste is expected to be resolved by September 1996 with the approval of an engineering evaluation of the economics of storage versus disposal. Current U.S. Department of Transportation regulations (49 CFR 172 and 173) make shipment of solutions to another site nonviable.

3.2.8 Technology Development

Work in the PFP Process Support Laboratory, to be completed by the end of March 1996, will develop and demonstrate the technology to be used at PFP for stabilization of aqueous plutonium solutions.

3.3 RESIDUES AND OXIDES (<50 wt% Pu)

3.3.1 Scope

The scope of this portion of the Hanford SISMP addresses plutonium residues and wet solids left over from operations of the Plutonium Reclamation Facility (PRF), generated from cleanout of process gloveboxes and equipment, or recovered during the terminal cleanout of process support equipment and ductwork (up to 56 kg of plutonium could be recovered). Material recovered to date is currently stored in gloveboxes at buildings 234-5Z and 236-Z. This category also includes plutonium-bearing material generated as a result of cleanout of other Hanford Site plutonium facilities such as the PUREX Plant.

The backlog inventory of low-organic (<2 wt% organic) sludge residues at the PFP (236 items) has been stabilized at 1000 °C and 0.5wt% LOI using muffle furnaces (NOTE: five items had anomalies with LOI testing. Two had gains on ignition and three had high LOIs between 0.5 to 1.0wt%).

High-organic sludges (>2 wt% organic) may be generated during terminal cleanout of the PRF and will either have to be hydrolyzed for organic destruction before thermal stabilization or limited to small furnace batches because of their exothermal reaction hazard. A safety appraisal is needed to determine the safe batch size. Much of the material arising from terminal cleanout work at PFP and PUREX will be immobilized and discarded as waste, but some sludge may have sufficient plutonium content to warrant stabilization and recovery. The stabilization process would be the same as for the other sludges, with or without hydrolysis, as appropriate. The stabilization of fluoride bearing residues is being evaluated. The primary concern associated with the thermal stabilization of these materials is corrosion of equipment and the acceptable form required in the to-be-issued residue standard. The process planning at this time assumes, conservatively, thermal stabilization of all the terminal cleanout material.

Plutonium-bearing residues such as sand, slag, and crucible, incinerator ash, and other miscellaneous dry residues from prior process operations, some containing fluorides, calcium metal powder and pellets, iodine etc. are not considered stable for long-term storage. Vault storage has been allowed through special exemptions and special packaging in the existing Hanford Site storage criteria. The inventory of these residues includes approximately 1,625 items with a bulk weight of about 1,893 kg. These items are in the 234-5Z, 2736-Z, and 2736-ZB Building storage vaults. The reactive incinerator ash (46 items, 52 cans) has been stabilized to 1000 °C and 1% LOI. This material was then packaged to the interim criteria. The stabilization and storage of the reactive incinerator ash completed the actions necessary to fulfill the requirement of Milestone "IP-3.3-032; Stabilize 46 cans of selected ash from RF in the muffle furnaces." Milestone IP-3.3-032 was completed in January 1996. Completion of this milestone was documented by letter to DOE.

Combustible solids include PFP's current inventory of polycubes and plutonium and MOX scrap with dylene. The inventory of combustible solids includes approximately 251 items containing 1,800 polycubes of various sizes containing a total of approximately 34 kg plutonium, total. The miscellaneous combustible solids are contained in 22 items of 64 kg bulk weight. These items are not an imminent hazard because they are not susceptible to spontaneous combustion, and they are packaged and stored in such a way as to allow proper venting.

All other solid, plutonium-bearing residues contain less than 50 wt% plutonium. This includes about 2,200 items totaling about 3,000 kg bulk weight of oxides which are interim stable based on their previous thermal treatment. This material is currently stored in the 2736-Z and 2736-ZB Vaults.

The FFTF unirradiated fuel pins and assemblies are in storage at PFP and at FFTF.

3.3.2 Remediation Objectives

The objective of this remediation is to transform the plutonium-bearing residues to a stable plutonium oxide form suitable for storage to the interim storage criteria. Most of the residues have low plutonium content (< 50 wt% plutonium) and will not come under the DOE Standard (DOE-STD-3013-94) for 50-year storage. Hanford criteria for thermal treatment is currently being used (1.0 wt% loss on ignition at 1000 °C) for these residue materials. This material will then be packaged in food-pack cans for storage to the interim criteria. Discussion is underway with LANL regarding shipment of the richest SS&C for stabilization.

The unirradiated FFTF fuel pins and assemblies are considered acceptable as-is for long term storage. No further actions are envisioned for these materials.

3.3.3 Remediation Processes

Note: This section may be modified as a result of the on-going trade studies and residue policy.

The process for stabilization of plutonium-bearing residues is thermal treatment currently using two muffle furnaces located in Room 230-A of the 234-5Z Building. Figure 3-2 shows the location of the existing and proposed process equipment. Furnace temperatures are regulated to first vaporize volatile material at low temperature (~ 200 °C) and then to raise temperatures ultimately to 1000 °C for final stabilization to the desired end point. After a minimum 1-hour soak at the maximum temperature (approximately 10% of the sludge items and the majority of the reactive incinerator ash items require up to a 3 hour soak time), the material is allowed to cool in a controlled environment and packaged to existing Hanford Site criteria (slip lid can, taped and bagged out, nested into two mechanically sealed food-pack cans). The slip lid can will be replaced with a sealed convenience can starting in late May 1996.

High-organic sludge residues will require pretreatment prior to stabilization. The pretreatment process, hydrolysis, is partially installed in glovebox HC-60 (room 230-C). Completion of installation, testing, and readiness assessment are required prior to startup.

Most of the other residues will be stabilized by thermal treatment in muffle furnaces. Some of the material will require a two-stage heating cycle to drive off volatiles at a lower temperature before increasing the temperature to the 1000 °C end point. After a minimum 1-hour soak at the high temperature, the material will be allowed to cool in a controlled environment and packaged to Hanford Site's criteria, including use of a sealed convenience can starting in May 1996.

The polycubes will require a different process to decompose and separate the polystyrene from the plutonium oxide. The polycubes will be treated in a two-stage pyrolysis furnace to decompose and vaporize the polystyrene, burn off the residual carbon, and stabilize the residual plutonium oxide. This process is similar to one previously used for polycube stabilization (located in glovebox MT-4 of the 236-Z Building) until it was shut down for an offgas problem. The unit to be utilized for the stabilization outlined in this plan is likely to be located in room 235-B of the 234-5Z Building. Development of the pyrolysis system is being conducted at LANL with direction from Hanford. The development focuses on batch pyrolysis with off gas treatment. Three off gas treatment methods are under consideration: catalytic conversion, silent plasma discharge, and secondary combustion. Selection of the preferred treatment method is expected in June 1996.

The miscellaneous combustibles are expected to be compatible with the pyrolysis system.

Many of the items currently stored in PFP's vaults are not fully characterized. Specifically, there is a lack of information regarding the non-plutonium constituents. Some chemical characterization will be required to stabilize or discard this material. Upgrades to the PFP laboratory have been identified to provide characterization capability, and these upgrades are included in Section 3.5.

The FFTF unirradiated fuel is already stable and packaged to 50-year criteria so no effort other than storage of the containers is required.

3.3.3.1 Preparation. The preparation phase for the polycube stabilization begins with an engineering study concurrent with a development program for the polycube stabilization system. The development program is intended to gather information to select a polycube stabilization method and support the design of the selected stabilization method. The information collected will be compiled into an engineering study. The engineering study will document the test data collected, the decisions made, and provide information to proceed with conceptual design. The engineering study will end prior to the completion of the developmental program. The method being developed is pyrolysis with off gas treatment. Three off gas treatment methods for pyrolysis are being considered: catalytic conversion, silent plasma discharge and secondary combustion. Testing will begin concurrently for the three off gas treatments. These tests will be used to gain information to support the decision process and eventual implementation of the selected method. A prototype unit will be demonstrated at LANL. The conceptual design process starts shortly thereafter. Safety analysis for the polycube stabilization process will ensure safe operation and provide the proper safety documentation to comply with DOE orders (DOE 5480.22 and DOE 5480.23) and WHC management policies (WHC-CM-4-46). Compliance with these requirements will help ensure the protection of the environment and the employees; members of the general public are not subject to undue risk. Definitive design, procurement and site preparation will start concurrently. The installation of equipment, development of procedures and the training of the operating personnel will begin concurrently. Readiness assessment scoping was will be done to establish the breadth and depth of the assessment in November 1997 prior to startup of the polycube stabilization process.

A readiness assessment will be conducted by WHC for the polycube stabilization process in accordance with established WHC readiness process procedures that ensure compliance with DOE Order 5480.31. This readiness process shall focus on the adequacy of hardware, personnel, and the administrative process necessary to support and maintain the safe operation of the stabilization activity. After the readiness process is completed and readiness is verified, written authorization to proceed with the polycube stabilization program work will be provided to plant management. Completion of the readiness process ends the preparation activities required prior to startup of the polycube stabilization process. Completion of the readiness process also responds to DOE's policy that facilities will be started or restarted in accordance with DOE Order 5480.31.

The preparation phase for the six muffle furnace installation began with design for the gloveboxes and room the furnaces will be located. A safeguards and security evaluation was completed for the area selected to receive the six furnaces. This evaluation determined the base-case and upgrade-case risk for the thermal stabilization area. The safety analysis for thermal stabilization will ensure safe operation and provide the proper safety documentation to comply with DOE orders (DOE 5480.22 and DOE 5480.23) and WHC management policies (WHC-CM-4-46). Compliance with these requirements will help ensure the protection of the environment and the employees, members of the general public are not subject to undue risk. Procurement and site preparation started concurrently. Security improvements were initiated. Thermal stabilization equipment is installed. Procedures are developed to operate the thermal stabilization process. Training of the operating personnel begins after the procedures are completed. Readiness assessment scoping is necessary to establish the breadth and depth of the assessment in August 1996 prior to startup of the thermal stabilization process. Testing of the furnaces, shortly after the installation is completed will ensure proper equipment operation.

A readiness assessment will be conducted by WHC for the residue stabilization process in accordance with established WHC readiness process procedures that ensure compliance with DOE Order 5480.31. This readiness process shall focus on the adequacy of hardware, personnel, and the administrative process necessary to support and maintain the safe operation of the stabilization activity. After the readiness process is completed and readiness is verified, written authorization to proceed with the residue stabilization program work will be provided to plant management. Completion of the readiness process ends the preparation activities required prior to startup of the six new muffle furnaces.

3.3.3.2 Production. Startup processing of the polycube stabilization process is initiated in January 1998 and fulfills the requirement of Milestone "IP-3.3-028; Stabilization of Polycubes begins." Completion of this milestone will be documented by letter to DOE. Completion of the polycube stabilization process will be in August 1998. Completion of this activity fulfills the requirement of Milestone "IP-3.3-029; Stabilization of Polycubes completed." This material will be packaged to the interim storage criteria if the repackaging system is not available.

Startup processing of the six muffle furnaces is initiated September 1996. These six furnaces have a throughput capacity of about 1,800 kg of bulk solids per year. Eight furnaces (including the two existing furnaces) are expected to bring the total processing capacity to about 2,400 kg per year to transform the current inventory of solids to a stable form to meet the DOE standard for 50-year storage. Starting in October 1996 and continuing till late March 1998, sand, slag and crucible and poorly characterized items are processed. Completion of this activity in March 1998 fulfills the requirement of Milestone "IP-3.3-026; Stabilization of reactive solids (SS&G) completed." Completion of this milestone will be documented by letter to DOE. Thermal stabilization of residues and mixed oxides also starts in October 1996 completing in January 2002. Completion of this activity fulfills the requirements of two milestones: "IP-3.3-027; Stabilization and repacking of interim-stabilized materials completed", and "IP-3.3-033; Stabilize and package all remaining residues to safe interim storage standards." Completion of these milestones will be documented by letter to DOE.

3.3.4 Schedule Objectives

Details for stabilization of sludges and other miscellaneous solid residues are shown in Appendix B of Volume 2 of this report. The operation of the existing two muffle furnaces (covered by an approved environmental assessment) is ongoing. The stabilization of the original inventory of 236 low organic sludges was completed in June 1995. Present NEPA documentation for operating the furnaces allows sludges, incinerator ash, and materials from similar sources to be stabilized. Stabilization of the 46 items of reactive incinerator ash was completed in January 1996. The furnaces are now stabilizing other incinerator ash items (moderate to low risk material).

Sludges recovered from the terminal cleanout activities will be stabilized and/or packaged for WIPP disposal in the same year they are generated, starting in October 1995, using the two existing furnaces supplemented as necessary with new furnaces coming into service in September 1996. Sludge stabilization operations in connection with terminal cleanout will continue until the end of the PFP cleanout program in January 2002.

Six new muffle furnaces will be installed in existing gloveboxes HA-21I and HA-20MB in Room 235-B of Building 234-5Z, three furnaces to a glovebox. The six furnaces will be ready for operation beginning in September 1996. Figure 3-2 shows the location of these gloveboxes. With a three-shift operation, these six furnaces have a throughput capacity of about 1,800 kg of bulk solids per year. Eight furnaces are expected to bring the total processing capacity to about 2,400 kg per year. This sequence of furnace capacity increases would permit completion of stabilization of miscellaneous solid residues in 1998. The schedule would improve depending upon the amount of miscellaneous solid residues that can be discarded as TRU solid waste.

Details for stabilization of the polycubes are shown on the attached schedule. The pyrolysis equipment will be ready for full operation starting by November 1997. The campaign is expected to be completed by July 1998. The material will be packaged for storage to meet the DOE standard for 50-year storage.

The miscellaneous combustibles are not expected to be compatible with the pyrolysis system and will be dispositioned as waste by July 1998.

The PFP Analytical Laboratory is expected to be upgraded. Additional instrumentation will be provided to support necessary analyses in characterization of miscellaneous solid residues and process support of the stabilization operations. The laboratory upgrade is expected to be complete by December 1997.

3.3.5 Assumptions

The following assumptions are made in developing the portion of the SISMP for residues.

1. Dose rates associated with the residue stabilization effort will be manageable given the WHC/DOE administrative limit of 1,500 mrem exposure per year. A dose evaluation, discussed in Section 3.6, will be completed to confirm this assumption or to identify the changes needed to achieve an acceptable dose.

2. Most of the miscellaneous solid residue material will be low plutonium assay. The material will be stabilized to 1000 °C with a 1.0 wt% LOI at 450 °C, necessary for compliance with the DOE Criteria for Interim Storage of Plutonium Bearing Materials. The stabilized material will be packaged to the Interim Storage Criteria pending disposition.

3. Operations will be on a 24-hour-per-day, 5-day-per-week basis, and personnel and funding will be provided to support this level of effort.

3.3.6 Issues and Problems

The following issues and problems have been identified that could affect the ability of the residue stabilization program to meet its program objectives.

1. Until the processing and terminal cleanout activities are fully defined and an integrated system dose evaluation is completed in June 1996, worker exposure cannot be accurately determined. Results of the dose evaluation may identify a need for additional shielding or automation, to meet the WHC/DOE administrative guideline of 1,500 mrem per year.

2. An upgrade of PFP Analytical Laboratory capabilities is needed to facilitate characterization of the plutonium-bearing material for processing or disposal, to provide better process control of the various stabilization operations, and to meet WIPP and RCRA criteria for TRU waste.

3. DOE approval of a strategy to discard a significant fraction of the miscellaneous solid residue as TRU solid waste will expedite completion of the stabilization effort. At the same time, space allocations in the WIPP must be made to ensure that a new problem is not created.

4. The on-going trade studies will impact this program. The impacts ar indeterminate at the time.

3.3.7 Alternatives/Impacts

A detailed evaluation of processing alternatives at Hanford was conducted in association with the Environmental Assessment conducted for the current sludge stabilization effort. This evaluation concluded that no reasonable alternatives to thermally treating plutonium-bearing sludges for stabilization. For safety reasons, high-organic bearing sludges will have to be treated for organic destruction by hydrolysis before furnace treatment. Constraints imposed by the DNFSB Recommendation 94-1 schedule preclude development, design, and construction of a new, customized process system. Shipment of the material to another DOE site for processing is currently being reviewed for selected high-assay residue. Much of the plutonium-bearing material in inventory at PFP, including sludges, can most economically be discarded as TRU solid waste. Engineering analyses of this alternative currently underway will be submitted to RL by July 1996 for approval.

The only viable alternatives for miscellaneous solid residues are thermal stabilization and vault storage, or treatment and discard as TRU solid waste. Characterization of the residues may indicate pretreatment requirements such as size reduction to support requirements for calcium metal stabilization, but no other mainline process, such as a new specialty processing facility, is available within the time constraints of this program. If discard is selected,a glovebox will be modified to support cementing and packaging of the material for discard as TRU solid waste.

Hanford has no separations capability for the high-grading of residues to oxides.

The results of the on-going trade studies will evaluate intersite shipment/separation alternatives.

3.3.8 Technology Development

The ongoing stabilization (sludges and ashes) effort will provide muffle furnace technology to support stabilization of other plutonium-bearing materials. Hydrolysis of organic-bearing materials has been practiced at PFP and elsewhere and needs no specific development. Coordination with LANL is ongoing to determine the preferred method for dealing with sand, slag, and crucible. Hanford and LANL are participating in the trade study on the disposition of sand, slag, and crucible. This trade study will conduct a comparison of alternative methods of achieving material forms that comply with established standards or criteria for disposal or long-term storage for sand, slag, and crucible. Funding for the trade studies are being provide by the NMSTG. The trade study completion date is May 1996. Hanford is also participating in the ash and combustibles trade studies.

Hanford and LANL are also cooperating on the development of a polycube stabilization method. The method being developed at LANL is pyrolysis with off gas treatment. Three off gas treatment methods are being considered: catalytic conversion, silent plasma discharge and secondary combustion. Selection of the preferred off gas treatment is expected in July 1996. Completion of the LANL development activities is expected when the prototype demonstration at LANL is completed in August 1996.

3.4 METALS AND OXIDES

3.4.1 Scope

This material category includes the PFP's current inventory of plutonium metals and oxides material of greater than 50 wt% plutonium that meets the Hanford Site's existing storage criteria (stabilized to 450 °C with a 1.0 wt% LOI, also called interim stable). This category covers approximately 2,999 items, containing approximately 2,600 kg of plutonium, will require additional stabilization and repackaging. While the majority of PFP's metals have a heat output that mandates they be transformed to oxides, a portion of the metals will only require repackaging.

3.4.2 Remediation Objectives

The objective is to transform the plutonium metal and oxide materials to a stable form, typically oxide, suitable for 50-year storage. This will be done concurrently with the treatment and repackaging of the interim stable residues. The material in this category has a plutonium content of >50 wt% and is covered by DOE Standard DOE-STD-3013-94. This material will either be stabilized and repackaged to the DOE criteria or for selected metals simply repackaged to the DOE criteria.

3.4.2.1 Preparation. The preparation for the thermal stabilization process for metals and oxides is identified in Section 3.3.3.1, Preparation for the Six Muffle Furnaces. Re-stabilization of the of the metals and oxides will be completed using the six muffle furnaces.

The preparation phase for the packaging loadout system began with the DOE complex procurement. Initiation of the complex-wide procurement completed the requirements for Milestone "IP-3.2-028; Start engineering studies of a new repackaging line at Hanford." Installation and site preparation design begin the preparation phase at Hanford. The packaging system will be procured. Site preparation will start ahead of procurement to ensure the location ready to receive the system. Installation of the system then occurs. Completion of the installation fulfills the requirement of Milestone "IP-3.2-029; Complete detailed design, equipment procurement, and installation of a new repackaging system at Hanford." Procedure development will begin concurrently with installation, and will end the with the completion of training. Readiness assessment scoping will be necessary to establish the breadth and depth of the assessment in May 1998 prior to startup of the packaging process. System testing will ensure the proper operation of the packaging system.

A readiness assessment will be conducted by WHC for the packaging system in accordance with established WHC readiness process procedures that ensure compliance with DOE Order 5480.31. This readiness process shall focus on the adequacy of hardware, personnel, and the administrative process necessary to support and maintain the safe operation of the stabilization activity. After the readiness process is completed and readiness is verified, written authorization to proceed with the packaging system program work will be provided to plant management. Completion of the readiness process ends the preparation activities required prior to startup of the packaging system. Completion of the readiness process also responds to DOE's policy that facilities will be started or restarted in accordance with DOE Order 5480.31. Completion of the readiness assessment fulfills the requirement of Milestone "IP-3.2-030; Train staff, prepare procedures, perform operational readiness testing (prior to commencing operations." Completion of this milestone will be documented by letter to DOE.

3.4.2.2 Production. The production process for stabilizing metals and oxides in six muffle furnaces is identified in Section 3.3.3.2. Processing capability will begin to be available for this processing in late 1998. Starting the stabilization of high assay oxides in late 1998 will fulfill the requirement of Milestone "IP-3.2-033; Start restabilizing high assay oxides at the PFP." Processing capability for the eight furnaces, (six muffle furnaces plus two existing) is expected to be about 2400 kg per year. Completion of high assay oxide stabilization is planned by January 2002. Completion will fulfill the requirement of Milestone "IP-3.2-034; Complete restabilizing high assay oxides at the PFP." Completion of both milestones will be documented by letter to DOE.

A related production process for the repackaging of metal and previously stabilized materials will begin in June 1998. Initiating that activity will fulfill the requirement of Milestone "IP-3.2-031 Commence repackaging operations at Hanford." Interim milestones within the repackaging activity include completion of metal repackaging by September 2000. Completion of this activity will fulfill the requirement of Milestone "IP-3.2-032; Complete Metal Repackaging at Hanford." Completion of stabilization and repackaging of all oxide and metals will fulfill the requirement of Milestone "IP-3.2-018; Thermally Stabilize and Repackage all Plutonium Oxide to meet the Metal and

Oxide Storage Standard." This activity will be completed by January 2002. Completion of these milestones will be documented by letter to DOE.

3.4.3 Remediation Process

Stabilization will be done in muffle furnaces after stabilization of the sludges and reactive solid residues. Re-stabilization of the oxides would require only the high-temperature soak period in the furnace, and the throughput of the six new furnaces would be 2,400 kg per year on this material. As with the other material, the stabilized product from the oxide feed would be allowed to cool in a controlled environment and then would be packaged to DOE Standard DOE-STD-3013-94. Material processed before the new packaging system was operational would have to be repackaged.

3.4.4 Schedule Objectives

Evaluation of the two existing continuous calciners at PFP was completed in March 1996 with a determination that stabilization of the solid residues using continuous calcination process was not appropriate.

Stabilization or repackaging of metals will be completed by September 2000. The oxides will be re-stabilization upon the completion of stabilization of the reactive residues (FY 98) with completion in early 2002. Material processed after June 1998 will be packaged and stored to DOE standard criteria. Metal and oxides, processed before June 1998, will have to be repackaged to the DOE standard.

3.4.5 Assumptions

The following assumptions are used in the development of the management plan for the metal and oxides schedule.

1. The DOE project to provide the packaging and storage capability per DOE Standard DOE-STD-3013-94 will be completed in time to allow a June 1998 startup date at PFP. This is an expedited schedule requiring close management and appropriate resource availability.

2. Dose rates associated with the residue stabilization effort will be manageable given the WHC/DOE administrative limit of 1,500 mrem exposure per year. A dose evaluation, discussed in Section 3.6, will be completed to confirm this assumption or to identify the changes needed to achieve an acceptable dose.

3.4.6 Issues and Problems

The following issues and problems have been identified that could affect the ability of the stabilization program for metal and oxides to meet its objectives.

- Until the processing activities are defined and an integrated system dose evaluation is completed in June 1996, worker exposure cannot be accurately determined. Results of the dose evaluation may identify a need for additional shielding, automation, or an entirely new system to meet the WHC/DOE administrative guideline of 1,500 mrem per year. This dose assessment may indicate that the batch furnaces are acceptable as-is or with minor modifications, thus eliminating the need for a continuous system.

3.4.7 Alternatives/Impacts

The PFP is evaluating the option of using the stabilization portion of the PuSAP. This option appears to provide significant benefit to PFP. A final decision is expected by May 31, 1996.

3.4.8 Technology Development

No technology development needs are identified for this material.

3.5 ACTIVITIES COMMON TO ALL PLUTONIUM-BEARING MATERIAL TYPES - SUPPORT SYSTEMS

3.5.1 Scope

This category includes all support systems necessary to implement this portion of the Hanford SISMP, but which are not directly related to a specific material category. Current infrastructure (basic facility services such as power, ventilation, heat, etc.) at the PFP are in need of upgrades to support facility operations for the next 8 to 15 years of stabilization, cleanout, and transition to a deactivated state. Approximately half of PFP's current inventory of plutonium-bearing material is expected to be covered by DOE Standard DOE-STD-3013-94, the remainder will be covered by the interim storage criteria. To implement DOE-STD-3013-94 (as well as the residue standard under development), PFP will need to: (1) install a new packaging system; (2) modify the existing vault storage arrays to accept the new package; and (3) develop a new convenience container meeting the requirements of DOE Standard DOE-STD-3013-94. The existing safeguards and security (SAS) systems will need to be modified as well to support the new package and/or to maintain reliability for the next 20 years of storage. The current laboratory capabilities at the Hanford Site are insufficient to support the necessary analysis of TRU materials and wastes. Depending on the outcome of the DOE Materials Disposition PEIS, additional upgrades to the 2736-Z and 2736-ZB facilities may be required.

3.5.2 Support Objectives

The objectives of these support systems are: to enable the facility to transform the plutonium-bearing materials to a stable form, typically oxide, suitable for long-term storage; to provide the necessary hardware to implement the DOE-STD-3013-94 packaging standard; and to maintain a safe and compliant facility. Additionally, these support systems will enable the facility to discard those items that are determined to be waste in full compliance with state and federal regulations.

3.5.3 Support Systems Descriptions

The required support system modifications can be broken down into four categories:

1. Installation of the packaging and loadout system and associated vault modifications to allow for the implementation of DOE-STD-3013-94 and the to-be-issued residue standard.

2. Upgrades to the existing PFP laboratories to enable complete characterization of plutonium-bearing materials and waste as needed.

3. Upgrades to the existing facility infrastructure to enable the facility to support plutonium handling in a cost-effective manner. These upgrades are not fully defined but include replacement of the steam system with electric service, replacement of old ventilation control equipment with more reliable and maintainable systems, and modification of facilities as required to support the general transition and deactivation of the PFP complex.

4. Modernization of the existing SAS systems to provide maintainable remote inventory and surveillance capabilities.

All proposed modification projects are being screened to ensure that they support the general transition of the PFP complex towards deactivation and are necessary to achieve an acceptable level of reliability.

Due to the scope of the work required and the associated cost, one line-item-funded project is envisioned for the new packaging system and associated vault modifications. The SAS system modernization is expected to be expense-funded replacement-in-kind. The laboratory upgrades are expected to be within the constraints of a general plant project (GPP).

3.5.4 Schedule Objectives

Engineering work on the facility upgrades and SAS modernization is well underway. The SAS project is currently funded for FY 1995 and FY 1996 with contingent funding in FY 1997. An estimate will be prepared for the laboratory upgrades with the goal of obtaining GPP funding for 1997. The new packaging system and associated vault modifications will require additional engineering prior to development of a validated cost estimate. Reprogramming of an existing line item (FY 1998, $18 million for PFP SAS upgrades) will be required to meet the programmatic goal of completion of the repackaging by May 2002. The packaging system can, accordingly, be available in June 1998.

3.5.5 Assumptions

The following assumptions are used in developing this portion of the Hanford SISMP, addressing the support system schedule.

1. Approximately half of the plutonium-bearing material will be above 50 wt% of plutonium and will therefore be stored in the Hanford Site's organic-free convenience container until the capacity exists to package to DOE-STD-3013-94 criteria.

2. That the consolidated development and procurement activity currently underway at DOE-HQ will provide a functional system which PFP can procure in October 1997 (FY 1998 funding) and have fully operational by June 1998.

3.5.6 Issues and Problems

No specific issues or problems have been identified in this area. The DOE standard packaging system is being developed through a consolidated development and procurement effort.

3.5.7 Alternatives/Impacts

The development and procurement of the packaging system is being coordinated by DOE-HQ. No alternatives are being considered locally. Hanford will continue to stabilize material and store it to Hanford's current criteria (using an organic-free convenience container starting in May 1996) until such a time as the standard packaging system is fielded.

3.5.8 Technology Development

The standard packaging system is being developed by DOE-HQ as a consolidated, complex-wide activity.

Hanford will need to stabilize material prior to the fielding of the DOE standard DOE-STD-3013-94 packaging system. The development of a convenience container must meet the requirements of DOE-STD-3013-94 and residue standard currently under development, and be capable of guaranteeing the LOI of the stored material. This convenience container must also fit into Hanford's existing food-pack-style container for interim storage. This container must be free of organics while still guaranteeing a leak tight-seal. The Hanford Site's convenience container will guarantee that material does not have to be re-stabilized before repackaging to DOE standard criteria.

3.6 DOSE EVALUATION

The preliminary stabilization and cleanup rates in this SISMP do not consider the radiation dose on the workers, and it is questionable that individual doses can be held within the administrative limit of 1,500 mrem per year with all systems operational and at projected staff levels. A dose evaluation engineering study on the overall system will be performed to address this issue. The study will be completed in June 1996 in time for the recommendations to be implemented. Preliminary results from the draft study have identified areas where dose reduction may be realized by incorporating changes in operating techniques or by adding shielding. It also identified concerns related to procedures and operational practices.

3.7 CHARACTERIZATION OF PLUTONIUM-BEARING MATERIALS

Containers of plutonium-bearing materials shall be classified according to their content and container integrity into the following categories:

- Meets stability requirements of current Hanford Storage Specifications and will meet Interim Storage Criteria as is.
- Meets stability requirements of current Hanford Storage Specification but would require repackaging to meet Interim Storage Criteria.
- Needs thermal stabilization to meet Interim Storage Criteria or DOE-STD-3013-94 requirements.

This characterization shall be done by:

- Reviewing the documentation on the contents of each container.
- Assessing the material and container in accordance with the above categories
- Where necessary, sampling and analyzing the contents of the container and the container itself to make the above determination.

An inventory characterization implementation plan has been prepared to establish the framework for performing this characterization. Detailed work plans will be used to provide specific work instructions for the selection of items to be examined and direct the analyses to be performed. The first phase work plan implementation was conducted in March 1996. It included provision to perform digital radiography on all selected containers and based on those results detailed container examinations and chemical analyses were conducted. Evaluation of these data will form the basis for subsequent phases to provide finer granularity to the characterization of the inventory.

This effort will provide a risk basis for the sequencing of repackaging or stabilization to ensure continued safe storage as well as minimize risk during storage until disposition is complete. This will also ensure the proper stabilization process is used on each item.

3.8 PLUTONIUM FINISHING PLANT FINAL SAFETY ANALYSIS REPORT REVISION

The PFP received approval for the FSAR after a four-year approval process. The scope of processing and cleanout activities listed in the DNFSB Recommendation 94-1 SISMP will necessitate a revision to the PFP FSAR. This revision will need to be expedited through the DOE approval cycle in order to meet the programmatic goals.

3.9 INTERNATIONAL ATOMIC ENERGY AGENCY INTERACTION

Currently, one of PFP's vaults is monitored by the IAEA. Plans exist to bring the rest of PFP's vaults under IAEA monitoring prior to completion of the implementation of this plan. While it is believed that necessary arrangements can be made to allow the stabilization to continue as planned, there is a significant potential for schedule delays.

3.10 WORK PLAN

Cost, schedule, and technical baselines for the plutonium-bearing materials covered by this SISMP are provided by this document. Cost and schedule performance will be monitored on a monthly basis, and variance reports will be submitted to RL by the PFP Program Manager on the seventh of each month beginning June 7, 1995. Each task or activity is covered by a schedule bar on the GANTT chart and by a WBS Cost Account. A PFP Cost Account Manager is assigned to each activity and is responsible for cost and schedule performance under that activity. The PFP Cost Account Manager will report his performance to the PFP Program Manager on the first of each month. The variance report by the PFP Program Manager will cover any variation between the baseline and actual schedule or cost account with explanation and plans for necessary corrective action. The technical baseline is subject to formal change control and cannot be changed without the change control process.

The Program baseline will be reviewed and changed, as necessary, every six months starting in August 1995. The formal change control process will govern any change to the Program baseline.

3.11 PLUTONIUM VULNERABILITY CORRECTIVE ACTIONS

3.11.1 Scope

Hanford has 35 identified Plutonium Environmental, Safety, and Health Vulnerabilities. The vulnerabilities range from institutional problems to specific hardware problems. Many of the identified vulnerabilities will be corrected through the stabilization and packaging activities required by the DNFSB Recommendation 94-1 Implementation Plan, others will be corrected as a part of plutonium handling facilities transition (deactivation) to the Environmental Restoration Program, the remaining can not be fully corrected until environmental restoration is complete. Table 3-3 outlines the vulnerability and relationship to the three methods of mitigation.

3.11.2 Mitigation Activities

3.11.2.1 Stabilization and Packaging Activities. Vulnerabilities associated with stabilization and packaging of plutonium bearing materials will be mitigated by the efforts outlined in sections 3.2 through 3.5 of this Management Plan. All activities will be completed by May 2002.

3.11.2.2 Transitioning of Plutonium Handling Facilities Activities. Vulnerabilities associated with residual contamination in facilities will be mitigated through facility transition and eventual deactivation. The end result of this effort will be facilities that are acceptable for turnover to the Environmental Restoration Program. Those activities listed with completion dates listed in Table 3-3 are also shown on this Management Plan schedule. Only the cost associated with the cleanout and deactivation of the PFP are included in the total program costs included in this Management Plan. Budget data have only been developed for activities through the year 2004.

3.11.2.3 Environmental Restoration Activities. Vulnerabilities that can not be mitigated by the operating contractor will be mitigated during environmental restoration activities. These vulnerabilities typically require facility demolition or other large scale corrective measures. Appropriate compensatory measures are in place to ensure the vulnerabilities do not pose undue risk to the workers, public, or environment. No schedule or budget data are available at this time.

3.11.2.4 Status of Commitments in Plutonium Vulnerability Management Plan. The "Plutonium Vulnerability Management Plan" DOE/EN-0199, identifies specific commitments and schedules for completion of 13 corrective actions associated with plutonium vulnerability mitigation (ref. Table 3-4 and DOE/EM-0199 page A-2). The status of the 13 corrective actions are as follows: nine are complete, one is ahead of schedule, two are pending, and one has yet to be started.

Table 3-3. Hanford Plutonium ES&H Vulnerabilities

Plutonium Vulnerability Number	Vulnerability Title	Mitigation Process	Estimated Completion Date
RL-1.0.1	Competing Priorities for Experienced Personnel	N/A	N/A
RL-1.0.2	Penetration of Glovebox Barriers	Facility transition/ deactivation	FY 2004
RL-1.0.3	Isolation and Layaway of Gloveboxes	Facility transition/ deactivation	FY 2004
RL-1.0.4	Polymer-Based Panels and Glovebox Windows	Facility transition/ deactivation	FY 2004
RL-1.0.5	Penetration of Contamination Containment/Fixative	Facility transition/ deactivation	FY 2006
RL-2.0.1 (PNL)	Insufficient Knowledge of Packaging Configuration and Nature of Material in Building 324	Stabilization and packaging efforts directly related to the DNFSB Recommendation	TBD
RL-2.0.2 (PNL)	Insufficient Knowledge of Packaging Configuration and Nature of Material in Building 325	Stabilization and packaging efforts directly related to the DNFSB Recommendation	TBD
RL-2.0.3 (PNL)	Insufficient Knowledge of Packaging Configuration and Nature of Material in Other PNL Buildings	Stabilization and packaging efforts directly related to the DNFSB Recommendation	TBD
RL-.1	Criticality Accident During Deactivation or D&D Activities Due to Abnormal Conditions	Facility transition/ deactivation	FY 2006
RL-3.1.2.1	232-Z Incinerator Contamination Release Due to Seismic Destruction of Building	Facility transition/ deactivation	December 1995
RL-3.1.2.2	Release of Plutonium Holdup in Exhaust Ducts Downstream of 234-5Z Final HEPA Filters Via 291-Z Stack Exhaust Blowers	Facility transition/ deactivation	FY 2006
RL-3.1.2.3	Concrete Block Wall and Doors at the South End of the PRF Canyon Fail DBE Analysis	Re-analysis has shown wall and doors are adequate as-is.	Complete
RL-3.1.3.1	Hydrogen Generation in Solution Storage Containers Which Are Not Vented	The suspect containers were inspected and vented as required.	Complete
RL-3.1.3.2	Plutonium Stored in Unstable Forms	Stabilization and packaging efforts directly related to the DNFSB Recommendation	January 2000
RL-3.1.3.3	Deterioration of Storage Containers	Stabilization and packaging efforts directly related to the DNFSB Recommendation	May 2002
RL-3.1.3.4	Insufficient Knowledge of Packaging Configuration and Characterization of Material	Stabilization and packaging efforts directly related to the DNFSB Recommendation	January 2000
RL-3.1.4.1	Injury or Contamination During PRF Canyon Entry	Facility transition/ deactivation	September 1999

Plutonium Vulnerability Number	Vulnerability Title	Mitigation Process	Estimated Completion Date
RL-3.1.4.2	Reactive Chemicals in PFP Gloveboxes	Stabilization of the existing inventory of sludges has been completed. Any future sludge that is generated during facility cleanup will be stabilized soon after collection.	Complete
RL-3.1.5.1	Breach of Drain Lines with Holdup in PFP	Facility transition/ deactivation	FY 2003
RL-3.1.5.2	HF Corrosion of Exhaust Ventilation Ductwork and Primary Filters Servicing Glovebox HC-9B and HA-46 in PFP	Facility transition/ deactivation	September 1997
RL-3.1.5.3	Corrosion of Ductwork Servicing Laboratories by Acids	Facility transition/ deactivation	FY 2003
RL-3.1.5.4	Worker Exposure from Exhaust Ventilation Ductwork and Process Vacuum System	Facility transition/ deactivation	September 1997
RL-3.1.6.1	Contamination and Exposure from Cleaning 242-Z	Facility transition/ deactivation	FY 2003
RL-3.2.1	PUREX Pu Residual Inventory	Facility transition/ deactivation	FY 1997
RL-3.2.2	Residuals in PUREX Tunnels	Environmental Restoration Program	TBD
RL-3.2.3	Release of Residual Deep Bed Filter Contamination Via the PUREX Main Stack	Environmental Restoration Program	TBD
RL-3.2.4	Inadvertent Breach of Gross Pu Contamination Beneath Paint in the PUREX White Room	Facility transition/ deactivation	FY 1997
RL-3.3.1.1	Contamination Spread Resulting from Loss of Control Resulting from a Roof Fire at Retired Facilities	Environmental Restoration Program	TBD
RL-3.3.1.2	Potential Loss of Containment Integrity - Retired Facilities: 222-B & -T, 202-S, 308, 309, 3706	Facility transition/ deactivation	TBD
RL-3.3.2.1	340 Waste Handling Complex Release to Environment	Facility transition/ deactivation	TBD
RL-3.3.2.2	Sand Filters at 221-B, 221-T, and 202-S	Environmental Restoration Program	TBD
RL-3.3.2.3	Z-9 Building Frequent Contamination Outside of Engineered Barriers	Facility transition/ deactivation	FY 2001
RL-3.3.2.4	Release of Plutonium from 231-Z Duct	Facility transition/ deactivation	FY 1998
RL-3.3.2.5	Residual Plutonium in 209-E	Facility transition/ deactivation	TBD
RL-WGAT-1	Criticality and Contamination Potential in Settling Tank 241-Z-361	Facility transition/ deactivation	FY 2000

Table 3-4. Plutonium Vulnerability Management Plan Corrective Action Schedule Status

COMMITMENT	COMMITMENT SCHEDULE	STATUS	COMMENTS
Interim measures to reduce risks	Complete	Complete	NA
Publish DOE Storage Standard	Complete	DOE-STD-3013-94 issued	Residues covered by interim storage criteria
Release Characterization Implementation Plan	March 1995	Complete	Characterization on going
Release Draft EIS for cleanout and deactivation of PFP	August 1995	Complete	Final draft in development. ROD expected June 30, 1996.
Complete thermal stabilization of Pu bearing sludge	August 1995	Complete	NA
Implement a program to repackage chloride and fluoride liquids	September 1995	Complete	These solutions were stabilized to oxides during technology development activities.
Properly vent suspect containers of plutonium nitrate	December 1995	Complete	NA
Complete assessment of affected facilities	March 1995	TBD	NA
Close offices in Building 231-Z	March 1995	Complete	NA
Close all other office spaces in these facilities	December 1995	TBD	NA
Deactivation of Building 308	1998	Complete	NA
COMMITMENT	COMMITMENT SCHEDULE	STATUS	COMMENTS
Deactivation of Building 309	1999	Working	Projected to be completed in 1997
Decontamination and decommissioning of facilities	TBD	TBD	NA

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APPENDIX A

FACILITY DESCRIPTIONS

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APPENDIX A: FACILITY DESCRIPTIONS

KE and KW Basins

The KE and KW Basins are located in the 100 Area of the Hanford Site. The basins are constructed of reinforced concrete walls and floors. The dimensions of each basin are 125 feet long (38 meters), 67 feet wide (20 meters), and 21 feet deep (6 meters). The KE Basin walls are a constant thickness of 69 cm. The KE Basin has neither sealant nor liner on its concrete. The KW Basin has an epoxy sealant, but no liner.

Each basin is enclosed by a one story steel framed building. The building also houses the water treatment and cooling systems. The roof structure of the steel frame includes a monorail fuel transport system. A personnel floor grating system covering the entire basin, is suspended from the roof.

Water levels are maintained in the K Basins at a minimum of 3 m above the irradiated fuel to cool the fuel and provide radiological shielding for personnel working in the facility. The water retention boundary extends into the auxiliary pits located on the east and west ends of the basins. The water in each basin is recirculated through a closed loop water-cooling system using mechanical chillers. Filters and an ion exchange system maintain basin water clarity and remove radionuclides. Used filters and spent ion-exchange system components are disposed of at the Hanford 200 Area Low-Level Waste Burial Grounds.

The fuel is stored in canisters on the bottom of the basins in single stacked storage racks. The canisters are approximately 74 cm high, have two cylindrical barrels which are approximately 23 cm in diameter, and normally contain 14 fuel elements. A significant fraction of the fuel has damaged cladding which occurred at reactor discharge or during subsequent fuel handling, or resulted from uranium metal oxidation during storage. The loss of cladding integrity allows soluble and gaseous fission products to be released into the canister water. The canisters used in the KE Basin do not have lids and thus allow free exchange of water between the canister and the basin. Some of the canisters in the KE Basin also have screen bottoms. All of the canisters in the KW Basin have closed lids and bottoms.

Using hoists and separately attached lifting rods, canisters can be moved along an underwater path which corresponds to the route of the interconnecting network of slots built into the floor-grating covers. The canisters can be shifted to and from the storage basins into the abutting pits or pickup station for subsequent unloading, loading, reviewing, or inspection operations as needed.

In the KE Basin, a significant amount of sludge has accumulated on the floor. The sludge consists of zirconium oxide, iron oxide, concrete grit, and other materials that have mixed with fission products and fuel pieces, the fuel pieces having escaped from open storage canisters or remaining from previous fuel encapsulation activities. .

The K Basins each currently have about 25% unused capacity (assuming no stacking), although encapsulation of the KE fuel and accumulated sludge would eliminate the unused capacity in the KE Basin. Fuel enrichment only up to 0.947% is allowed in the KE Basin because of the sludge accumulation on the basin floor.

Access to the K Basins is by rail. Cask handling capability at the basins are similar and fairly restrictive. Crane capacity is 27 metric tons. Casks must be loaded under water and must be less than 2.6 m tall. The cask transfer pit is 2.1 m by 2.8 m, but framework within the loading pit reduces the free clearance to 1.5 m by 1.2 m. Also, only the transfer pit located on the south side of the basin is functional.

T Plant

The 221-T Building is a 259 m (850 ft) long by 21 m (68 ft) wide by 23 m (74 ft) high reinforced concrete canyon building. T Plant was originally designed for recovery of plutonium from defense production reactor fuel. The building consists of the canyon, three galleries, one shielded craneway and a "headend" facility. The canyon area consists of 37 cells and one railroad tunnel entrance/exit. Shielding walls made of 3-m-thick (9 ft) reinforced concrete separate the cells from the electrical and pipe galleries. The operating gallery is separated from the canyon deck by a 1.5-m-thick (5 ft) concrete wall that extends 3 m (9 ft) towards the ceiling. Most of the cells are covered by four 2-m-thick (6 ft) reinforced-concrete blocks. The original equipment has been removed from some to the cells. The 221-T Building canyon pool cell (Cell 4) was modified for the storage of the PWR Core II irradiated fuel. This concrete cell has a fabric liner between white concrete and grey reinforced concrete.

Cell 4 is adjacent to the railroad tunnel and contains a 4 m wide by 8.4 meter long pool with a capacity of about 200,000 l. Filtered, demineralized raw water is used for the initial pool fill. An installed demineralizer provides make-up water to replenish pool water lost by evaporation. An ion exchange column, installed in a radiation shield near the pool, is provided for removal of radioactive contamination from the pool water and for maintaining water quality. Two pumps, each capable of providing a flow of 38 l/min, are installed for recirculation of pool water through the ion exchange column and the water chillers. Two chillers, each capable of removing up to 133,000 kJ per hour of radioactive decay heat, are installed near the pool. One pump and one chiller will normally be on standby. A catwalk is placed 1.5 m above the pool to allow access to the pool for sampling and maintenance. All fuel must be handled remotely. The water depth in the pool cell is 5.8 meters (19 feet). Each assembly is stored vertically in a separate compartment of a rectangular metal rack.

Fast Flux Test Facility

Until recent defueling of the FFTF reactor, FFTF assemblies were stored within several different systems at FFTF. Irradiated assemblies were stored within the reactor core, the in-vessel storage (IVS), the interim decay storage (IDS), and the fuel storage facility (FSF). Some irradiated fuel pins were shipped off-site for detailed examination and a few assemblies were temporarily located within the IEM cell, while they were examined. Irradiated assemblies were handled remotely and those within the reactor core, the IVS, the IDS, and the FSF were cooled with liquid sodium. Assemblies were routinely moved between the reactor core, the IVS and the IDS; but once placed in the FSF, fuel assemblies were not reinserted into the reactor. The following paragraphs describe storage at each of the FFTF systems although the reactor has been permanently defueled.

The reactor contains the fueled and non-fueled assemblies, and provides radiation shielding, cooling, and instrumentation to allow safe operation. The reactor is also equipped with instrumentation which permits monitoring of assembly temperature and coolant flow, but is not part of the plant safety system.

The reactor core contains fueled, non-fueled, and control rod assemblies, as well as radial reflectors and shield components, which function together to create a controlled, fast neutron environment. The core consists of nine rows of vertical elements arranged in a hexagonal array. The active zone consists of the 91 positions of the six inner rows. It can be loaded with as many as 82 fueled and non-fueled-test assemblies, with the other nine positions occupied by control rods. The active zone is surrounded by three rows of reflector assemblies.

The IVS is located within the reactor core barrel, but outside of the core region. Fuel stored in the IVS enables the reactor core to be reconfigured during an operating cycle, without opening the reactor vessel. The IVS consists of three storage modules within the reactor, each serving one-third of the reactor core. Each module provides 19 natural-circulation, sodium-cooled receptacles for core components. Each IVS module consists of a top and bottom plate welded together with an elliptical shaped body. The storage receptacles are cylindrical tubes supported by the top and bottom plates. Heat is rejected through the same primary coolant system that services the reactor core.

The IDS is located within the reactor containment building, but outside of the reactor core. It provides a controlled environment for temporary storage of irradiated fuel and other core components between irradiations in the reactor core. The IDS also provides temporary storage of new assemblies and other core components enroute to the core. The IDS is in a rectangular, steel-lined concrete cell. The IDS consists of a rotatable storage basket, contained in a sodium filled, argon inerted, stainless steel primary vessel. A carbon steel guard tank surrounds the primary vessel to help ensure adequate sodium cooling even if the primary vessel were to leak. The atmosphere outside the primary vessel, but within the concrete cell, is nitrogen which also serves as a heat transfer medium to control the cell temperature.

There are 122 storage positions for fueled components and other core components, arranged in five concentric circles. The outer four circles can store 112 of the 3.7 m long core components while the inner circle can store ten special 12 m long non-fuel assemblies. In order to accommodate these different length assemblies, the IDS has a relatively small cylindrical lower section connected to a larger upper section. The lower cylinder is approximately 6 m long and 0.25 m in diameter. The upper section is a cylinder 3.8 m long and 3.7 m in diameter. The transition between these sections is a conical section approximately 2 m long. The primary vessel contains about 60,000 kg of sodium.

The decay heat of an assembly placed in the IDS must be no greater than 10 kW, while the total inventory decay heat is limited to 155 kW. Decay heat is dissipated by either the primary sodium system for the reactor or the backup nitrogen cooling system.

The FSF is located at the FFTF, in a separate building from the reactor containment building. It provides a controlled environment for longer term storage of irradiated fueled components and other core components. The FSF consists of a primary storage vessel, several closed loop systems and supporting facilities. The fuel is held in a rotatable storage rack contained in a sodium filled, argon inerted, carbon steel primary vessel. A surrounding carbon steel guard tank ensures adequate sodium containment and cooling, in the event of a primary vessel leak. The FSF is housed in a building of standard industrial above-grade construction and reinforced concrete below-grade construction.

The primary vessel contains 466 positions for assemblies and Ident 69 containers (containers of irradiated assembly fuel or blanket pins) arranged in concentric circles, although only 380 are currently usable due to criticality considerations. The primary vessel is about 6.9 m in diameter and 7.3 m long. It is supported by a flange at the top and contains about 100,000 kg of sodium. The decay heat of an assembly placed in the FSF must be no greater than 1.4 kilowatts.

Decay heat is removed from the stored materials by natural circulation of the vessel sodium. The sodium transfers heat to two separate sodium-potassium heat transfer loops, which reject the heat to the atmosphere through a natural draft heat exchanger in each loop. Each loop has a heat removal capacity of 205 kW.

The FSF is designed to interface with the FFTF fuel-handling equipment to facilitate insertion and removal of fueled and non-fueled core components, as are all the FFTF facilities where fuel is held. The FSF makes use of the Bottom Loading Transfer Cask and the FFTF floor valve for these operations.

324 Building

The 324 Building accommodates the study of chemical processes from laboratory to pilot scale at levels of radiation varying from natural background to megacuries (MCi). It also permits examination and mechanical testing of irradiated specimens. The 324 Building contains the laboratory, support facilities including hot cells, and offices required to pursue technical laboratory operations.

The 324 Building is 62.5 m by 71.6 m in plan and 13.7 m in height above ground level. The 324 Building has a partial basement, first, second, and partial third floors for a total of approximately 9,450 m^2 of floor area. The foundation structure is poured-in-place reinforced concrete. The superstructure is constructed from insulated, fluted-steel, industrial panels supported on a structural steel frame.

Fuel in the 324 Building is stored primarily in two hot cells:

- B Cell - is 6.7 m wide x 7.6 m long x 9.3 m high. The cell is 3.0 m below grade and extends 6.2 m above ground level. The floor and walls are lined with stainless steel. The cell is serviced by two remotely operated cranes with 2.7 and 5.4 metric tons capacity, respectively. These cranes travel through a 5.2 m high doorway into the neighboring Airlock Cell.

  The cell is surrounded on three sides by operating galleries on the first and second floors and on two sides by a gallery at the basement level. Shielding walls at the three operating faces of the first-floor operating gallery level are 1.2 m thick, high density concrete. Each of these walls has a large viewing window, two master-slave manipulators, and a number sleeved holes for supplying services to the cell. There are two cubicles on the west wall of B-Cell. The remaining cell-to-gallery shielding walls are 1.4 m and 1.2 m thick normal concrete at the first and second floors and basement, respectively.

- D Cell - is 4.0 m wide x 6.4 m long x 5.2 m high and is located directly over C-Cell. The floor between the cells is 0.6 m thick with a removable floor plug. The short east and west walls are 1.7 m thick normal concrete and border on the Cask Handling Area and operating gallery, respectively. The long north wall is 1.1 m thick normal concrete and borders on the Airlock Cell. The long south wall is 1.2 m thick, high density concrete and borders the operating gallery.

  D-Cell is similar to other RE cells (A and C cells) and has two shielding windows, two pair of master-slave manipulators, a remote viewing periscope, and closed-circuit television. The floor is lined with stainless steel; the walls are lined with mild steel with a corrosion-resistant coating. Access to the cell is via the Airlock Cell or through a small transfer port communicating with a glove box. This glovebox is used for experiments using microcuries of radioactive materials in encapsulated form and connects to the ventilation system. A small 10 cm pass-through port is available for one-way movement of materials into the cell. All normal operations in D-Cell are done remotely; all services and facilities are provided at the front face and connected through shielding plugs or offset piping.

Although there are rail spurs in the 300 Area, no direct rail access to the 324 facility is available. Any movement of materials to or from the facility would need to be done by truck. The facility has an overhead crane with a capacity of 27 metric tons, which could be used to move the fuel inside the building. There are also some restrictions to movement of heavy or large objects within the facility, specifically, the floor loading capacity is limited to 978 kg/m^2. The hot cell air lock height is also somewhat limited.

The fuel is stored dry in racks within the cells. Air provides the necessary cooling and is filtered by high efficiency particulate air filters before discharged through an exhaust stack. The fuel is handled remotely with cranes and master-slave manipulators.

325 Building

The 325 Building was designed to provide space for radiochemical research. The building, located in the 300 area of the Hanford Site, houses the 325-A Radiochemistry Facility and the Shielded Analytical Laboratory. The 325 Building consists of 1) a central portion (completed in 1953) containing general purpose laboratories modified for low-level radiochemical work by provision of special ventilation and work enclosures; 2) a south (front) wing containing office space, locker rooms, a lunch room and maintenance shops; and 3) east and west wings provided with shielded enclosures and remote manipulators for high-level radiochemical work.

The central portion of the building is 59.1 by 59.8 m on three floors (basement, ground, and second) and contains over 100 laboratories and offices. The south wing is 22.6 by 40.5 m on two floors and contains offices, a conference room, a machine shop, a lunch room, and rest rooms. The east wing (325A), known as the High-Level Radiochemistry Facility, housing the process research hot cells, truck lock, and manipulator repair, is 14.6 by 39.6 m with a 12.2 by 12.8 m service area/truck lock addition. The west wing (325B), known as the Shielded Analytical Laboratory, is 16.2 by 16.5 m and houses additional process research hot cells. Small fuel pieces are stored in the hot cells in both the High-Level Radiochemistry Facility and the Shielded Analytical Laboratory.

The High-Level Radiochemistry Facility contains three interconnecting cells (A-, B-, and C-Cell) and supporting facilities for work with megacuries of radionuclides. Two of the cells have inside dimensions of 1.8 m wide by 4.6 m high by 2.1 m deep; the third cell has inside dimensions of 4.6 m wide by 4.6 m high by 2.1 m deep. The three cells are enclosed in a 25 m by 14.6 m steel-framed, reinforced-concrete structure. These cells are shielded with walls of 1.2 m thick, high-density concrete on the front and sides and 0.9 m thick, high-density concrete on the back. Remote operation of the cell equipment is performed in the "front face" operating gallery; movement of materials takes place in the rear support gallery. The rear support gallery also provides access to the cells. The cells are ventilated by air drawn from the rear face gallery and exhausted through testable HEPA filters. The cells are constructed on the first-floor level and supported by heavy reinforced-concrete piers, columns, and pilasters. The basement level contains exhaust ducting, HEPA filters, and other miscellaneous services to the cells. The front side contains manipulators, service ports, and high-density lead-glass windows having equivalent shielding to that of the walls. Each cell has a 45.7 cm thick Meehanite iron door shielding the main entrance and other smaller entry ports on the back.

B-Cell currently contains a core extruder and analytical measuring equipment used for the tank waste characterization program. A-Cell and C-Cell contain contaminated equipment from canceled programs, for which clean-up is not currently funded. Currently A-Cell and C-Cell are also being used to characterize tank waste.

The Shielded Analytical Laboratory contains six interconnecting "hot" cells and two separate hot cells. The interconnecting cells are 1.7 by 1.7 m compartments inside shielding walls. These compartments are divided into three groups of two compartments each, separated by hollow 10.2 cm thick sheet metal dividers. The shielding walls on the east and north sides of the cells are 30.5 cm of Meehanite iron. Shielding walls on the west and south sides are 66 cm of magnetite concrete. The east side of each compartment is equipped with two manipulators and with high-density, lead-glass viewing windows having the same shielding effect as the walls. These compartments are used for analytical chemistry operations on small amounts of highly radioactive materials such as samples of single-shell tank waste. Operations within the cells are by manipulator or other remote equipment. The other two hot cells are in a separate room and are two all-metal cells. One cell is 2.0 m long by 1.4 m wide by 2.5 m high, inside dimensions, with 15 cm thick walls and roof. The other cell is 1.7 m long by 1.5 m wide by 1.5 m high, inside dimensions, with 15 cm thick walls and roof. This cell sits on a pedestal that is 81 cm above the floor. Both cells have shielded viewing windows, two master-slave manipulators, an access door, and a pass-through port.

Although there are rail spurs in the 300 Area, no direct rail access to the 325 facility is available. Any movement of materials to or from the facility would need to be done by truck. The 325A Wing has an overhead crane with 27 metric tons capacity and the 325B Wing has an overhead crane with 2.7 metric tons capacity, which could be used to move the fuel inside the building.

327 Building

The 327 Building is a single-story structure with a partial basement. Maximum dimensions are 65.5 m long by 42.7 m wide by 9.8 m tall and the building is roughly cruciform in shape. The total work area is approximately 2,330 m^2 with 929 m^2 of laboratory and work areas; 195 m^2 of offices; 223 m^2 of storage areas; and 975 m^2 of common areas containing ventilation and auxiliary equipment. The building framework is welded steel. The exterior walls are fluted steel insulated panels. The primary operating area is on the main floor and includes 11 hot cells, two small shielded cells, two small water pools, the area around the cells (the canyon), and the bays connected to the canyon in which auxiliary operations are performed.

A 13.5 and a 18 metric ton bridge crane are used to transfer casks containing radioactive structural materials or fuel from the receiving area to the cells or between the cells, and for general lifting and transfer service in the canyon.

Materials unaffected by air are examined and tested in shielded cells with an air atmosphere. Cells A through I are shop-fabricated from high-density cast iron (Meehanite) having a specific gravity of 7.3. The base, walls, and top cover are fitted together by a groove-dowel, lock-together design. The shielded cells rest on a reinforced concrete floor. If direct access is required, a wall may be removed to permit maintenance or to make changes in process or handling equipment.

Most operations in the cells are performed with manipulators. Spaced symmetrically about the iron cell walls are interchangeable plugs that lock in place by expanding retaining rings. Services and viewing ports are supplied through special plugs.

The two lead-brick shielded cells are used for density determination and for deposition of surface films for electron microprobe studies.

The Special Environmental Radiometallurgy Facility or SERF Cell provides an examination and storage facility with a nitrogen atmosphere for specimens that may be affected by air. The facility consists of an upper operating area and a lower storage area. A detachable shielded enclosure at the north end, with access to the operating cell, houses a remote metallograph for photomicrography, microhardness testing, and sample viewing at high magnification. Two airlocks provide access for entry or removal of test materials, supplies, equipment, and waste without compromising the integrity of the cell atmosphere. Operating equipment is designed to be located entirely within the cell, and operations are performed with manipulators.

The SERF storage cell is located in the basement and is connected to the operating area by a transfer tube. There is a thickness of 1.75 m of concrete between the ceiling of the SERF storage cell and the floor of the main SERF cell above. Shielding consists of 0.6 m of concrete on all sides with 10 cm of lead shielding on the north and west sides and 27 cm of steel on the operating (east) face. The south side is inaccessible since it is adjacent to a building support wall. A manipulator is provided to permit positioning and retrieval of materials in the storage area. Three storage racks are located in the cell, on the wall opposite and on the two walls adjacent to the operating face of the cell. The racks accommodate 6.4 cm diameter by 10.2 cm long sample cans and other smaller containers. The three storage racks contain a total of 460 locations.

The purpose of the wet storage basins is to store incoming material before examination and out-going material before shipment. The larger storage basin is 3 m wide by 4.6 m long by 5.2 m deep, with an 2.6 m deep underwater shelf, 1.2 m wide, across the width of the basin. The smaller basin is 1.8 m wide by 2.4 m long by 3 m deep. A canal 0.5 m wide by 3 m deep connects the large and small basins, to facilitate movements of material from one storage basin to the other. Two 225 kg jib cranes, one serving each basin are used to transfer materials in the basins. A transfer tube connects Cell A and the small basin. A mechanical sample carrier in the tube provides for sample transfers between cells and the basins. Water quality in the basins is maintained by molecular filters and mixed bed deionizers.

Several racks are located in the large basin for storage of fuel and structural materials. There is one breeder reactor fuel pin storage rack, capable of holding up to 200 pins in a rigid array. The rack consists of 76 cm long, 2.5 cm diameter stainless steel tubes arranged in a 4 x 50 rectangular array. The tubes are welded into a box-like structure with a stainless steel frame and side panels. The rack sits on the basin floor with the storage tubes oriented vertically. A lifting ring is permanently attached to the top of the rack. The entire rack is 168 cm long, 61 cm wide, and 76 cm high. A wall rack for containers holding individual pins or structural specimens and a peg rack for holding tubing or duct material are located on the north wall of the large storage basin.

The irradiated fuel is stored in several different locations within the Postirradiation Testing Laboratory of 327 Building. The intact fuel pins are stored in a rack in a water basin and in various facility hot cells. The partial fuel pins and small fuel pieces are stored in small cans on shelves in the thirteen hot cells, and in a small dry storage vault.

200 Area Plutonium Finishing Plant

The PFP complex is located within the 200 West Area of the Hanford Site. The principal structure, 234-5Z Building, was completed in 1949 to complete the purification of plutonium from Hanford reactors for production of weapons parts. The PFP received plutonium nitrate solutions from the PUREX plant for reduction to plutonium metal and fabrication of parts. In 1989, the final production of plutonium metal for defense purposes ended abruptly without extensive cleaning of the process areas.

Various forms of plutonium were purified and produced during the operating life of the PFP. The primary product was plutonium metal in the form of ingots called "buttons", produced in the RMA Line and the RMC Line. Plutonium oxide was also produced in the RMA Line. The PFP had the capability to process both weapons-grade material (containing Pu^{239} with about 6% Pu^{240}) and fuels-grade material (containing Pu^{239} with about 12% Pu^{240}). In addition to the processing of plutonium produced in Hanford reactors, the PFP has received and processed materials from other DOE reactors and facilities during its operational life. Some of these materials remain in PFP storage vaults, including a significant amount of plutonium oxide with greater than 12% Pu^{240}.

When processing was stopped at the PFP, reactive forms of plutonium remained in several of the main processing areas in addition to an extensive inventory of partially stabilized plutonium forms stored in the secure vaults. The inventory of materials remaining in process areas is contained in the main body of this document. A brief description of the major PFP structures which are of interest to the PFP stabilization effort follows:

The 234-5Z Building is 500 feet long and 180 feet wide, with four levels: basement, first floor, duct level and second floor. The frame is structural steel with an outer sheathing of aluminum panels over rock wool insulation and 16-gauge sheet metal. There are also 8-inch thick internal reinforced concrete walls, principally running in the longer east to west direction, which extend only to the second floor. Within the 234-5Z Building, various areas house remaining equipment from two plutonium metal production areas and parts fabrication equipment, various purification processes, secure storage vaults, several laboratories and related support areas, extensive ventilation/filtration systems, support office areas and personnel changing rooms. Some processing equipment, primarily the fabrication line and some small purification processes, was removed earlier in the plant history, but the majority of processing equipment remains. The primary areas which contain significant amounts of contamination internal to equipment (holdup) include the inactive RMC and RMA metal production lines, related ventilation ductwork and filter housings (which are still active), analytical laboratory gloveboxes (both active and inactive) and active Plutonium Process Support Laboratory gloveboxes. Work is ongoing to remove and reconfigure several sections of ductwork directly connected to the RMA and RMC processes, which contain the bulk of the holdup.

In the original design of the PFP complex process facilities, all planned operations and laboratories except waste collection and disposal were provided in the 234-5Z Building. Increases in production, storage and scrap recovery requirements made the following major additions necessary:

1961	Waste Incinerator Facility, 232-Z Building
1964	Plutonium Reclamation Facility, 236-Z Building
1964	Waste Storage and Treatment Facility, 241-Z Building

1980 Vault Storage Facility: 2736-Z, 2736-ZA, 2736-ZB and 2721-Z Buildings

The 232-Z Building is a concrete-block structure, 37" long by 57" wide, located just south of 234-5Z Building. It was completed in 1961 and houses an incinerator formerly used to recover plutonium from combustible wastes. The recovered plutonium was recycled through the processing areas at PFP. The incinerator is undergoing deactivation and decommissioning; equipment has been partially dismantled to eliminate most remaining plutonium holdup.

The 236-Z Building is a four-story reinforced concrete structure, 79" by 71" by about 48" high, surmounted at the southwest corner by a two-story penthouse which adds 22.5 feet to the building's height. The process cell located in the center of the structure contains many tall, narrow tanks varying in length from 2.5 feet to about 50 feet. There is an opening in the south concrete wall of the process cell to the equipment transfer facility (added after initial construction), which allows equipment to be moved directly in and out of the cell from outdoors. The building is linked to the 234-5Z Building by another addition, the 242-Z Building. The facility was started in 1964 to recycle scrap plutonium from RMC processing into a purified plutonium nitrate form suitable for metal production. The primary process was solvent extraction, for which most equipment is in the main process cell. Ancillary processing included dissolution of plutonium solids and filtrate evaporation for dilute solutions. All containers of scrap plutonium which were collected in the late 1980s and temporarily stored in the access gloveboxes have now been removed from the PRF and stabilized via muffle furnaces. Process cell interior surfaces, tankage, access gloveboxes and ancillary gloveboxes still contain a significant amount of plutonium holdup.

The 241-Z Building is a 92-foot by 20-foot by 22-foot deep underground reinforced concrete structure with a roof at approximately grade level. There are five separate tank cells, each containing a 5000-gallon tank used to accumulate radioactive wastes for adjustment and transfer to Hanford's underground waste storage tanks. Three of the tanks are active at this time, and the remaining two will await decontamination when the building is deactivated. The 243-Z Building is an active low-level waste treatment facility, added to the PFP complex in 1994. Liquid wastes, primarily cooling water from various systems within the complex, are collected and treated as necessary in this facility before discharge to the Hanford final treatment and discharge plant.

The 2736-Z vault storage facility is an active standalone complex of secure SNM storage vaults and related support equipment with separate ventilation and personnel facilities, located within the PFP complex just south of the 234-Z Building. The 2736-Z Building is a one-story reinforced concrete structure, 65" long by 56" wide, containing SNM storage vaults. The 2736-ZA Building is also of reinforced concrete, 40" by 22", containing exhaust ventilation and filtration equipment for the vaults. The 2736-ZB Building is a concrete structure, 132 feet long by 90 feet wide, used for shipping, receiving, repackaging and non-destructive assay of SNM. The 2721-Z Building is a small structure containing backup electrical power equipment. The storage facility is expected to remain active for the foreseeable future, to safely and securely store SNM. Facility equipment such as storage pedestals and racks will require modification to accommodate stabilized and repackaged SNM in the "3013" packages which comply with DOE-STD-3013-94. Structural modifications are not anticipated, but the ventilation system may require a capacity increase to accommodate the packaging configuration if metal storage is continued and material is received from other DOE locations. The facility contains only minimal amounts of internal equipment contamination, which will be managed during the life of the facility.

200 Area Plutonium Finishing Plant Fuel

Eighty-four grams of 93.2 percent enriched uranium fuel stored at the 2736-ZB Building at the Plutonium Finishing Plant in the 200 West Area of the Hanford Site. The fuel was irradiated at the University of Washington. The fuel is a uranium-aluminum alloy with aluminum cladding. The fuel is contained in a partial assembly of six plates, which are 65.1 centimeters in length, 7.24 centimeters in width and 0.18 centimeters in thickness. The six fuel plates are stored in one 55 gallon drum. The fuel has had very little exposure; its burnup is effectively zero, with surface dose rates of 0.3 mr/hr gamma and 0.8 mr/hr beta plus gamma.

There are 7.8 kilograms of plutonium fuel from the LAMPRE at Los Alamos National Laboratory stored in three EBR II casks within the yard area at PFP. The casks are located within a protective concrete structure.

200 West Area Low-Level Burial Ground

There are 17.2 kilograms of uranium from the TRIGA at Oregon State University stored at the 200 Area Low Level Burial Grounds. The uranium hydride fuel in the TRIGA fuel element is mixed with zirconium hydride (8.5% uranium and 91.5% zirconium). Six or seven of the aluminum clad fuel assemblies are contained in each of 13 lead-lined 55 gallon drums. The average weight of the drums is 1,043 kilograms. Overall dimensions of the TRIGA fuel elements are 3.73 centimeters (1.47 inches) in outside diameter and 72.1 centimeters (28.4 inches) in length. The fuel was received at Hanford during 1987 and is covered with soil in Trench 7 in 218-W-4C.

The 218-W-4C Burial Ground contains trenches with flat, gravel bottoms, and with asphalt bottoms. The 218-W-4C Burial Ground holds the 13 lead-lined 55 gallon drums in trench 7, covered with at least four feet of soil.

The current storage container, called the TRIGA® Standard Fuel Element Storage Drum is composed of three layers. The outside skin is made from a 17C DOT Specification Container, 49 CFR 178.115, sometimes called a

55-gallon drum. The intermediate container is a carbon steel, 14-inch diameter, schedule 80 pipe section, with a bottom welded closure and a top bolted closure. Normal weight concrete is poured between these two containers. The third and inner container is a 5-inch diameter, schedule 40 pipe. The void between the two pipes is filled with lead shot with lead castings top and bottom.

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Volume 2

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DNFSB RECOMMENDATION 94-1
HANFORD SITE INTEGRATED STABILIZATION MANAGEMENT PLAN
VOLUME 2: SCHEDULES

EXECUTIVE SUMMARY

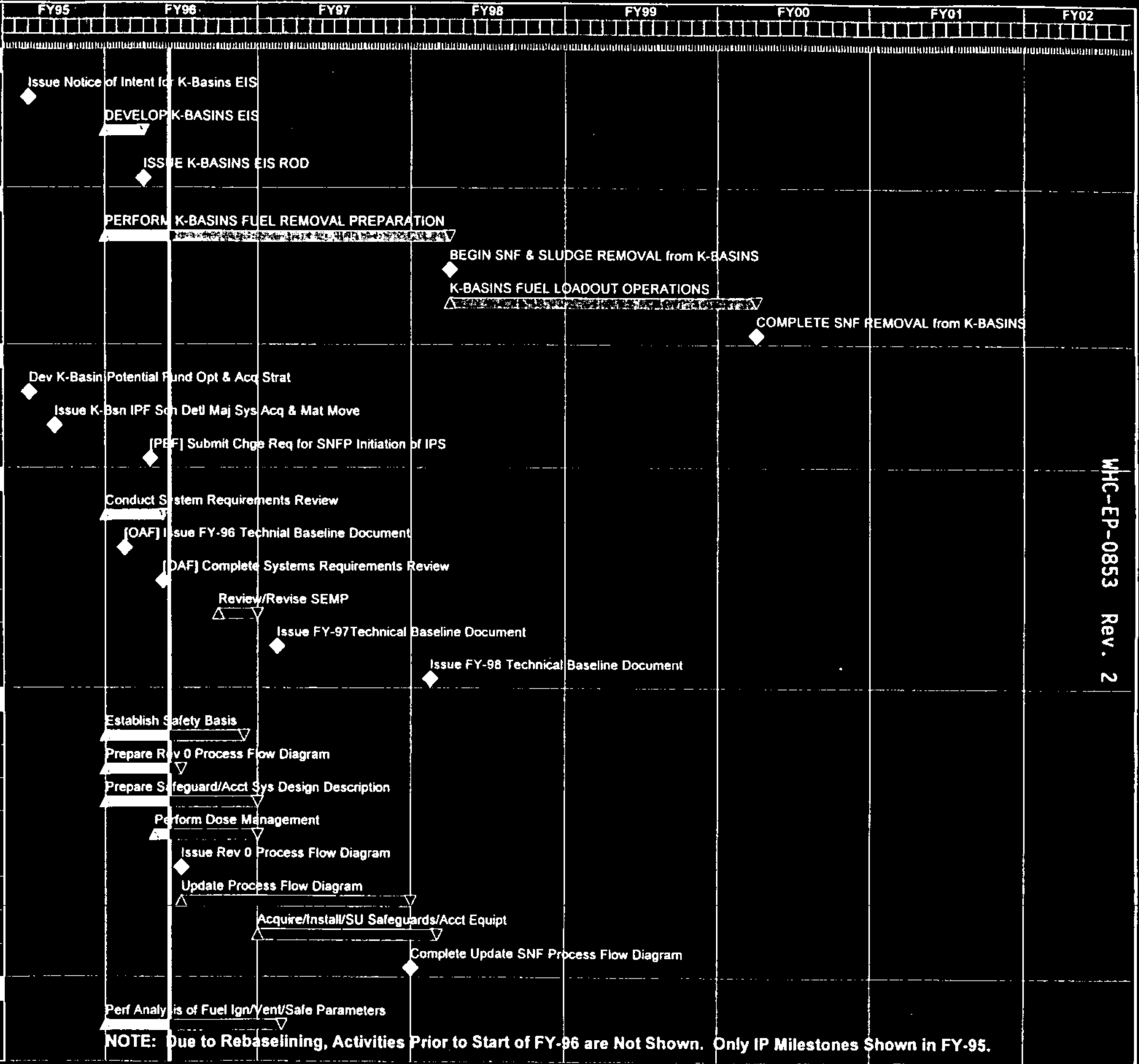
The Hanford Site Integrated Stabilization Management Plan (SISMP) was developed in support of the U.S. Department of Energy's (DOE) Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 94-1 Integrated Program Plan (IPP). Volume 1 of the SISMP identifies the technical scope and costs associated with Hanford Site plans to resolve concerns identified in DNFSB Recommendation 94-1. Volume 2 of the SISMP provides the Resource Loaded Integrated Schedules for Spent Nuclear Fuel Project and Plutonium Finishing Plant activities identified in Volume 1 of the SISMP.

Appendix A provides the schedules and progress curves related to spent nuclear fuel management. Appendix B provides the schedules and progress curves related to plutonium-bearing material management.

APPENDIX A

HANFORD SITE SPENT NUCLEAR FUEL SCHEDULES

Activity ID	Early Start	Early Finish
ENVIRONMENTAL IMPACT STATEMENT		
IP-3.6-015		31MAR95A
IP36-010	02OCT95A	31DEC95A
IP-3.6-010		31DEC95A
K-BASINS FUEL REMOVAL		
IP36-012A	02OCT95A	31DEC97
IP-3.6-012		31DEC97
IP36-001A	31DEC97	31DEC99
IP-3.6-001		31DEC99
Project Integration 1.4.1.01		
IP-3.6-014		31MAR95A
IP-3.6-020		31MAY95A
IP3612AB12		15JAN96A
Systems Engineering 1.4.1.02.01.01		
IP3612AC12	02OCT95A	16FEB96A
IP3612AC11		15NOV95A
IP3612AC14		16FEB96A
IP3612AC15	01JUL96*	30SEP96
IP3612AC17		15NOV96*
IP3612AC18		14NOV97*
Process Engineering 1.4.1.02.01.02		
IP3612AC19	02OCT95A	29AUG96
IP3612AC26	02OCT95A	01APR96
IP3612AC32	02OCT95A	30SEP96
IP3612AC36	29JAN96A	30SEP96
IP3612AC28		01APR96*
IP3612AC30	02APR96*	30SEP97
IP3612AC34	01OCT96*	03DEC97
IP3612AC31		30SEP97*
Technology Acquisition 1.4.1.02.01.03		
IP3612AC92	02OCT95A	25NOV96



NOTE: Due to Rebaselining, Activities Prior to Start of FY-96 are Not Shown. Only IP Milestones Shown in FY-95.

Project Start 01OCT92
Project Finish 30SEP11
Data Date 04MAR96
Plot Date 13MAR96

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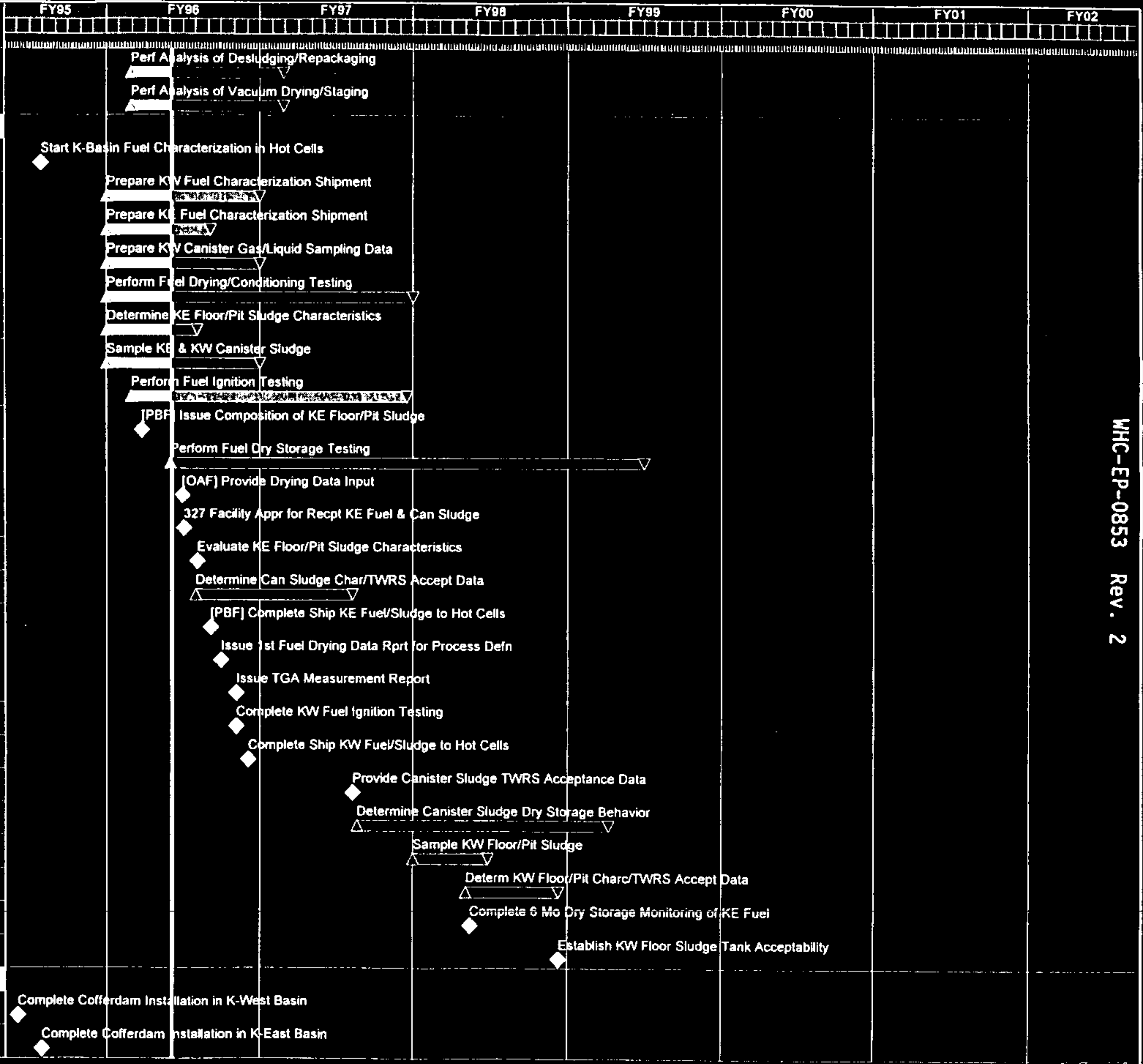
Activity ID	Early Start	Early Finish
IP3612AC93	27NOV95A	25NOV96
IP3612AC94	27NOV95A	25NOV96
Characterization 1.4.1.02.01.04		
IP-3.6-018	28APR95A	
IP3612AC50	02OCT95A	30SEP96
IP3612AC54	02OCT95A	03JUN96
IP3612AC58	02OCT95A	30SEP96
IP3612AC60	02OCT95A	30SEP97
IP3612AC76	02OCT95A	01MAY96
IP3612AC81	02OCT95A	30SEP96
IP3612AC64	27NOV95A	15SEP97
IP3612AC78		22DEC95A
IP3612AC70	01MAR96A	31MAR99
IP3612AC61		28MAR96*
IP3612AC53		01APR96*
IP3612AC80		01MAY96*
IP3612AC82	01MAY96*	08MAY97
IP3612AC56		03JUN96
IP3612AC62		28JUN96*
IP3612AC63		02AUG96*
IP3612AC66		02AUG96*
IP3612AC52		30AUG96*
IP3612AC83		08MAY97
IP3612AC84	20MAY97*	04JAN99
IP3612AC85	01OCT97*	27MAR98
IP3612AC86	02FEB98*	11SEP98
IP3612AC71		10FEB98*
IP3612AC87		11SEP98*
K-Basins Maint & Operations 1.4.1.03.01		
IP-3.6-016		28FEB95A
IP-3.6-017		28APR95A



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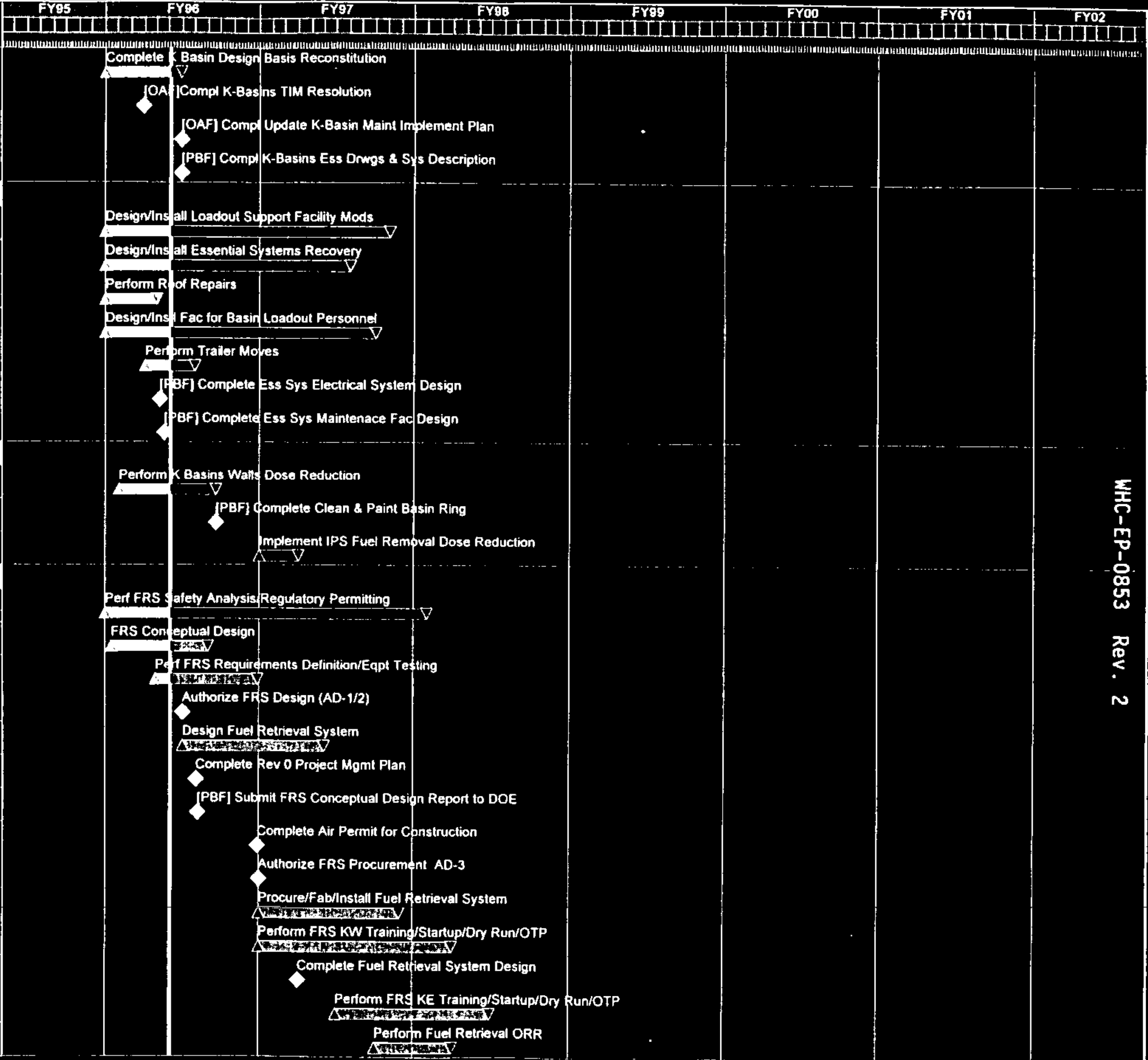
Activity ID	Early Start	Early Finish
IP3612AD30	02OCT95A	29MAR96
IP3612AD16		29DEC95A
IP3612AD12		26MAR96*
IP3612AD14		29MAR96*
K-Basins Facility Projects 1.4.1 04 01		
IP3612AE36	01OCT95A	01AUG97
IP3612AE10	02OCT95A	30APR97
IP3612AE20	02OCT95A	31JAN96A
IP3612AE34	02OCT95A	30JUN97
IP3612AE22	02JAN96A	29APR96
IP3612AE13		06FEB96A
IP3612AE12		16FEB96A
Dose Reduction 1.4.1 04 02 01		
IP3612AF15	03NOV95A	17JUN96
IP3612AF16		17JUN96*
IP3612AF20	01OCT96*	31DEC96
Fuel Retrieval Project 1.4.1 04.03		
IP3612AG35	02OCT95A	30OCT97
IP3612AG22	16OCT95A	31MAY96
IP3612AG15	29JAN96A	27SEP96
IP3612AG23	01APR96*	
IP3612AG24	01APR96*	28FEB97
IP3612AG12		01MAY96*
IP3612AG25		07MAY96*
IP3612AG36		27SEP96*
IP3612AG28	01OCT96*	
IP3612AG30	01OCT96*	29AUG97
IP3612AG42	01OCT96*	29DEC97
IP3612AG26		31DEC96*
IP3612AG51	01APR97*	31MAR98
IP3612AG46	01JUL97*	29DEC97



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Activity ID	Early Start	Early Finish
IP3612AG31		29AUG97*
IP3612AG40		30OCT97*
IP3612AG44		26NOV97*
IP3612AG48	30DEC97*	
IP3612AG50	30DEC97*	30DEC99
IP3612AG55	30DEC97*	30DEC99
IP3612AG52	01APR98*	30DEC99
IP3612AG56		31DEC99*
Water Treatment 1 4.1 04 06		
IP3612AJ32	02OCT95A	26JAN96A
IP3612AJ34	02OCT95A	29MAR96
IP3612AJ37	02OCT95A	01APR96
IP3612AJ33		08DEC95A
IP3612AJ31		22DEC95A
IP3612AJ35		01MAR96*
IP3612AJ42	02APR96	02JAN97
IP3612AJ45	03JAN97*	29DEC97
IP3612AJ48	01APR97*	30JUN97
IP3612AJ49	01JUL97*	31MAR98
IP3612AJ54	01OCT97*	29SEP00
IP3612AJ46		29DEC97
IP3612AJ50		31MAR98
Deactivation Preparation 1 4 1 04 07		
IP3612AK55	03JUN96*	30SEP96
MCO Acquisition 1 4 1.05		
IP3612AL60	02OCT95A	09FEB96A
IP3612AL62	02OCT95A	12DEC96
IP3612AL66	02OCT95A	08NOV96
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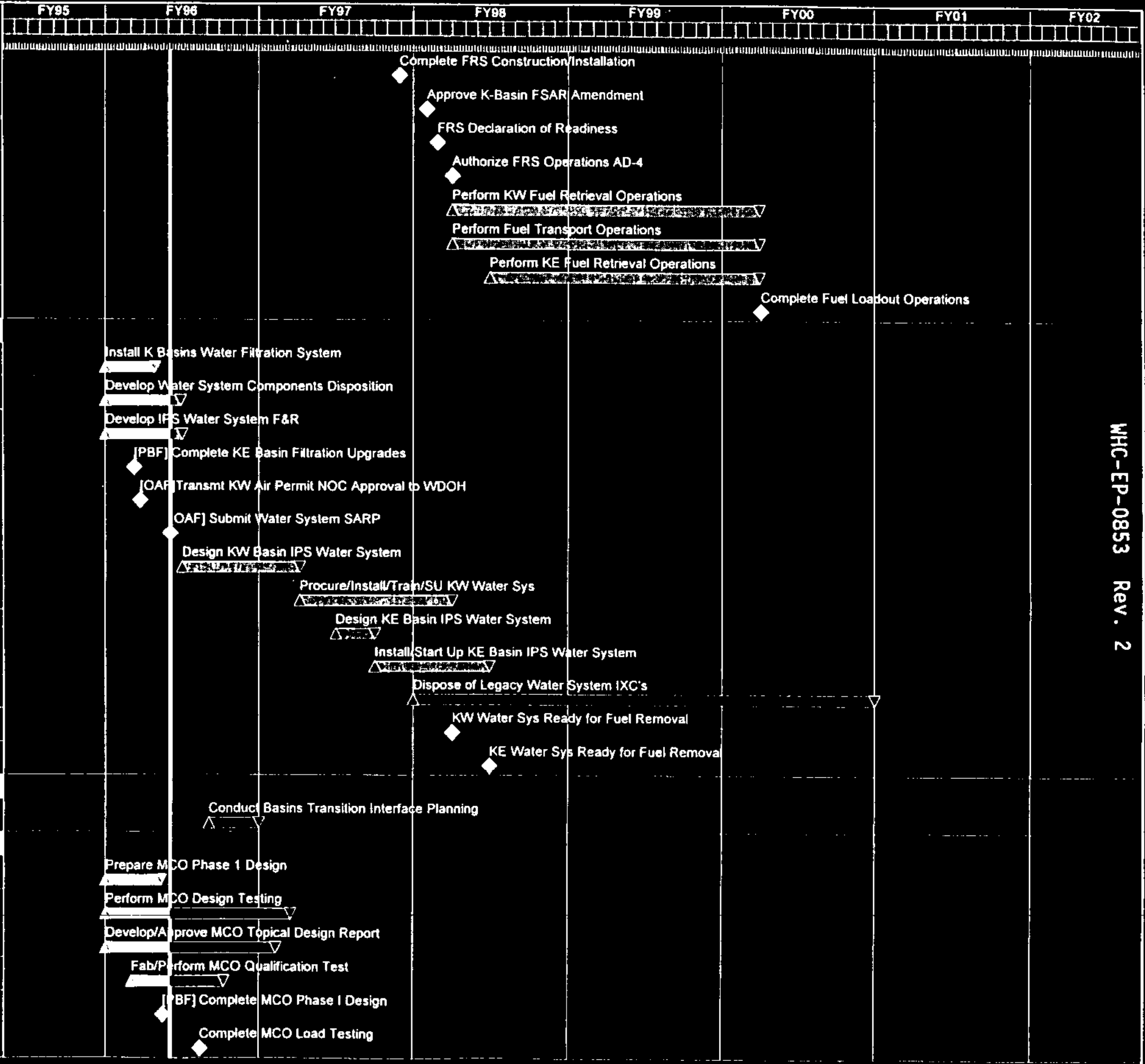
IP3612AL61		12FEB96A
IP3612AL63		13MAY96*



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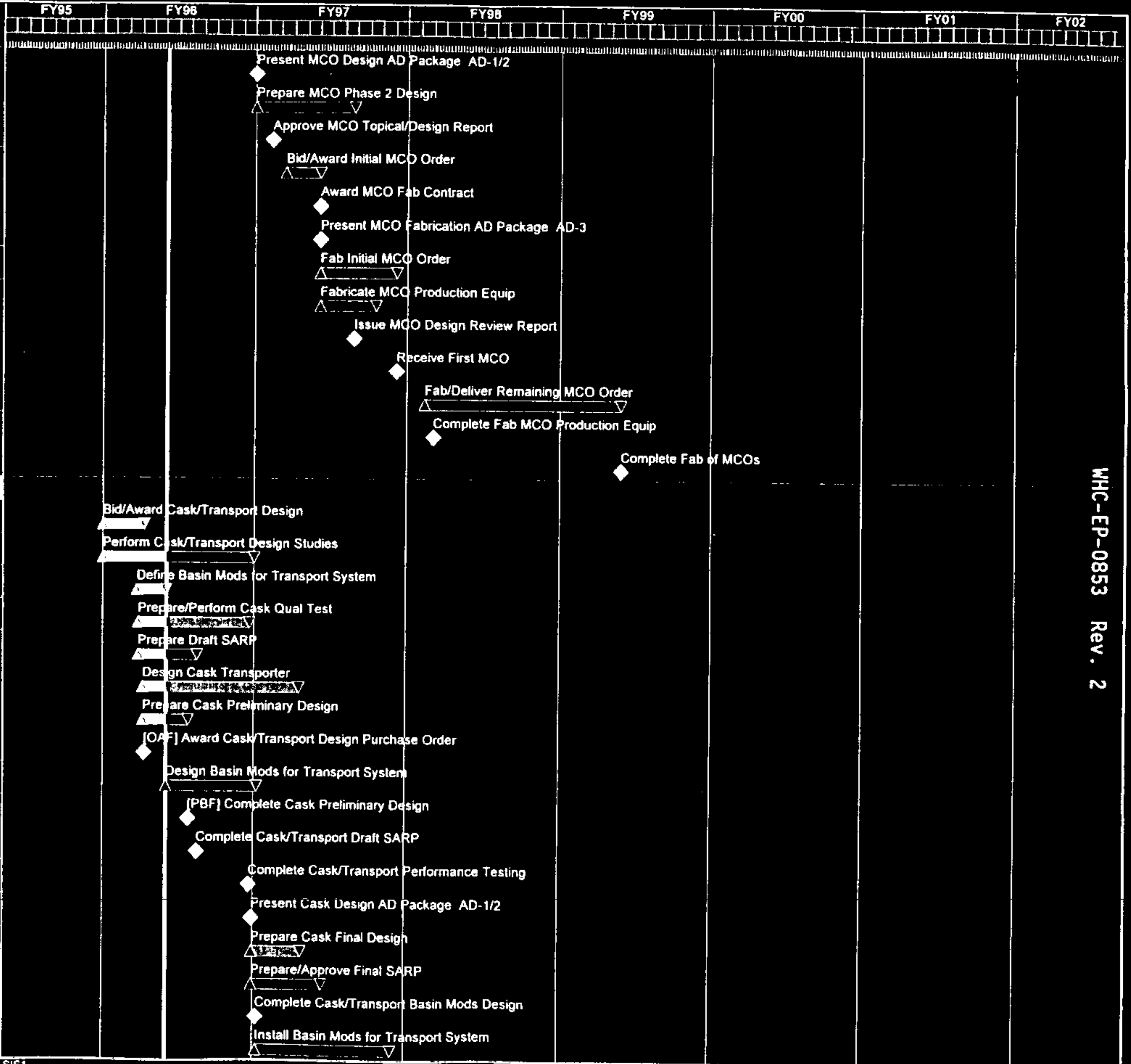
IP3612AL68		30SEP96*
IP3612AL69	01OCT96*	22MAY97
IP3612AL67		08NOV96*
IP3612AL71	12DEC96*	03MAR97
IP3612AL72		03MAR97*
IP3612AL73		03MAR97*
IP3612AL74	04MAR97	02SEP97
IP3612AL80	04MAR97*	16JUL97
IP3612AL70		22MAY97*
IP3612AL75		02SEP97*
IP3612AL81	12NOV97*	25FEB99
IP3612AL83		01DEC97*
IP3612AL82		25FEB99*
Cask/Transportation Sys 1 4.1 05		
IP3612AM14	02OCT95A	08JAN96A
IP3612AM18	02OCT95A	30SEP96
IP3612AM72	22DEC95A	01MAR96A
IP3612AM36	28DEC95A	19SEP96
IP3612AM50	28DEC95A	16MAY96
IP3612AM20	08JAN96A	15JAN97
IP3612AM24	08JAN96A	25APR96
IP3612AM15		08JAN96A
IP3612AM75	04MAR96*	07OCT96
IP3612AM25		25APR96*
IP3612AM53		16MAY96*
IP3612AM37		19SEP96*
IP3612AM27		26SEP96*
IP3612AM29	27SEP96*	22JAN97
IP3612AM55	27SEP96*	11MAR97
IP3612AM76		07OCT96*
IP3612AM80	08OCT96*	28AUG97



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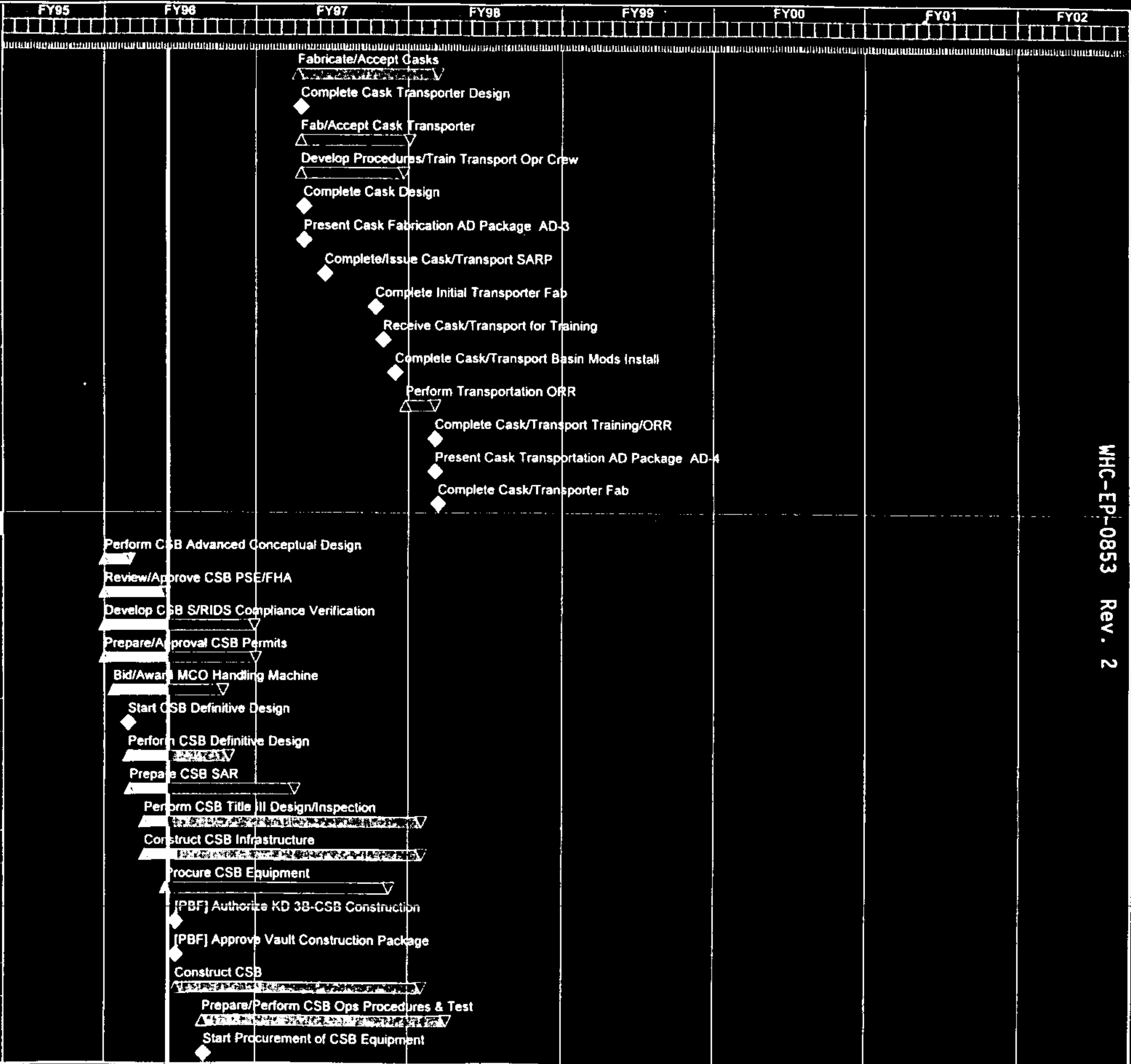
Activity ID	Early Start	Early Finish	
IP3612AM44	09JAN97*	09DEC97	Fabricate/Accept Casks
IP3612AM21		15JAN97*	Complete Cask Transporter Design
IP3612AM46	16JAN97*	01OCT97	Fab/Accept Cask Transporter
IP3612AM60	16JAN97*	19SEP97	Develop Procedures/Train Transport Opr Crew
IP3612AM30		22JAN97*	Complete Cask Design
IP3612AM43		22JAN97*	Present Cask Fabrication AD Package AD-3
IP3612AM57		11MAR97*	Complete/Issue Cask/Transport SARP
IP3612AM48		11JUL97*	Complete Initial Transporter Fab
IP3612AM62		31JUL97*	Receive Cask/Transport for Training
IP3612AM82		28AUG97*	Complete Cask/Transport Basin Mods Install
IP3612AM65	22SEP97*	02DEC97	Perform Transportation ORR
IP3612AM67		02DEC97*	Complete Cask/Transport Training/ORR
IP3612AM68		02DEC97*	Present Cask Transportation AD Package AD-4
IP3612AM45		09DEC97*	Complete Cask/Transporter Fab
Canister Storage Facility 1 4 1 07 01			
IP3612AN11	02OCT95A	29NOV95A	Perform CSB Advanced Conceptual Design
IP3612AN36	02OCT95A	23FEB96A	Review/Approve CSB PSE/FHA
IP3612AN37	02OCT95A	27SEP96	Develop CSB S/RIDS Compliance Verification
IP3612AN50	02OCT95A	30SEP96	Prepare/Approval CSB Permits
IP3612AN60	23OCT95A	12JUL96	Bid/Award MCO Handling Machine
IP3612AN12	27NOV95A		Start CSB Definitive Design
IP3612AN13	27NOV95A	26JUL96	Perform CSB Definitive Design
IP3612AN38	01DEC95A	31DEC96	Prepare CSB SAR
IP3612AN22	05JAN96A	30OCT97	Perform CSB Title III Design/Inspection
IP3612AN24	08JAN96A	31OCT97	Construct CSB Infrastructure
IP3612AN18	26FEB96A	12AUG97	Procure CSB Equipment
IP3612AN09		22MAR96*	[PBF] Authorize KD 3B-CSB Construction
IP3612AN20		22MAR96*	[PBF] Approve Vault Construction Package
IP3612AN21	22MAR96*	31OCT97	Construct CSB
IP3612AN26	24MAY96*	29DEC97	Prepare/Perform CSB Ops Procedures & Test
IP3612AN17	29MAY96*		Start Procurement of CSB Equipment



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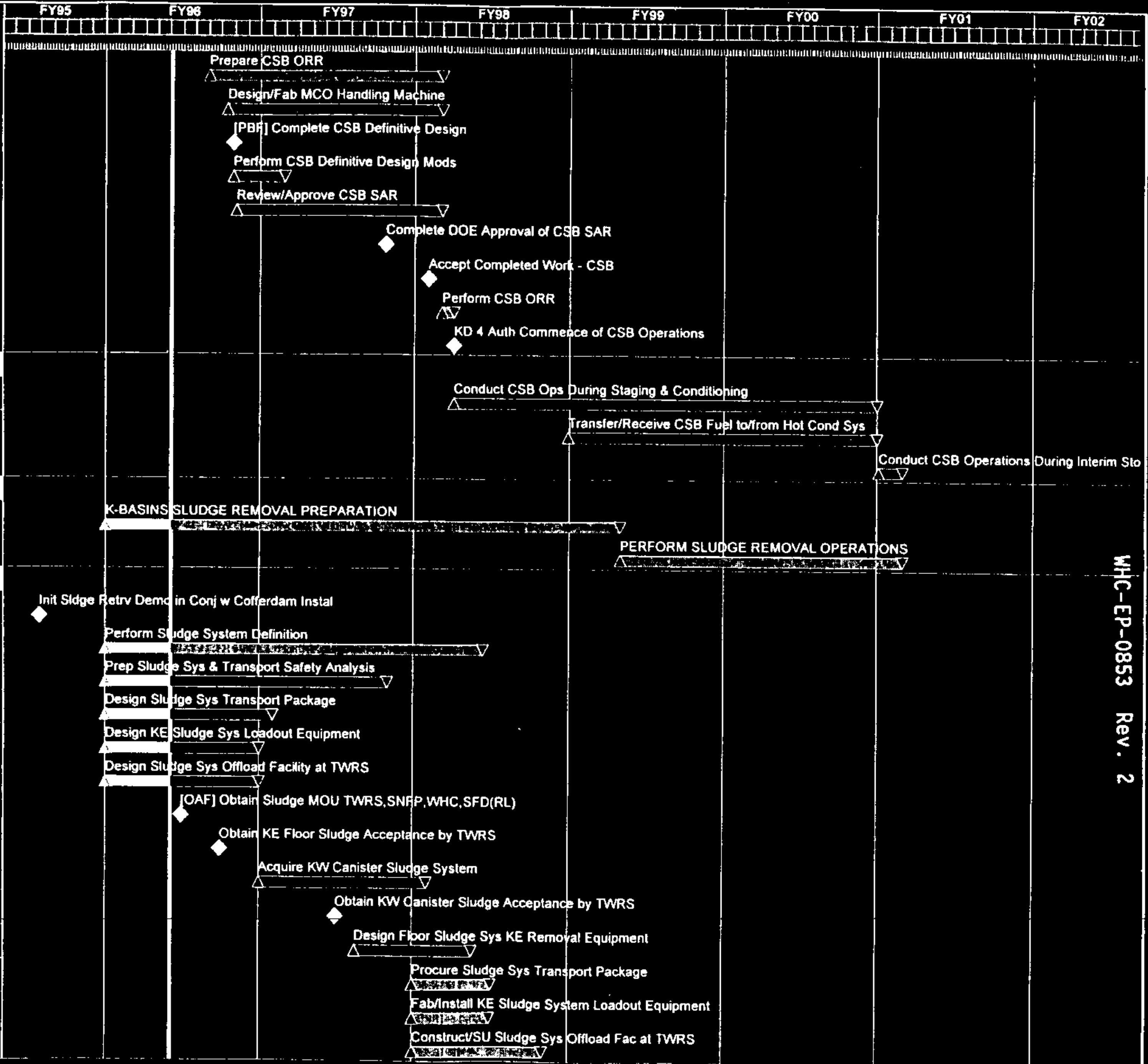
SISMP (Based on Feb 2, 96 IPS)

Date	Revision	Checked	Approved
	February 2, 1996 - Revision 0		

Activity ID	Early Start	Early Finish
IP3612AN28	31MAY96*	03DEC97
IP3612AN65	15JUL96	01DEC97
IP3612AN14		26JUL96*
IP3612AN15	29JUL96	25NOV96
IP3612AN40	05AUG96*	01DEC97
IP3612AN42		22JUL97*
IP3612AN23		31OCT97*
IP3612AN31	04DEC97*	29DEC97
IP3612AN33		29DEC97*
Canister Storage Bldg Opns 1 4 1 07 02		
IP3601AO10	30DEC97*	29SEP00
IP3601AO45	30SEP98*	29SEP00
IP3601AO20	02OCT00*	30NOV00
K-BASINS SLUDGE REMOVAL		
HSNF0AA	02OCT95A	29JAN99
HSNF0AB	01FEB99	30NOV00
Sludge Removal 1.4.1.04 04		
IP-3.6-019	28APR95A	
HSNF0AAH15	02OCT95A	12MAR98
HSNF0AAH40	02OCT95A	31JUL97
HSNF0AAH50	02OCT95A	01NOV96
HSNF0AAH80	02OCT95A	30SEP96
HSNF0AAH85	02OCT95A	30SEP96
HSNF0AAH86		29MAR96*
HSNF0AAH87		28JUN96*
HSNF0AAH91	01OCT96*	31OCT97
HSNF0AAH92		31MAR97*
HSNF0AAH76	15MAY97*	13FEB98
HSNF0AAH52	01OCT97*	01APR98
HSNF0AAH81	01OCT97*	31MAR98
HSNF0AAH88	01OCT97*	31JUL98



Project Start	01OCT92
Project Finish	30SEP11
Data Date	04MAR96
Plot Date	13MAR96

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△▽ Early Bar
▬ Progress Bar
▨ Critical Activity

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Date	Revision	Checked	Approved
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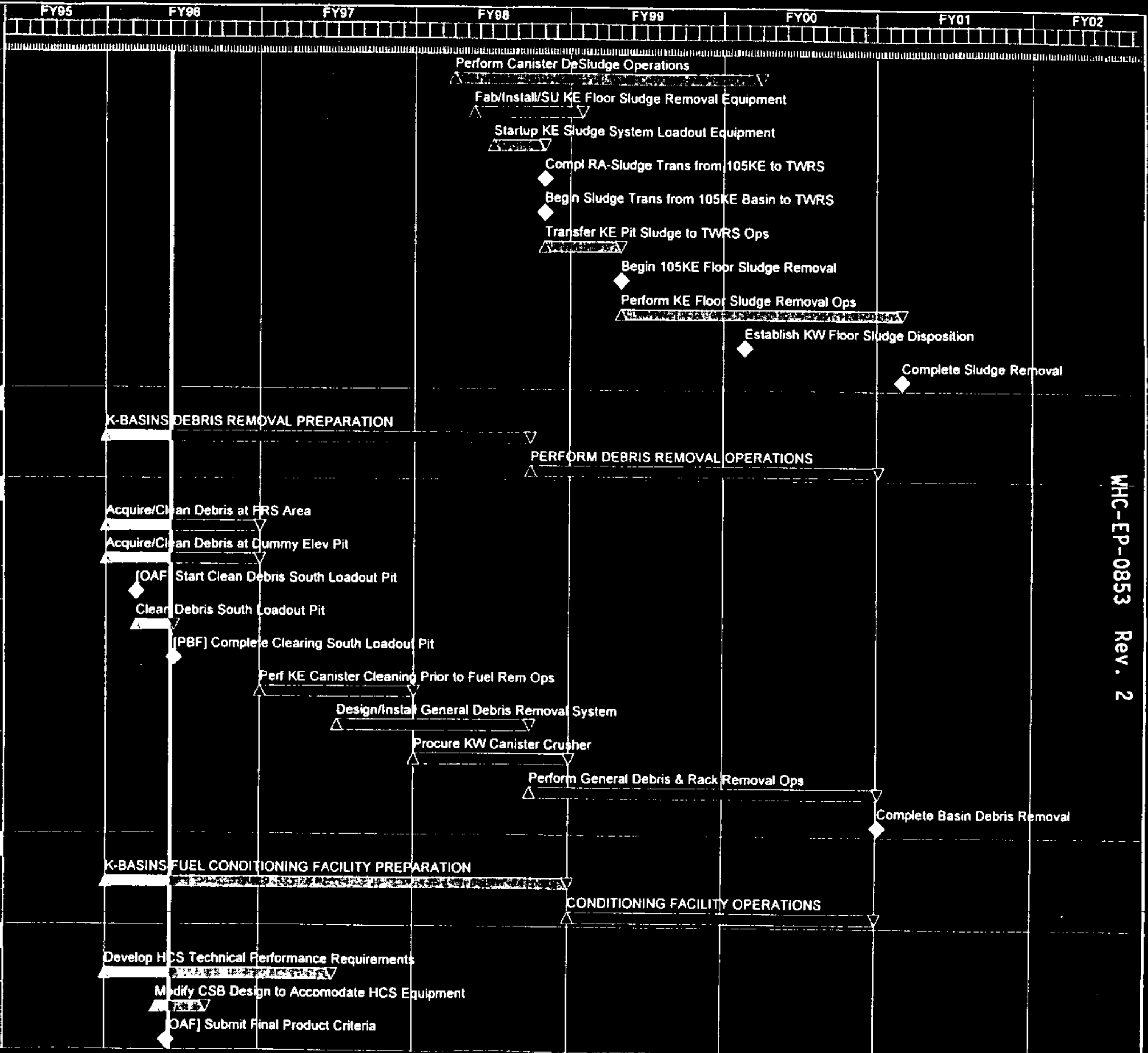
Activity ID	Early Start	Early Finish
HSNF0AAH97	30DEC97*	30DEC99
HSNF0AAH78	17FEB98*	30OCT98
HSNF0AAH82	02APR98*	31JUL98
HSNF0AAH83		31JUL98*
HSNF0AAH93	03AUG98*	
HSNF0AAH94	03AUG98*	29JAN99
HSNF0AAH95	01FEB99*	
HSNF0AAH96	01FEB99*	30NOV00
HSNF0AAH89		19NOV99*
HSNF0AAH98		30NOV00*
K-BASINS DEBRIS REMOVAL		
HSNF0BA	02OCT95A	30JUN98
HSNF0BB	01JUL98	02OCT00
Debris Removal 1.1.4.04.05		
HSNF0BAI14	02OCT95A	30SEP96
HSNF0BAI15	02OCT95A	30SEP96
HSNF0BAI11	12DEC95A	
HSNF0BAI12	12DEC95A	08MAR96
HSNF0BAI13		08MAR96*
HSNF0BAI23	01OCT96*	30SEP97
HSNF0BAI37	01APR97*	30JUN98
HSNF0BAI40	01OCT97*	30SEP98
HSNF0BAI45	01JUL98*	02OCT00
HSNF0BAI55		02OCT00*
FUEL CONDITIONING		
HSNF0CA	02OCT95A	30SEP98
HSNF0CB	01OCT98	29SEP00
Hot Conditioning System Acq 1.4.1.08.01		
HSNF0CAP10	02OCT95A	24MAR97
HSNF0CAP24	01FEB96A	28MAY96
HSNF0CAP20		23FEB96A



Project Start	01OCT92
Project Finish	30SEP11
Data Date	04MAR96
Plot Date	13MAR96

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△ ▽ Early Bar
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Date	Revision	Checked	Approved
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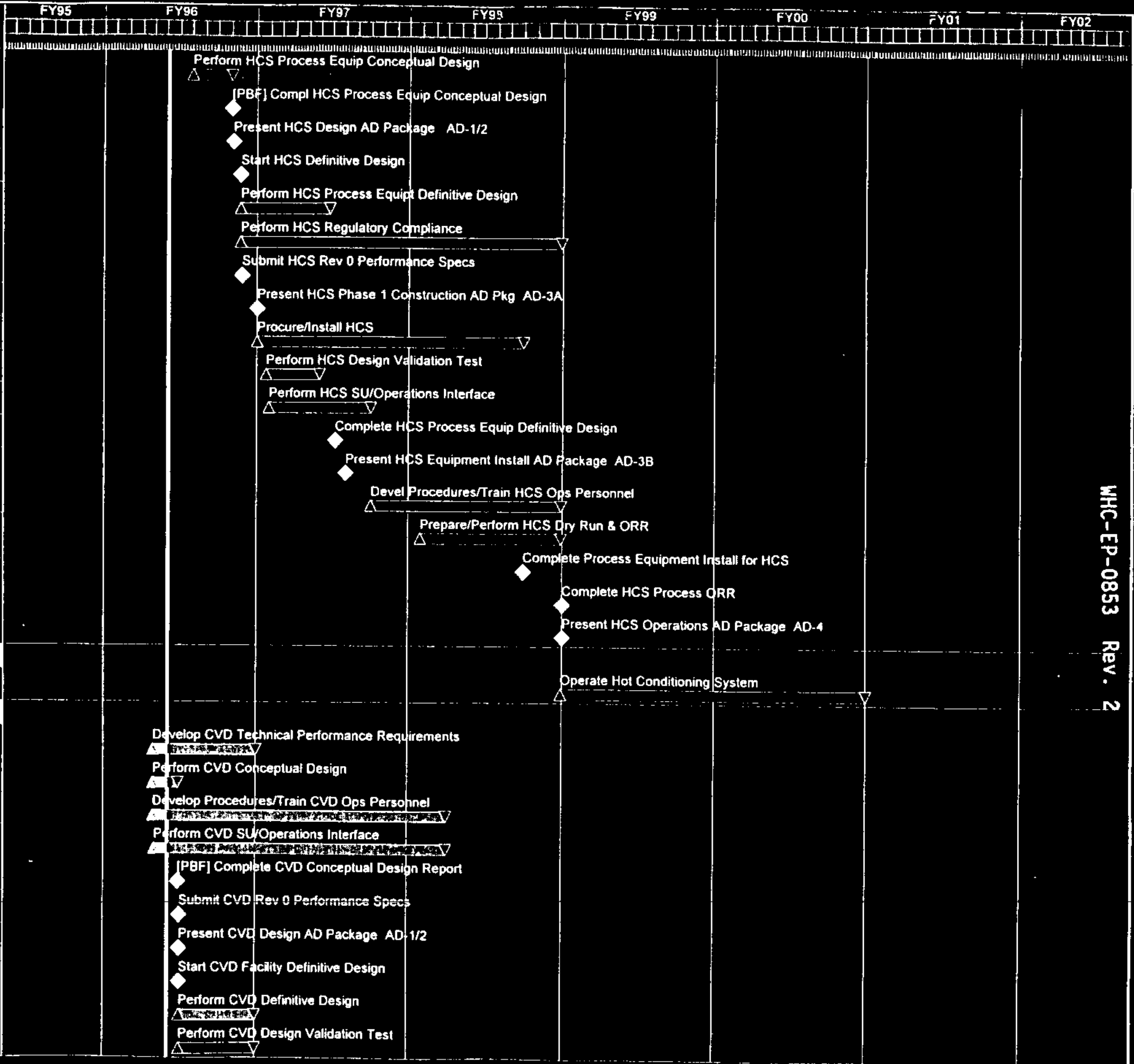
Activity ID	Early Start	Early Finish
HSNF0CAP26	01MAY96*	01AUG96
HSNF0CAP28		01AUG96*
HSNF0CAP32		02AUG96*
HSNF0CAP34	23AUG96*	
HSNF0CAP38	23AUG96*	24MAR97
HSNF0CAP50	23AUG96*	29SEP98
HSNF0CAP30		26AUG96*
HSNF0CAP42		30SEP96*
HSNF0CAP46	01OCT96*	30JUN98
HSNF0CAP44	22OCT96*	25FEB97
HSNF0CAP55	28OCT96*	30JUN97
HSNF0CAP40		07APR97*
HSNF0CAP45		30APR97*
HSNF0CAP60	01JUL97*	29SEP98
HSNF0CAP65	29OCT97*	29SEP98
HSNF0CAP48		30JUN98*
HSNF0CAP70		30SEP98*
HSNF0CAP75		30SEP98*
Hot Conditioning Sys Opns 1.4.1.08.02		
HSNF0CBP80	30SEP98*	29SEP00
K-Basin Cold Vac Dry Fac Acq 1.4.1.08.03		
HSNF0CAQ08	29JAN96A	30SEP96
HSNF0CAQ30	29JAN96A	29MAR96
HSNF0CAQ60	29JAN96A	29DEC97
HSNF0CAQ58	01FEB96A	29DEC97
HSNF0CAQ34		29MAR96*
HSNF0CAQ20		01APR96*
HSNF0CAQ36		01APR96*
HSNF0CAQ38	01APR96*	
HSNF0CAQ40	01APR96*	30SEP96
HSNF0CAQ44	01APR96*	30SEP96



Project Start 01OCT92
Project Finish 30SEP11
Data Date 04MAR96
Plot Date 13MAR96
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▨ Critical Activity

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Date	Revision	Checked	Approved
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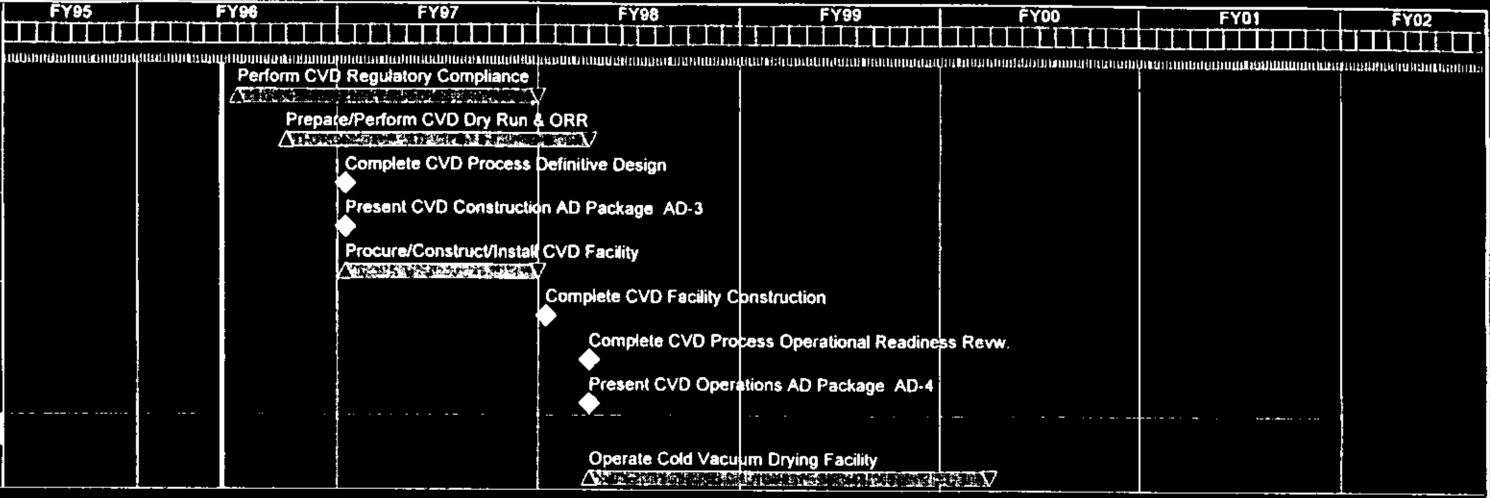
Activity ID	Early Start	Early Finish
HSNF0CAQ55	01APR96*	30SEP97
HSNF0CAQ65	01JUL96*	29DEC97
HSNF0CAQ42		14OCT96*
HSNF0CAQ46		15OCT96*
HSNF0CAQ48	16OCT96*	30SEP97
HSNF0CAQ50		13OCT97*
HSNF0CAQ70		29DEC97*
HSNF0CAQ75		29DEC97*
K-Basin Cold Vac Fac Opns 1.4.1.08.04		
HSNF0CBQ80	30DEC97*	30DEC99



Project Start	01OCT92
Project Finish	30SEP11
Data Date	04MAR96
Plot Date	13MAR96

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Progress Bar
▨ Critical Activity

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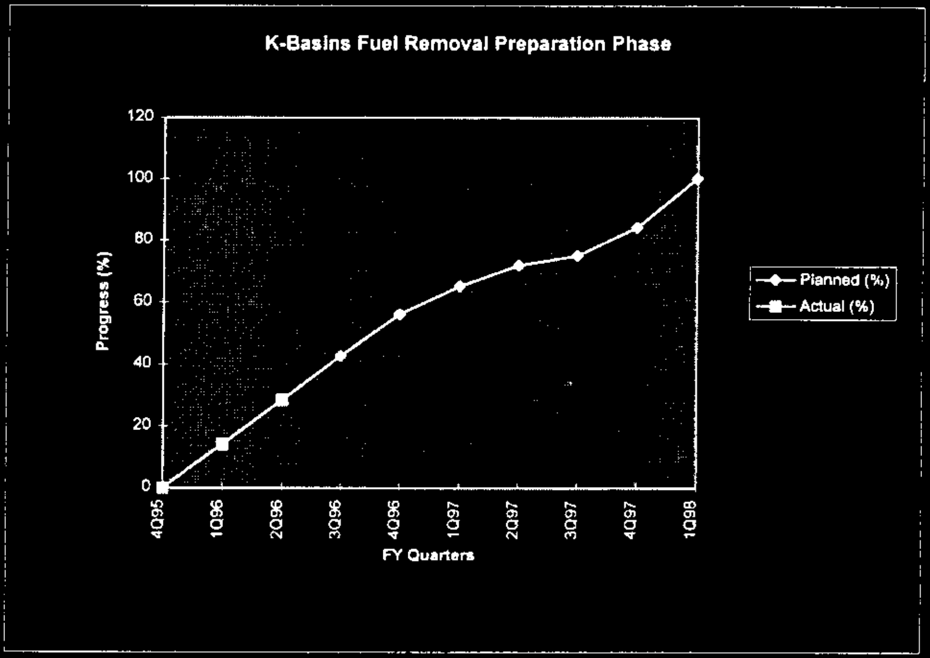
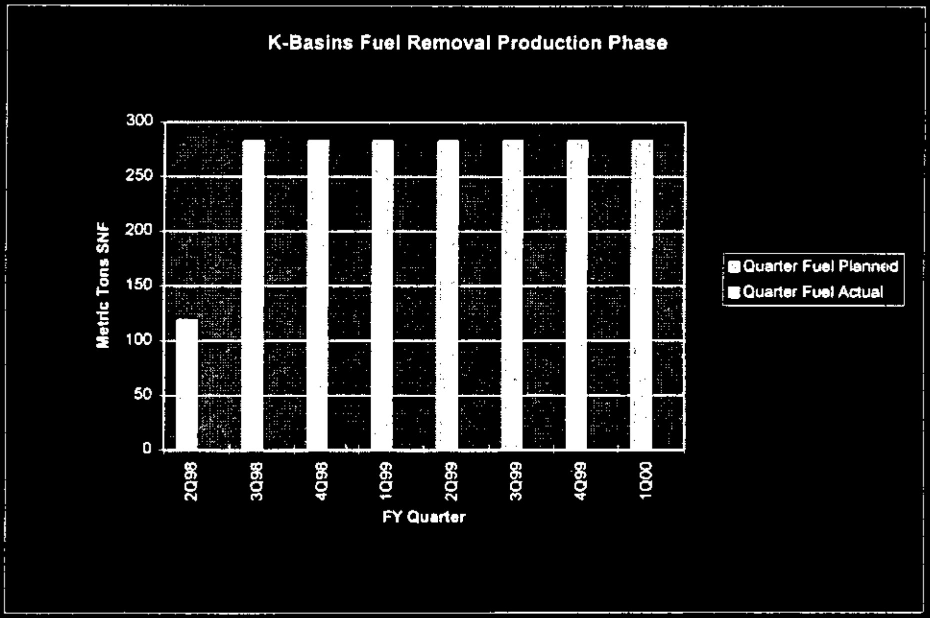
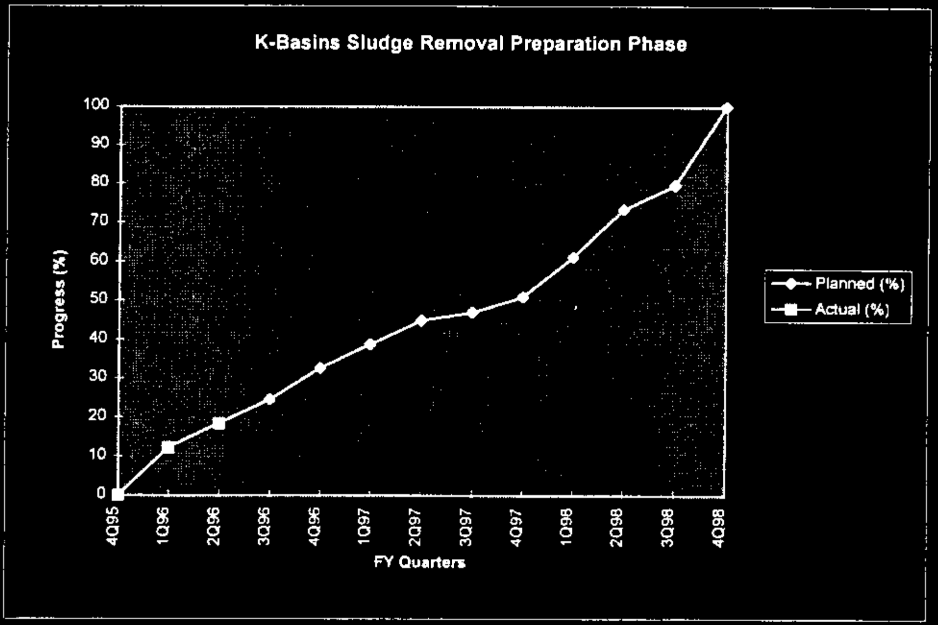
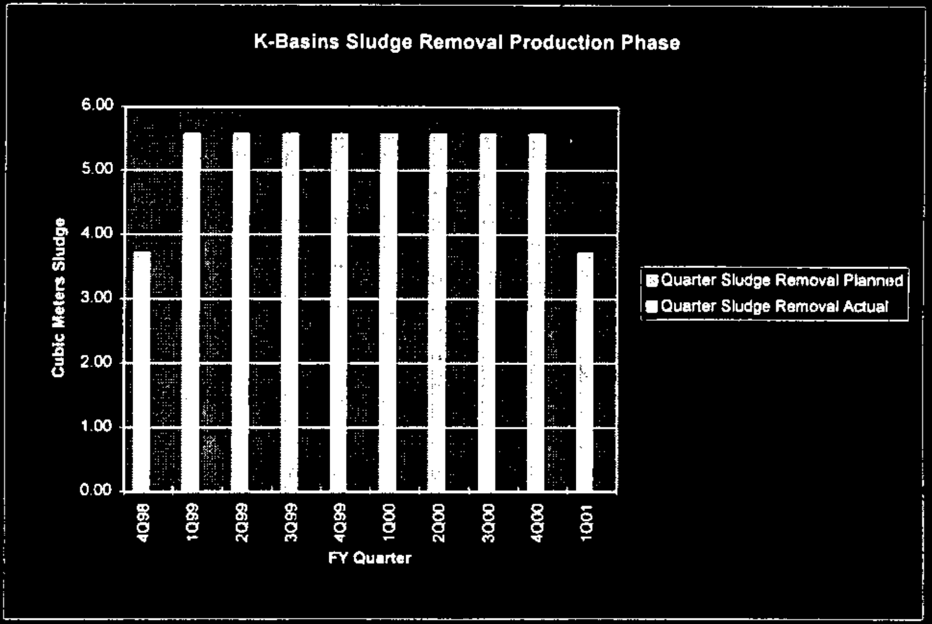
K Basins Fuel Removal Progress Curves





K Basins Sludge Removal Progress Curves

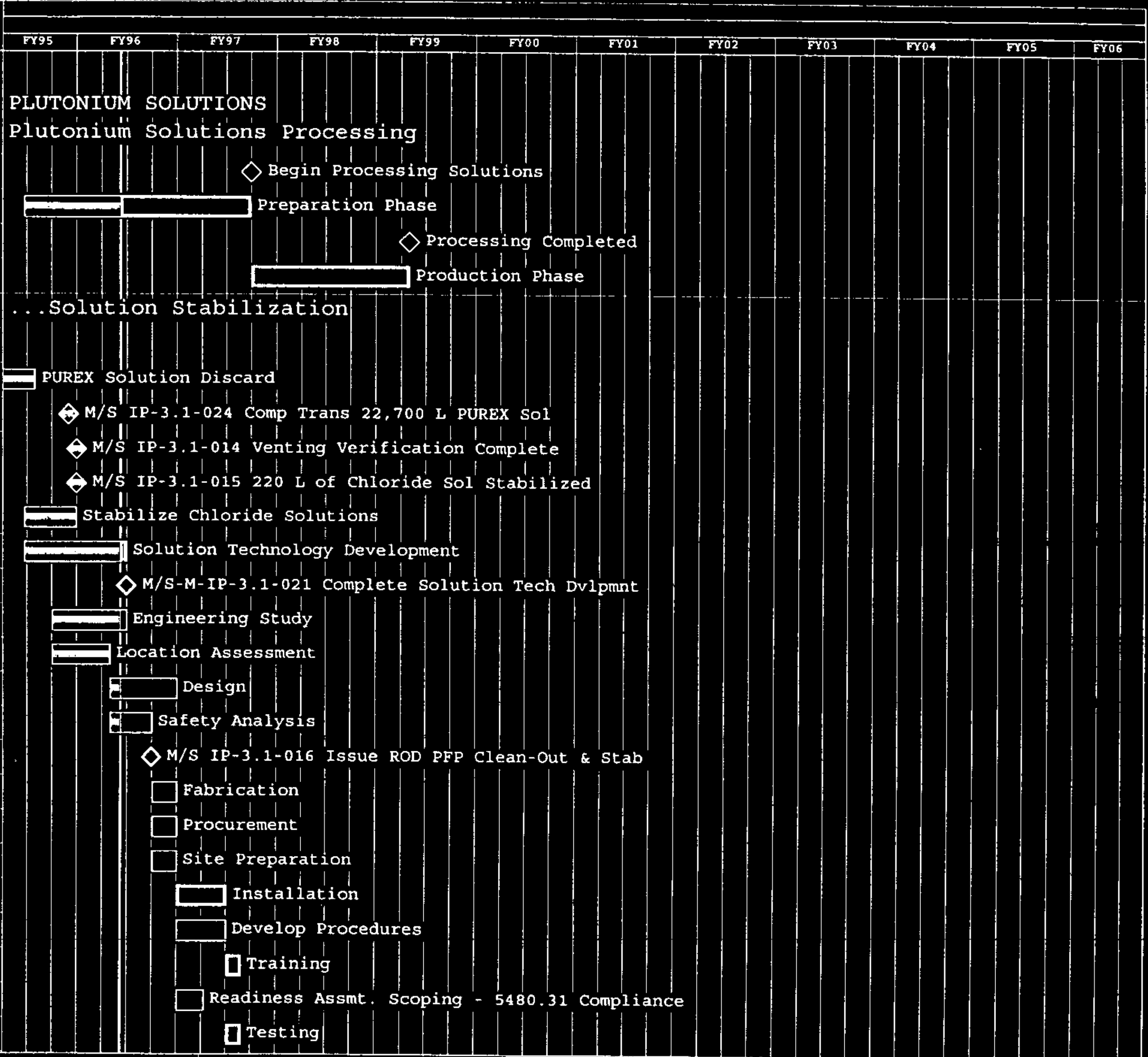




APPENDIX B

PLUTONIUM-BEARING MATERIALS SCHEDULES

ACTIVITY ID	EARLY START	EARLY FINISH	
			PLUTONIUM SOLUTIONS Plutonium Solutions Processing
IP31022A1	30JUN97		Begin Processing Solutions
IP31022A	22MAR95A	27JUN97	Preparation Phase
IP31017A1		28JAN99	Processing Completed
IP31017A	30JUN97	28JAN99	Production Phase
			...Solution Stabilization
IP31023	1JUN94A		
IP31024A	1JUN94A	30APR95A	PUREX Solution Discard
IP31024		31AUG95A	M/S IP-3.1-024 Comp Trans 22,700 L PUREX Sol
IP31014		29SEP95A	M/S IP-3.1-014 Venting Verification Complete
IP31015		29SEP95A	M/S IP-3.1-015 220 L of Chloride Sol Stabilized
IP31015A	22MAR95A	29SEP95A	Stabilize Chloride Solutions
IP31021A	22MAR95A	29MAR96	Solution Technology Development
IP31021		29MAR96	M/S-M-IP-3.1-021 Complete Solution Tech Dvlpmnt
IP31022B	3JUL95A	30MAR96	Engineering Study
IP31022C	3JUL95A	29JAN96A	Location Assessment
IP31022D	30JAN96A	1OCT96	Design
IP31022E	30JAN96A	1JUL96	Safety Analysis
IP31016		28JUN96	M/S IP-3.1-016 Issue ROD PFP Clean-Out & Stab
IP31022F	2JUL96	1OCT96	Fabrication
IP31022G	2JUL96	1OCT96	Procurement
IP31022H	2JUL96	1OCT96	Site Preparation
IP31022J	2OCT96	2APR97	Installation
IP31022K	2OCT96	2APR97	Develop Procedures
IP31022L	3APR97	27MAY97	Training
IP31022I	2OCT96	10JAN97	Readiness Assmt. Scoping - 5480.31 Compliance
IP31022M	3APR97	27MAY97	Testing



Plot Date	14MAR96
Data Date	8MAR96
Project Start	15SEP93
Project Finish	1JUN06

- Activity Bar/Early Dates
- Critical Activity
- Progress Bar
- ◇/⚑ Milestone/Flag Activity

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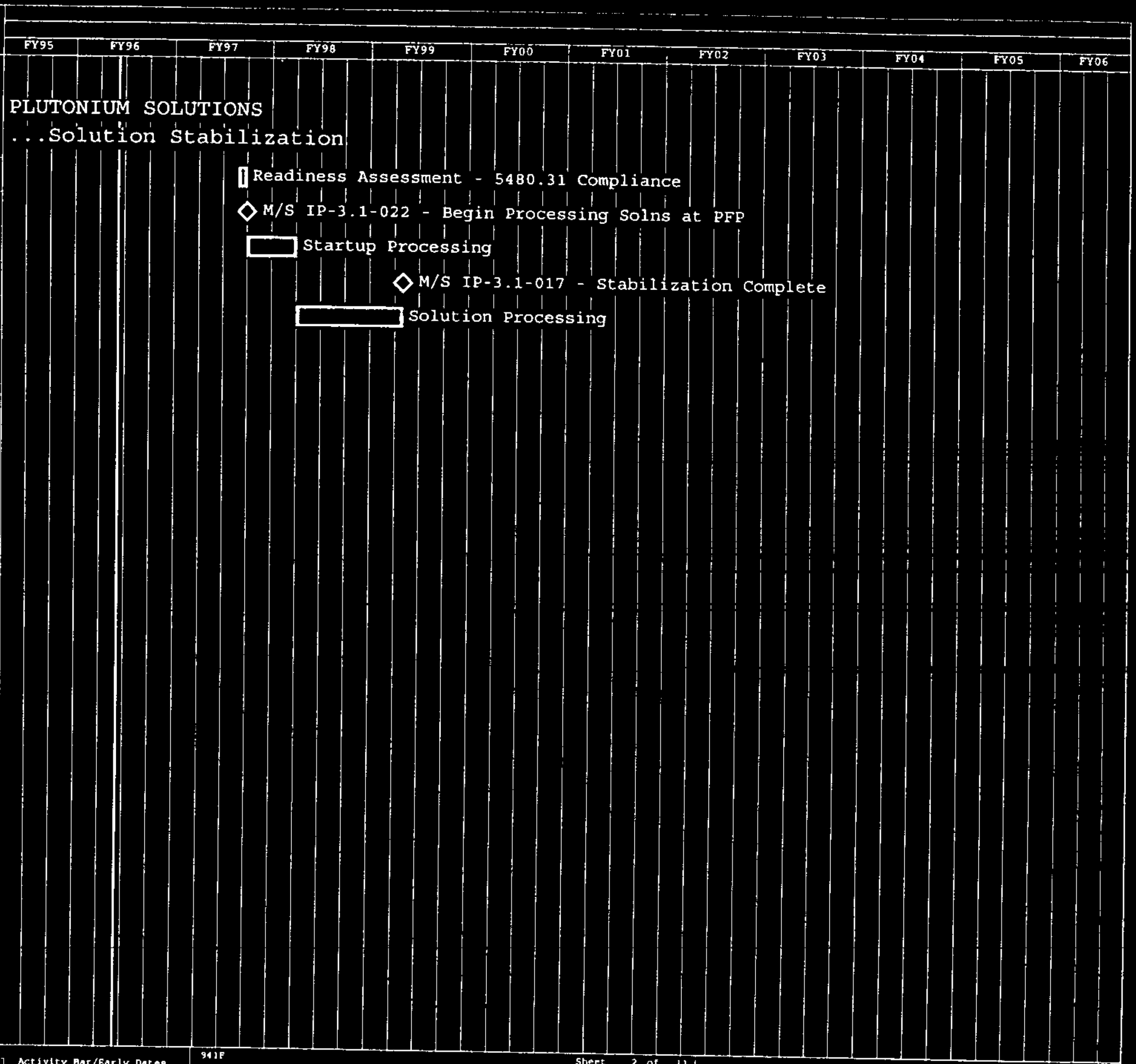
ACTIVITY ID	EARLY START	EARLY FINISH
IP31022N	28MAY97	27JUN97
IP31022	30JUN97	
IP31022A2	30JUN97	31DEC97
IP31017		29JAN99
IP31017B	1JAN98	28JAN99



Plot Date 14MAR96
Data Date 8MAR96
Project Start 15SEP93
Project Finish 1JUN06

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Activity Bar/Early Dates
Critical Activity
Progress Bar
◇ / ⚑ Milestone/Flag Activity

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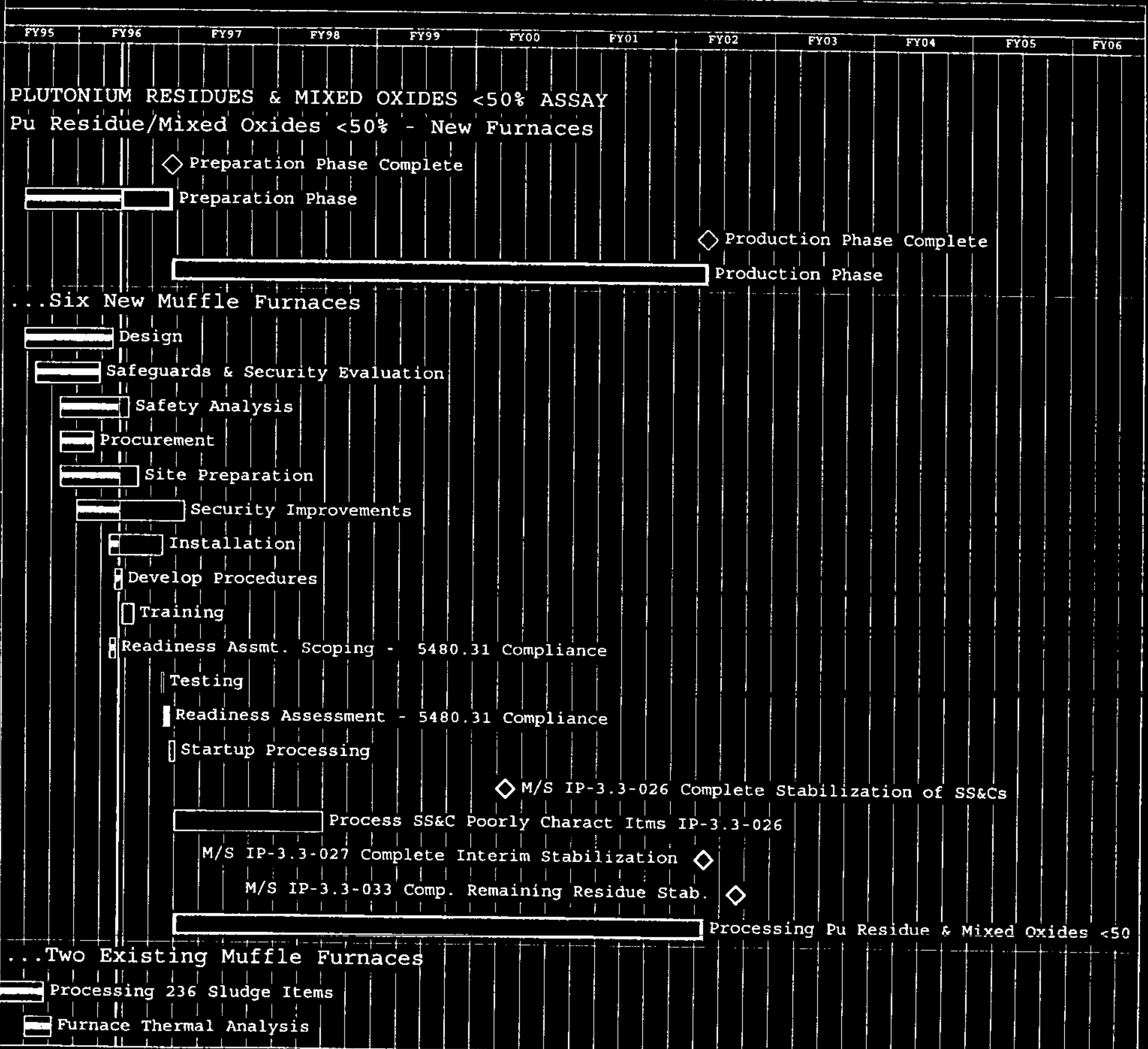
Plutonium Materials Stabilization
SISMP

Date	Revision	Checked	Approved



ACTIVITY ID	EARLY START	EARLY FINISH	
			PLUTONIUM RESIDUES & MIXED OXIDES <50% ASSAY
			Pu Residue/Mixed Oxides <50% - New Furnaces
IP33033A		10SEP96	◇ Preparation Phase Complete
IP33033B	22MAR95A	10SEP96	Preparation Phase
IP33033C		31JAN02	◇ Production Phase Complete
IP33033D	11SEP96	31JAN02	Production Phase
			...Six New Muffle Furnaces
IP33033M	22MAR95A	8FEB96A	Design
IP33033N	1MAY95A	22DEC95A	Safeguards & Security Evaluation
IP33033O	1AUG95A	8APR96	Safety Analysis
IP33033P	3AUG95A	30NOV95A	Procurement
IP33033Q	3AUG95A	14MAY96	Site Preparation
IP33033R	2OCT95A	31OCT96	Security Improvements
IP33033T	30JAN96A	12AUG96	Installation
IP33033U	20FEB96A	18MAR96	Develop Procedures
IP33033V	19MAR96	30APR96	Training
IP33033S	2FEB96A	23FEB96A	Readiness Assmt. Scoping - 5480.31 Compliance
IP33033W	13AUG96	19AUG96	Testing
IP33033X	20AUG96	10SEP96	Readiness Assessment - 5480.31 Compliance
IP33033Y	11SEP96	30SEP96	Startup Processing
IP33026		31JAN00	◇ M/S IP-3.3-026 Complete Stabilization of SS&Cs
IP33026A	1OCT96	31MAR98	Process SS&C Poorly Charact Itms IP-3.3-026
IP33027-1		31JAN02	M/S IP-3.3-027 Complete Interim Stabilization ◇
IP33033		31MAY02	M/S IP-3.3-033 Comp. Remaining Residue Stab. ◇
IP33033Z	1OCT96	31JAN02	Processing Pu Residue & Mixed Oxides <50
			...Two Existing Muffle Furnaces
IP33031A	1NOV94A	13JUN95A	Processing 236 Sludge Items
IP33033E	3APR95A	11JUL95A	Furnace Thermal Analysis

Plot Date	14MAR96
Data Date	8MAR96
Project Start	15SEP93
Project Finish	1JUN06

▭	Activity Bar/Early Dates
▭	Critical Activity
▭	Progress Bar
◇ / ⚑	Milestone/Flag Activity

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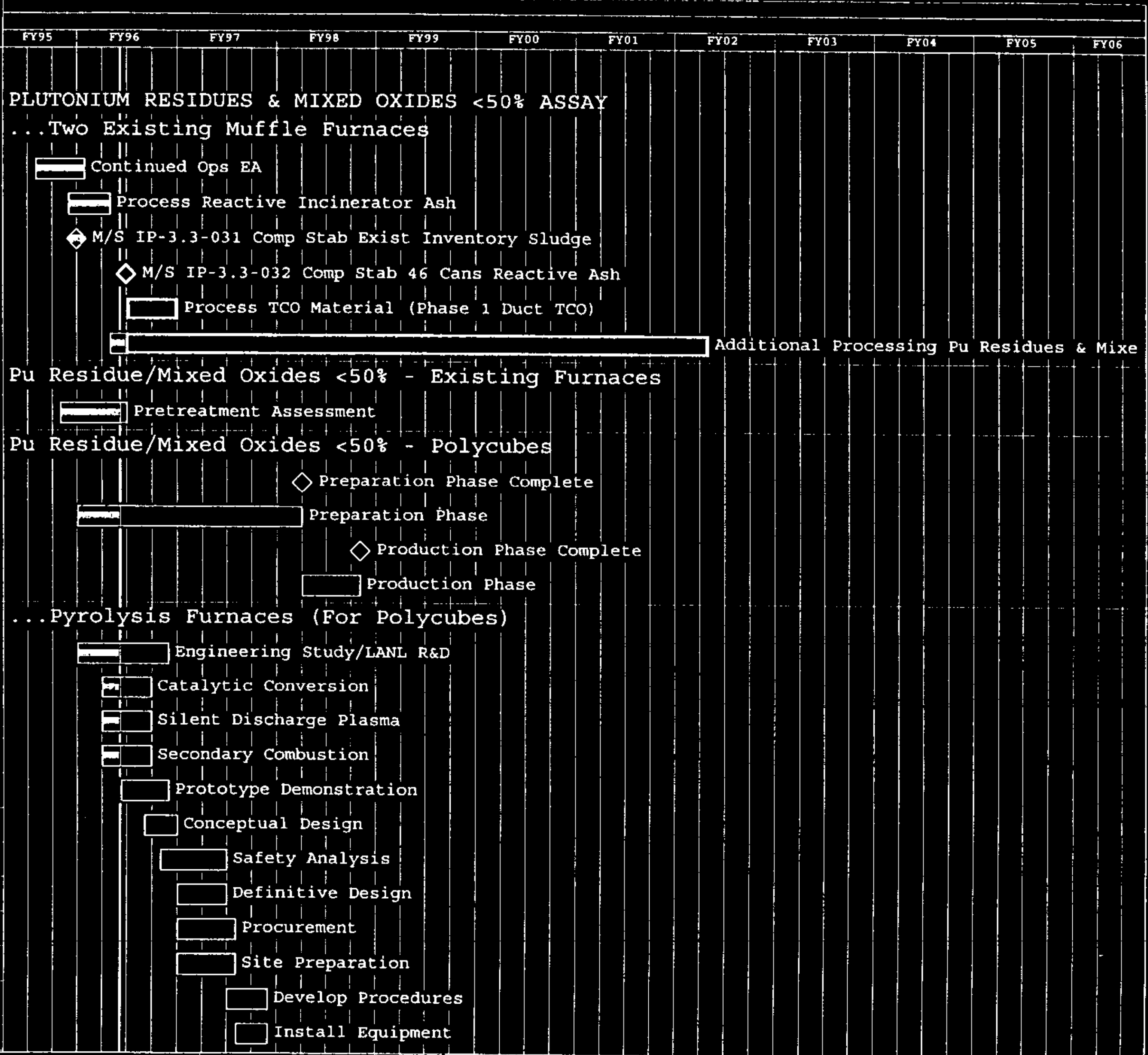
Westinghouse Hanford Company
Plutonium Materials Stabilization
SISMP

Date	Revision	Checked	Approved

ACTIVITY ID	EARLY START	EARLY FINISH	
			PLUTONIUM RESIDUES & MIXED OXIDES <50% ASSAY
			...Two Existing Muffle Furnaces
IP33033F	1MAY95A	30OCT95A	Continued Ops EA
IP33033G	1SEP95A	31JAN96A	Process Reactive Incinerator Ash
IP33031		29SEP95A	M/S IP-3.3-031 Comp Stab Exist Inventory Sludge
IP33032		29MAR96	M/S IP-3.3-032 Comp Stab 46 Cans Reactive Ash
IP33033H	1APR96	1OCT96	Process TCO Material (Phase 1 Duct TCO)
IP33033I	31JAN96A	31JAN02	Additional Processing Pu Residues & Mixe
			Pu Residue/Mixed Oxides <50% - Existing Furnaces
IP33033L	31JUL95A	1APR96	Pretreatment Assessment
			Pu Residue/Mixed Oxides <50% - Polycubes
IP33028A		31DEC97	Preparation Phase Complete
IP33028B	2OCT95A	31DEC97	Preparation Phase
IPEE029A		3AUG98	Production Phase Complete
IP33029B	1JAN98	3AUG98	Production Phase
			...Pyrolysis Furnaces (For Polycubes)
IP33028C	2OCT95A	30AUG96	Engineering Study/LANL R&D
IP33028C02	1JAN96A	28JUN96	Catalytic Conversion
IP33028C03	1JAN96A	28JUN96	Silent Discharge Plasma
IP33028C04	1JAN96A	28JUN96	Secondary Combustion
IP33028C05	11MAR96	30AUG96	Prototype Demonstration
IP33028C06	3JUN96	30SEP96	Conceptual Design
IP33028E	1AUG96	31MAR97	Safety Analysis
IP33028C07	1OCT96	31MAR97	Definitive Design
IP33028F	1OCT96	2MAY97	Procurement
IP33028G	1OCT96	2MAY97	Site Preparation
IP33028J	1APR97	29AUG97	Develop Procedures
IP33028C08	5MAY97	29AUG97	Install Equipment



Plot Date	14MAR96
Data Date	8MAR96
Project Start	15SEP93
Project Finish	1JUN06

▭ Activity Bar/Early Dates
▬ Critical Activity
▭ Progress Bar
◇/⚑ Milestone/Flag Activity

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Plutonium Materials Stabilization
SISMP

Date	Revision	Checked	Approved

ACTIVITY ID	EARLY START	EARLY FINISH	
			PLUTONIUM RESIDUES & MIXED OXIDES <50% ASSAY
			...Pyrolysis Furnaces (For Polycubes)
IP33028K	2JUN97	1SEP97	Training
IP33028H	3FEB97	7APR97	Readiness Assmt. Scoping - 5480.31 Compliance
IP33028L	1SEP97	31OCT97	Testing
IP33028C09	3NOV97	31DEC97	Readiness Assessment - 5480.31 Compliance
IP33028	30JUL99		◇ M/S IP-3.3-028 Begin Polycube Stabilization
IP33028C10	1JAN98	3AUG98	Process Polycubes IP-3.3-029
IP33029		31JAN01	◇ M/S IP-3.3-029 Complete Polycube Stabilization
			...Facility Cleanout
E10595	1OCT93A	1OCT98	PUREX Deactivation
E10510	1OCT94A	29DEC95A	232-Z Cleanout
E10515	1MAR95A	8MAR96	Move Out of 15 Retired Facilities
E10520	1JUN95A	30NOV95A	Planning Phase 1
E10530	2OCT95A	30SEP97	Glove Box TCO Ph 1
E10535	2OCT95A	30SEP97	Duct TCO Phase 1
E10525	6OCT95A	30SEP96	236-Z Deactivation Plan
E10526	1OCT96	30SEP97	236-Z Deactivation Modification Designs
E10540A	1JAN97	30SEP97	241-Z Cleanup Planning
E10545A	1JAN97	30SEP97	231-Z Cleanup Planning
E10527	1OCT97	30SEP98	236-Z Deactivation Modifications
E10540	1OCT97	30SEP98	241-Z Cleanup
E10545	1OCT97	30SEP98	231-Z Cleanup
E10550A	1JUN98	30SEP98	291-Z Cleanup Planning
E10555A	1JUN98	30SEP98	236-Z Cleanup Planning
E10550	1OCT98	30APR99	291-Z Cleanup
E10555	1OCT98	30SEP99	236-Z TCO
E10560A	1JUN99	30SEP99	241-Z-361 Cleanup Planning

Plot Date	14MAR96
Data Date	8MAR96
Project Start	15SEP93
Project Finish	1JUN06

▭	Activity Bar/Early Dates
▬	Critical Activity
▬	Progress Bar
◇ / ⚑	Milestone/Flag Activity

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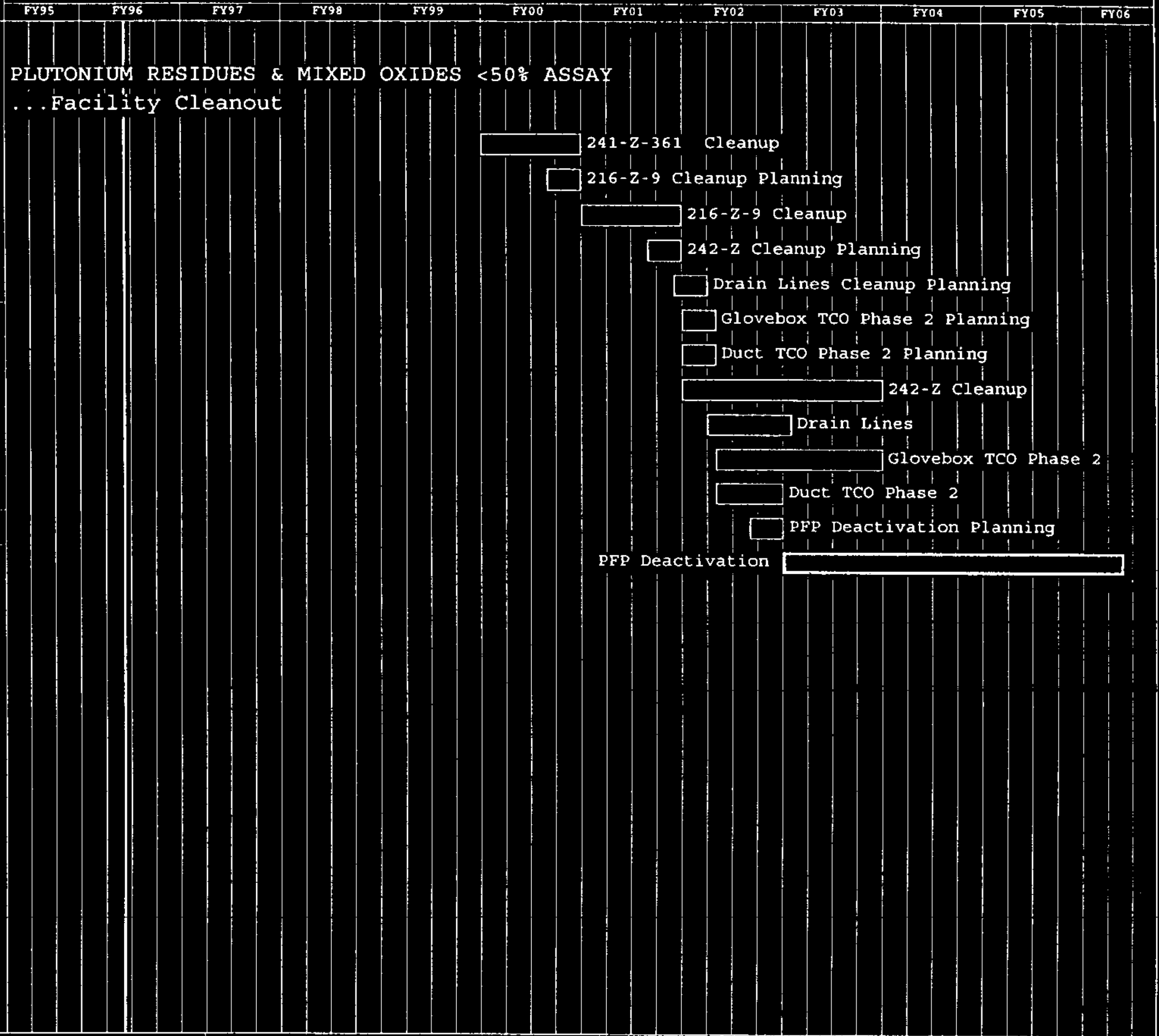
SISMP

Date	Revision	Checked	Approved

PLUTONIUM RESIDUES & MIXED OXIDES <50% ASSAY

...Facility Cleanout

ACTIVITY ID	EARLY START	EARLY FINISH
E10560	1OCT99	29SEP00
E10580A	1JUN00	29SEP00
E10580	2OCT00	28SEP01
E10575A	1JUN01	28SEP01
E10585A	3SEP01	31DEC01
E10565A	1OCT01	30JAN02
E10570A	1OCT01	30JAN02
E10575	1OCT01	30SEP03
E10585	1JAN02	31OCT02
E10565	31JAN02	30SEP03
E10570	31JAN02	30SEP02
E10590A	3JUN02	30SEP02
E10590	1OCT02	27FEB06



Plot Date	14MAR96
Data Date	8MAR96
Project Start	15SEP93
Project Finish	1JUN06

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Activity Bar/Early Dates
Critical Activity
Progress Bar
◇/⚑ Milestone/Flag Activity

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Westinghouse Hanford Company
Plutonium Materials Stabilization
SISMP

Date	Revision	Checked	Approved

ACTIVITY ID	EARLY START	EARLY FINISH	
			PLUTONIUM METAL & OXIDES >50% ASSAY
			...Processing Oxides >50% Assay
IP32033A		10SEP96	Preparation Phase Complete Preparation Phase Completed (refer to activity IP33033A). Six muffle furnaces ready for startup processing. Metals and Oxides restabilized using the six muffle furnaces.
IP32033	30JUL99		M/S IP-3.2-033 Start Restabilizing High Oxide
IP32034		31MAY02	M/S IP-3.2-034 Complete Restabilizing High Oxide
IP32034A	11SEP96	31JAN02	Processing Oxides
			...Packaging/Loadout System
IP32029A		29MAY98	Preparation Phase Complete
IP32029B	5JUL95A	29MAY98	Preparation Phase
IP33027B		31JAN02	Production Phase Complete
IP33027C	1JUN98	31JAN02	Production Phase
IP32028A	5JUL95A	1MAY97	Consolidated Procurement/Develop IP-3.2-028
IP32028	1SEP95A		M/S IP-3.2-028 Start Engr Study Repack Line
IP32029C	3FEB97	2JUL97	Installation Design
IP32029D	1OCT97	31DEC97	Procurement
IP32029E	1JUL97	30SEP97	Site Preparation
IP32031A	1JAN98	30APR98	Procedures
IP32029		31DEC98	M/S IP-3.2-029 Complete Design & Install
P32029-1	1JAN98	31MAR98	Installation IP-3.2-029
IP32031B	1APR98	30APR98	Training
IP32030B	1JAN98	27FEB98	Readiness Assessment Scoping
IP32031C	1APR98	30APR98	Testing
5IP32030		30SEP99	M/S IP-3.2-030 Complete Operational Readiness
IP32030A	1MAY98	29MAY98	Readiness Assessment IP-3.2-030
IP32031	29OCT99		M/S IP-3.2-031 Commence Repackaging
IP32032		29SEP00	M/S IP-3.2-032 Complete Metal Packaging

Plot Date	14MAR96
Data Date	8MAR96
Project Start	15SEP93
Project Finish	1JUN06

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▭	Critical Activity
▭	Progress Bar
◇/⚑	Milestone/Flag Activity

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ACTIVITY ID	EARLY START	EARLY FINISH	
			PLUTONIUM METAL & OXIDES >50% ASSAY
			...Packaging/Loadout System
P32018-1		31MAY02	M/S IP-3.2-018 Complete All Oxide Packaging ◇
IP32027I	1JUN98	31JAN02	Canning Operations
			...Continuous Calciner
IP32033R	1SEP95A	1MAR96A	Evaluate Existing Calciners
IP32033S		1MAR96A	◇ Modification Feasibility Decision
			...Vault Modifications
J10115	1OCT96	30JUN97	IAEA Coordination/Design Criteria Development
J10111	2DEC96	30MAY97	Security Vulnerability Assessment
J10110	2JUN97	28NOV97	Design Vault Modifications
J10116	24NOV97	28NOV97	IAEA Design Review
J10117		28NOV97	◇ IAEA Design Concurrence
			......Phase 1 Construct/Install (2736-ZB)
J10125	3NOV97	2FEB98	Phase 1 (2736-ZB) Procurement
J10126	3FEB98	1JUN98	Phase 1 (2736-ZB) Construction
J10127	3FEB98	1JUN98	Phase 1 (2736-ZB) Installation
J10128		1JUN98	◇ Phase 1 (2736-ZB) Operational
			......Phase 2 Construct/Install (2736-Z Vault 2)
J10135	4JUN98	3SEP98	Phase 2 (2736-Z Vault 2) Procurement
J10136	4SEP98	24DEC98	Phase 2 (2736-Z Vault 2) Construction
J10137	4SEP98	24DEC98	Phase 2 (2736-Z Vault 2) Installation
J10138		24DEC98	◇ Phase 2 (2736-Z Vault 2) Operational
			......Phase 3 Construct/Install (2736-Z Vault 4)
J10145	25DEC98	26MAR99	Phase 3 (2736-Z Vault 4) Procurement
J10146	29MAR99	16JUL99	Phase 3 (2736-Z Vault 4) Construction
J10147	29MAR99	16JUL99	Phase 3 (2736-Z Vault 4) Installation
J10148		16JUL99	◇ Phase 3 (2736-Z Vault 4) Operational

Plot Date	14MAR96
Data Date	8MAR96
Project Start	15SEP93
Project Finish	1JUN06

Activity Bar/Early Dates
Critical Activity
Progress Bar
◇ / ▶ Milestone/Flag Activity

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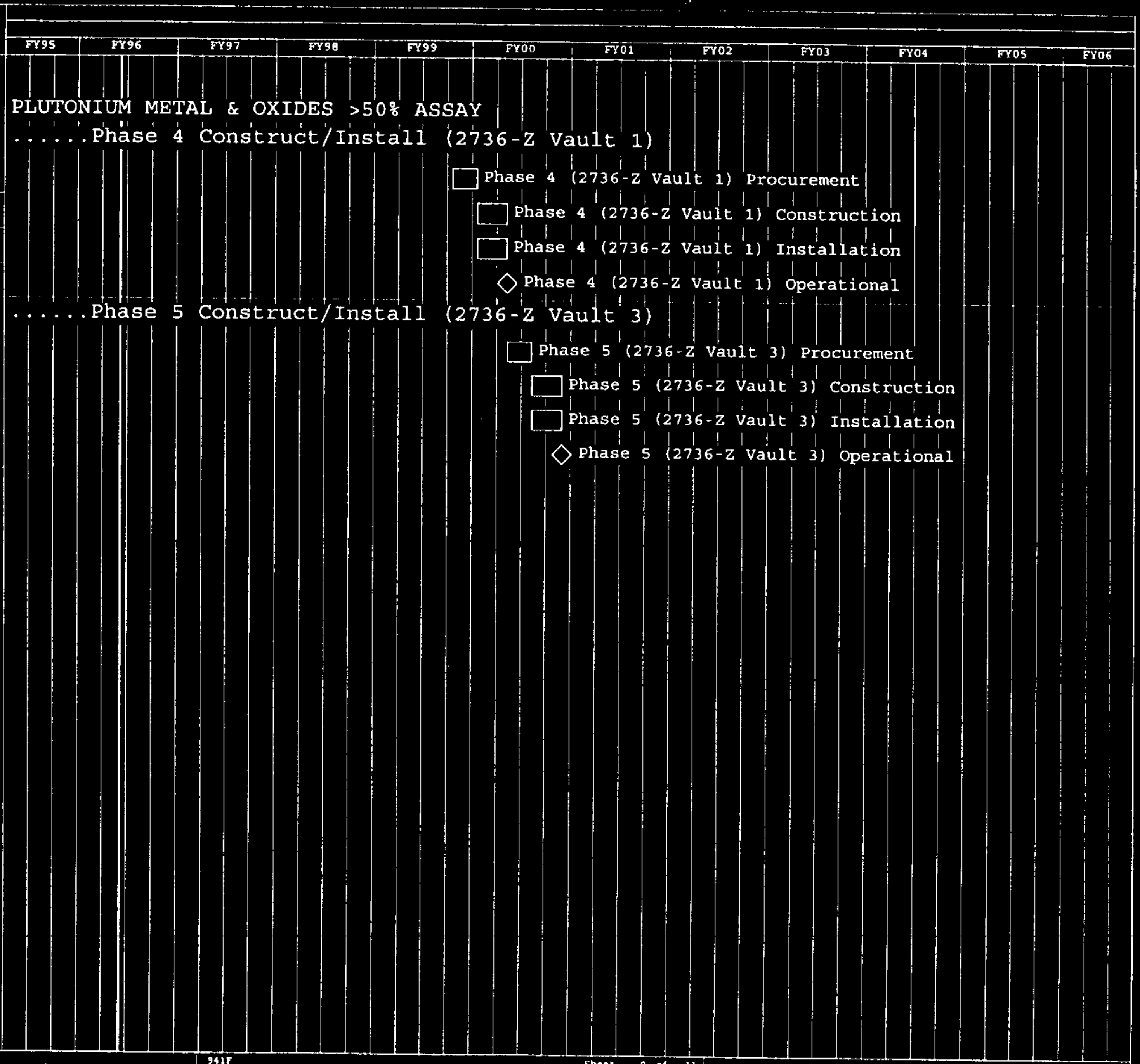
Sheet 8 of 11

Westinghouse Hanford Company
Plutonium Materials Stabilization
SISMP

Date	Revision	Checked	Approved

ACTIVITY ID	EARLY START	EARLY FINISH	
			PLUTONIUM METAL & OXIDES >50% ASSAY
			......Phase 4 Construct/Install (2736-Z Vault 1)
J10155	19JUL99	18OCT99	Phase 4 (2736-Z Vault 1) Procurement
J10156	19OCT99	7FEB00	Phase 4 (2736-Z Vault 1) Construction
J10157	19OCT99	7FEB00	Phase 4 (2736-Z Vault 1) Installation
J10158		7FEB00	Phase 4 (2736-Z Vault 1) Operational
			......Phase 5 Construct/Install (2736-Z Vault 3)
J10165	8FEB00	9MAY00	Phase 5 (2736-Z Vault 3) Procurement
J10166	10MAY00	29AUG00	Phase 5 (2736-Z Vault 3) Construction
J10167	10MAY00	29AUG00	Phase 5 (2736-Z Vault 3) Installation
J10168		29AUG00	Phase 5 (2736-Z Vault 3) Operational



Plot Date	14MAR96
Data Date	8MAR96
Project Start	15SEP93
Project Finish	1JUN06

(c) Primavera Systems, Inc.

▭ Activity Bar/Early Dates
▭ Critical Activity
▬ Progress Bar
◇ / ⚑ Milestone/Flag Activity

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Sheet 9 of 11

Westinghouse Hanford Company
Plutonium Materials Stabilization
SISMP

Date	Revision	Checked	Approved

ACTIVITY ID	EARLY START	EARLY FINISH	
			PFP COMMON ACTIVITIES
			Common Activities
B10160	1JUN94A	28JUN96	NEPA (PFP EIS)
B10170		28JUN96	M/S IP-3.1-016 Issue ROD PFP Clean-Out & Stab
B10130	1MAR95A	27OCT95A	Waste Disposal Evaluation
B10140		27OCT95A	M/S-I- Submit Request for DOE Approval
B10150	30OCT95A	11MAR96	DOE Review & Approve Waste Disposal Plan
B10155		11MAR96	M/S-I- DOE Approve Waste Disposal Plan
B10120	31MAR95A	29MAR96	Characterization Study (RL-3.1.3.4)
7B10110	1AUG95A	3JUN96	Dose Study
			...Solid Waste Operations
B10210	2OCT95A	1JUN06	
B10220	2OCT95A	1JUN06	
			...Hanford Convenience Container
C10110	1MAR96A	24MAY96	Vendor Design & Test Container Shipping
C10120	11MAR96	20MAY96	Update Documentation
C10130	6MAY96	20MAY96	Plan Site Preparation
C10140	21MAY96	24MAY96	Canner Install Site Preparation
C10160	27MAY96	28MAY96	Install Canner
C10170	29MAY96	31MAY96	Train Operators
C10180		31MAY96	Begin Using New Package
			...PFP Lab Support
H10106A		31OCT97	Preparation Phase Complete
H10106	1JUN95A	31OCT97	Preparation Phase
H10107A		31MAY04	Production Phase Complete
H10107	3NOV97	31MAY04	Production Phase
H10105	1NOV94A	31OCT97	On Going Lab Operations
H10110	1JUN95A	30NOV95A	Engineering Study

Plot Date 14MAR96
Data Date 8MAR96
Project Start 15SEP93
Project Finish 1JUN06

Activity Bar/Early Dates
Critical Activity
Progress Bar
◇/▶ Milestone/Flag Activity

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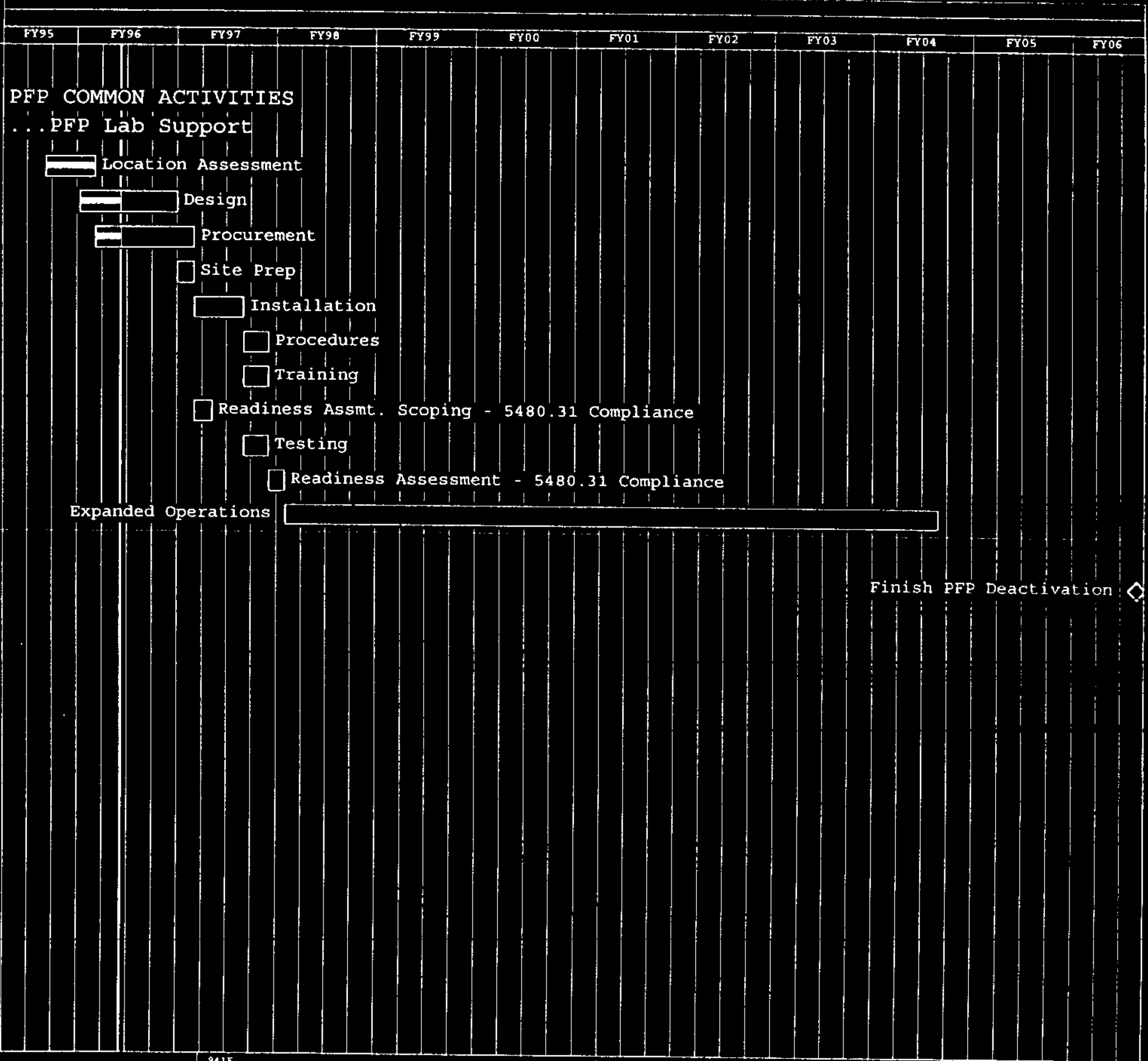
Sheet 10 of 11

Westinghouse Hanford Company
Plutonium Materials Stabilization
SISMP

Date	Revision	Checked	Approved

ACTIVITY ID	EARLY START	EARLY FINISH
H10115	7JUN95A	6DEC95A
H10116	10OCT95A	1OCT96
H10120	7DEC95A	2DEC96
H10122	1OCT96	2DEC96
H10125	3DEC96	2JUN97
H10126	3JUN97	2SEP97
H10128	3JUN97	2SEP97
H10123	3DEC96	7FEB97
H10130	3JUN97	2SEP97
H10131	3SEP97	31OCT97
H10140	3NOV97	31MAY04
Z1000		1JUN06



Plot Date	14MAR96
Data Date	8MAR96
Project Start	15SEP93
Project Finish	1JUN06

Activity Bar/Early Dates
Critical Activity
Progress Bar
◇ / ⚑ Milestone/Flag Activity

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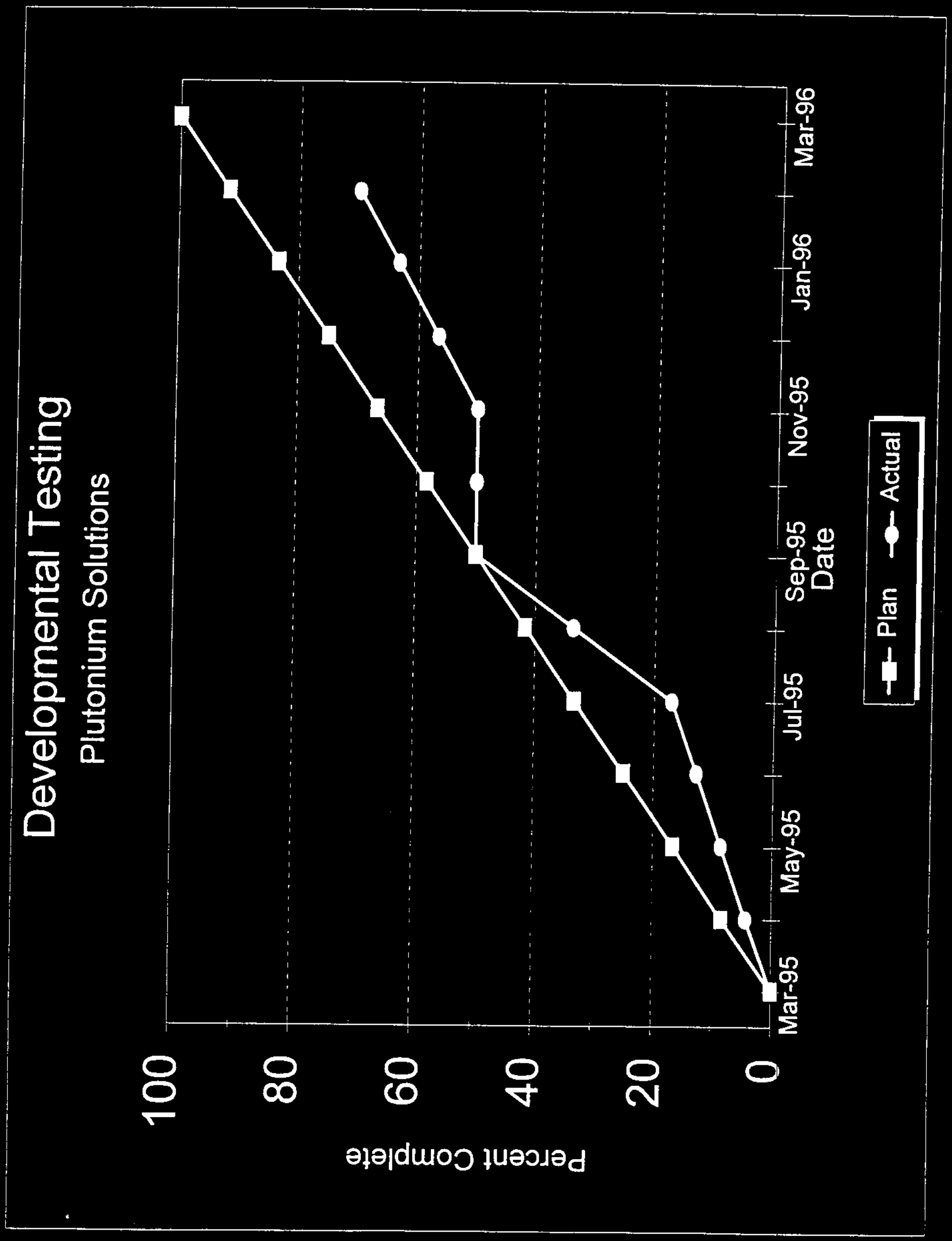
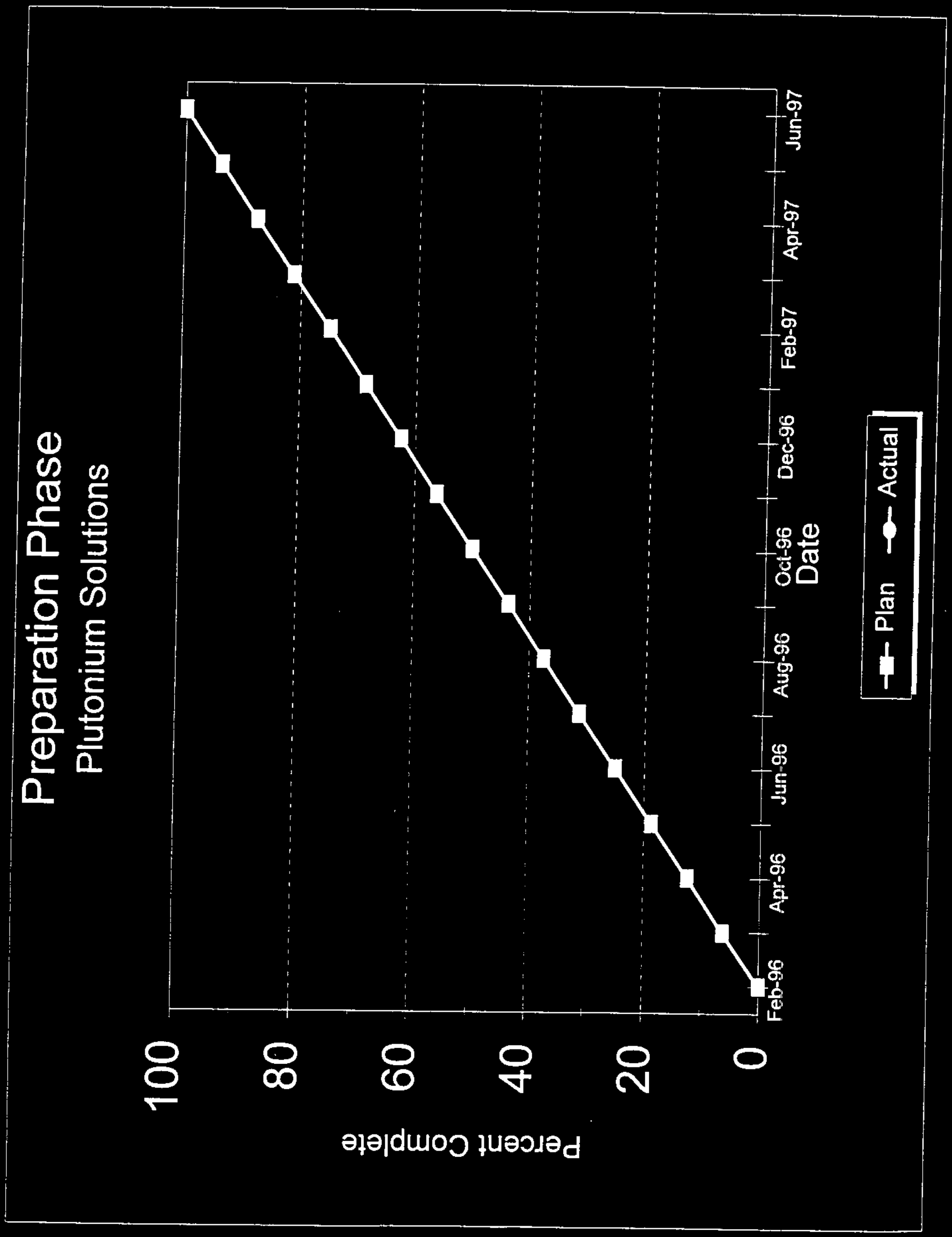
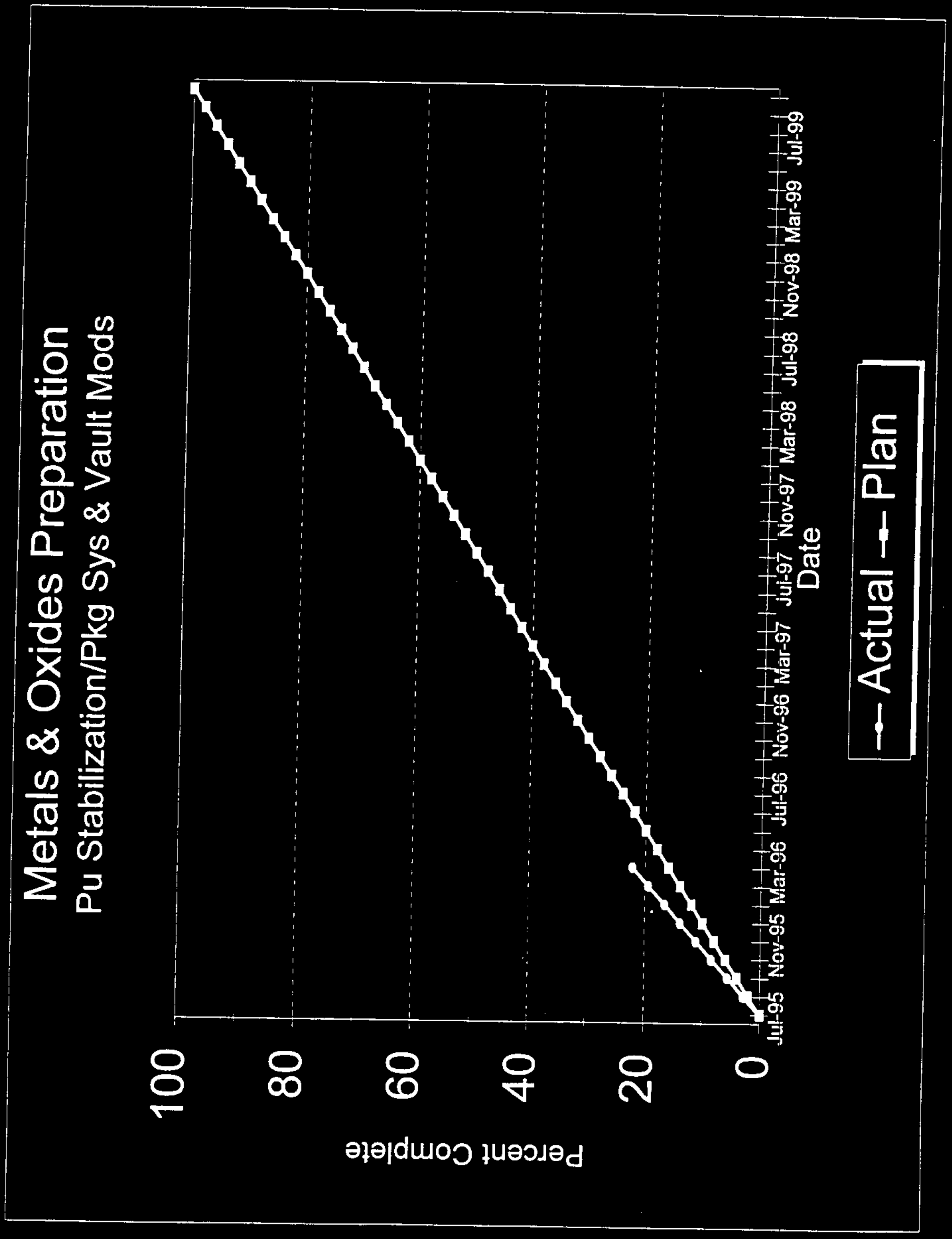
Sheet 11 of 11

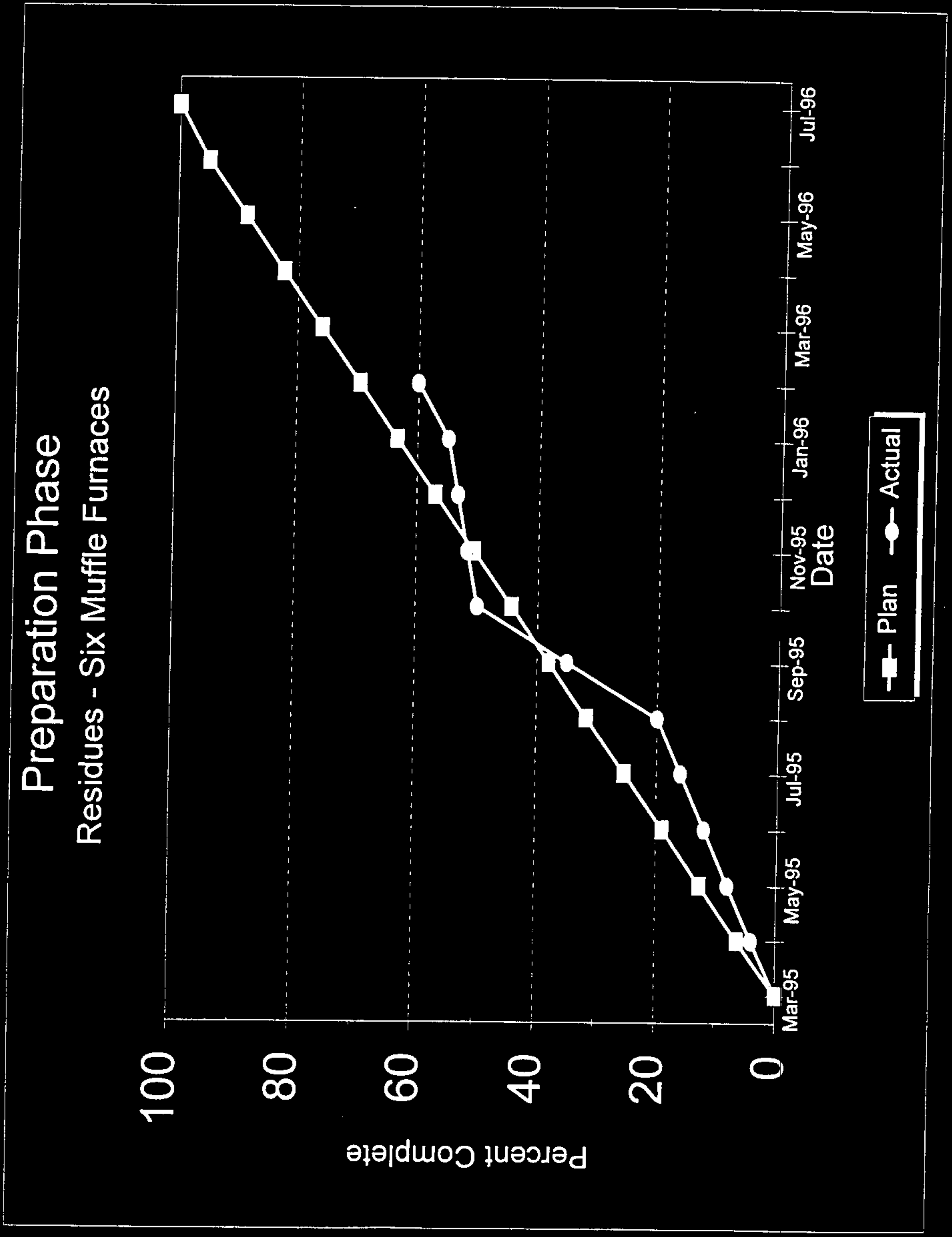
Westinghouse Hanford Company
Plutonium Materials Stabilization
SISMP

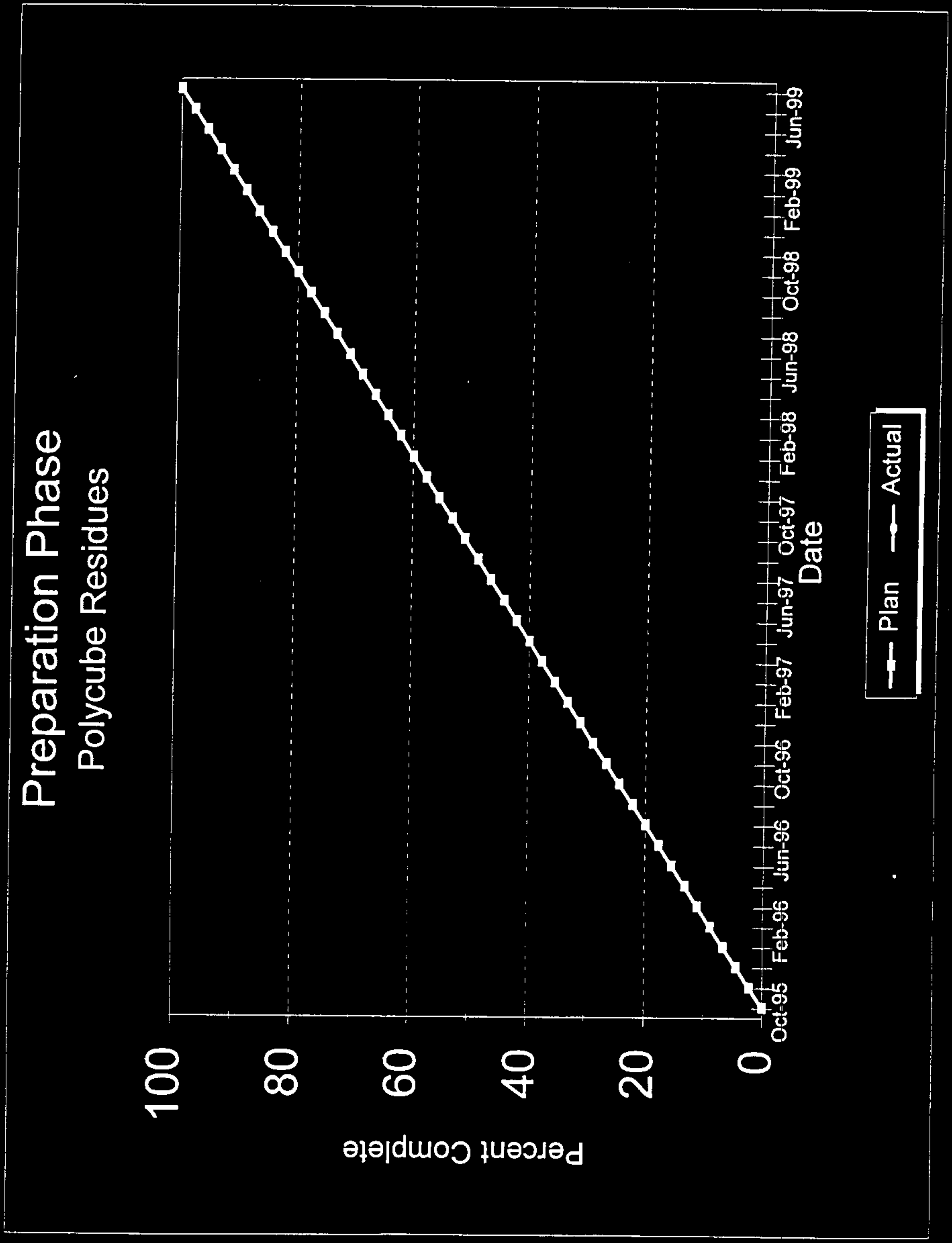
Date	Revision	Checked	Approved


Developmental Testing
Plutonium Solutions
Percent Complete
100
80
60
40
20
0
Mar-95
May-95
Jul-95
Sep-95
Nov-95
Jan-96
Mar-96
Date
Plan
Actual


Preparation Phase
Plutonium Solutions
Percent Complete
100
80
60
40
20
0
Feb-96
Apr-96
Jun-96
Aug-96
Oct-96
Dec-96
Feb-97
Apr-97
Jun-97
Date
Plan
Actual


Metals & Oxides Preparation
Pu Stabilization/Pkg Sys & Vault Mods
Percent Complete
100
80
60
40
20
0
Jul-95
Nov-95
Mar-96
Jul-96
Nov-96
Mar-97
Jul-97
Nov-97
Mar-98
Jul-98
Nov-98
Mar-99
Jul-99
Date
Actual
Plan


Preparation Phase
Residues - Six Muffle Furnaces
Percent Complete
100
80
60
40
20
0
Mar-95
May-95
Jul-95
Sep-95
Nov-95
Jan-96
Mar-96
May-96
Jul-96
Date
Plan
Actual


Preparation Phase
Polycube Residues
Percent Complete
100
80
60
40
20
0
Oct-95
Feb-96
Jun-96
Oct-96
Feb-97
Jun-97
Oct-97
Feb-98
Jun-98
Oct-98
Feb-99
Jun-99
Date
Plan
Actual

Westinghouse Hanford Company
Plutonium Materials Stabilization
(Dollars in Millions)

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	TOTAL
THERMAL TREATMENT								
RESIDUES	$ 6.2	$ 4.8	$ 3.3	$ 3.2	$ 3.2	$ 3.2	$ 1.7	$ 25.6
OXIDES	2.1	5.0	4.3	3.6	3.8	3.9	2.1	24.8
SOLUTIONS	1.2	2.2	1.5	0.8	0.0	0.0	0.0	5.7
COMBUSTIBLE RESIDUES	0.3	1.8	0.5	0.7	1.5	0.5	0.0	5.3
FACILITY CLEANOUT AND TCO	2.8	3.3	2.7	3.8	2.3	1.9	4.7	21.5
PACKAGING AND STORAGE	0.9	3.5	14.3	2.1	2.4	0.9	0.4	24.5
LABORATORY SUPPORT	1.4	1.1	1.5	1.5	1.5	1.6	1.6	10.2
PROJECT MANAGEMENT	2.2	3.1	3.2	3.3	3.4	3.6	3.7	22.5
FACILITY MODIFICATIONS/SUPPORT	3.4	2.6	N/A *	2.0	1.7	0.2	0.5	10.4
TOTAL	$ 20.5	$ 27.4	$ 31.3	$ 21.0	$ 19.8	$ 15.8	$ 14.7	$ 150.5

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