HLW-OVP-95-0031

High Level Waste Management Division

High-Level Waste System Plan Revision 5 (U)

April 26, 1995

Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29808

Prepared for the U. S. Department of Energy under contract no. DE-AC09-89SR18035

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April 27, 1995

Mr. Steven D. Richardson, Assistant Manager
High Level Waste
U. S. Department of Energy
Savannah River Operations Office
P. O. Box A
Aiken, SC 29802

Dear Mr. Richardson:

HIGH LEVEL WASTE SYSTEM PLAN, REVISION 5 (U)

Attached is the final version of the HLW System Plan, Revision 5. The reason for this revision is to align the Plan with the FY97 Five Year Plan and the current FY95 Annual Operating Plan. There are several improvements incorporated into this Plan as compared to Revision 4. Additional improvements are already in progress for Revision 6. It is anticipated that this Plan will be revised and issued again as Revision 6 after the FY96 Annual Operating Plan is finalized which is currently projected to occur in September 1995.

Questions or requests for additional information regarding this Plan should be directed to S. S. Cathey at 5-3052 or N. R. Davis at 5-1246 of my staff.

Sincerely,

C L Patjiang For
A. B. Scott, Jr.
Vice President and General Manager
High Level Waste Management Division

NRD:nrd/jbm

Att.

HLW-OVP-95-0031

High-Level Waste Management Division

High-Level Waste System Plan Revision 5 (U)

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Prepared for the U. S. Department of Energy under contract no. DE-AC09-89SR18035

HLW System Plan - Revision 5 (U)

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Executive Summary

This Revision of the High Level Waste (HLW) System Plan describes the HLW Program that can be accomplished with funding provided at the FY97 Five Year Plan (FYP) Target Level. The projected program will produce an average of 81 canisters per year, which is approximately 15% of the design capacity for the processing plants. Since there is the equivalent of 5,700 canisters of liquid waste currently stored in underground tanks at the Savannah River Site, a production rate of 81 canisters per year will complete the Waste Removal Program in FY2065. This does not meet the Federal Facilities Agreement (FFA) regulatory commitments and results in an extremely expensive life cycle cost for the program.

Regulatory Commitments

Completion of waste removal from the old-style waste tanks is part of the FFA commitment with the State of South Carolina Department of Health and Environmental Control. Per the requirements of the FFA, Savannah River submitted to the State a FFA Waste Removal Plan and Schedule in November 1993 which showed completion of waste removal from the old-style tanks in FY2028. This commitment date is still in effect. Therefore, from the State's perspective, the FY97 Five Year Plan and the related Revision 5 HLW System Plan shows a 37 year delay in completion of the waste removal program from old-style tanks.

Recent History of Funding Reductions

HLW has experienced significant funding reductions since the FY95 FYP was developed. The table below shows the funding by year and in cumulative for the five year period from FY96 to FY00. Budget reductions range from 23% to 42% in the individual funding years.

($ Millions)	FY96	FY97	FY98	FY99	FY00	Cumulative FY96- FY00	Funding Reduction
95 FYP	603	624	688	722	744	3,381	-
96 FYP	537	550	570	585	596	2,838	543
97 FYP Target	466	454	424	435	428	2,207	1,174
% Reduction	23%	27%	38%	40%	42%	35%	

Productivity Improvements

To reduce the programmatic impacts of the outyear funding reductions, an aggressive Productivity Improvement program has been in place at Savannah River since FY94. The following 23 % productivity improvement commitment has been incorporated into the FY97 FYP:

- FY94 5 % Reduction accomplished
- FY95 5 % Reduction incorporated into FY95 AOP
- FY96 10 % Reduction incorporated into FY97 FYP
- FY97 3 % Reduction incorporated into FY97 FYP

Programmatic Impacts

Based on the projected 38% to 42% funding reductions in the outyears, and even with productivity improvements incorporated, significant programmatic impacts to the HLW Waste Removal program will occur. Based on the outyear funding levels, the projected waste removal program will process an average of 81 canisters per year, which is approximately 15% of the design capacity for the processing plants. Since there is an equivalent of about 5,700 canisters of liquid high-level waste currently stored in underground tanks at Savannah River, this production rate will delay completion of the waste removal program until FY2065. This will result in waste storage tanks being in service up to 107 years with an accompanying significant increase in the risk of tank failure and environmental releases. This program will not meet the FFA regulatory commitment to complete waste removal by FY2028. The life cycle cost of this program, in FY95 constant year dollars, is $26.5 billion versus $11.3 billion for the Baseline Waste Removal Program described in Revision 4 of the HLW System Plan; an increase of $15.2 billion in life cycle costs.

Actions Required to Avoid Severe Program Impacts

To avoid the severe programmatic impacts and life cycle cost penalties described above, an estimate was developed to execute the "Baseline Program" described in Revision 4 of the HLW System Plan based on current overhead expenses and other costs. The Baseline Program is a rational HLW program with an average production rate of 231 canisters per year which is approximately 43% of the design capacity for the processing plants. This case will complete waste removal from old-style tanks in 2021 which meets the FFA regulatory commitments. The funding required to complete this program is shown below. The additional funding required above the current FY97 FYP Target Case for FY98 to FY00 is approximately $57 million per year. The implementation of this program will result in a $15 billion life cycle cost savings over the FY97 FYP Target "Current Program".

($ Millions)	Revised HLW System Plan Revision 4 "Baseline Program"	FY97 FYP HLW System Plan Revision 5 "Current Program"	Additional Funding Requirements
FY96	466	466	0
FY97	462	454	8
FY98	479	424	55
FY99	491	435	56
FY00	487	428	59
Total	2,385	2,207	178

Since it is clear that the "Baseline Program" described above is a more responsible HLW Program for Savannah River, all possible attempts should be made to maintain the "Baseline Program". In this Revision of the System Plan, Savannah River has already incorporated $1.1 Billion in cost reductions (since the Revision 4 estimate in October 1994) to the Life Cycle cost of the "Baseline Program". Savannah River is committed to continue developing more innovative techniques that could further reduce the funding requirements for this program. However, even with this aggressive cost reduction program, additional funding will be required in the outyears. It will be the combination of aggressive cost cutting with the acquisition of some additional funding that will yield a cost effective and responsible program similar to the "Baseline Program".

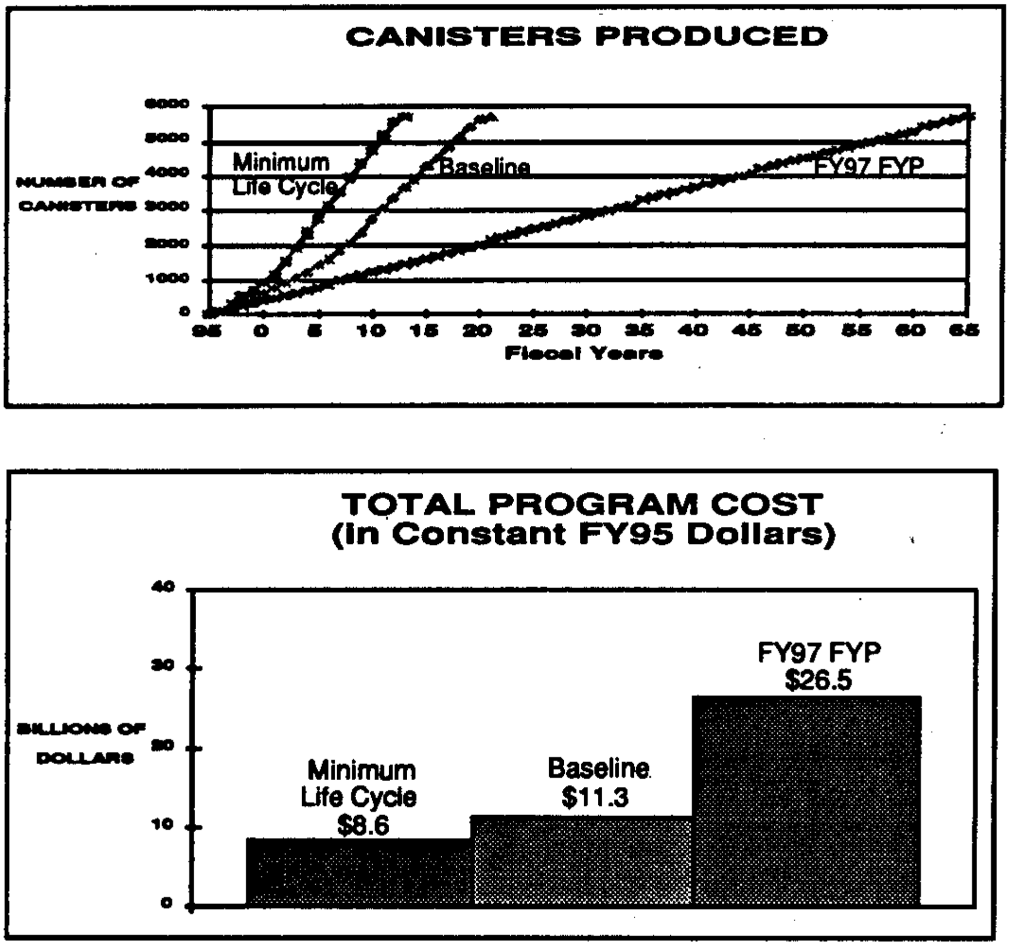
Potential Actions to Minimize Life Cycle Cost

To minimize life cycle cost, the HLW waste removal program should be completed as early as is practical. A "Minimum Life Cycle Cost Program" has been developed. This program processes an average of 340 canisters per year, which is approximately 63% of the design capacity for the processing plants. It completes waste removal from old-style tanks in FY2013, which exceeds the FFA regulatory commitments. The funding requirements to complete this program are shown below. The additional funding required above the current FY97 FYP "Current Program" for FY97 to FY00 ranges from $53 to 142 million per year. The implementation of this program will result in an $18 billion (FY95 Constant Year Dollars) life cycle cost savings over the "Current Program" that is based on the FY97 FYP Target Funding.

($ Millions)	"Minimum Life Cycle Cost Program"	FY97 FYP HLW System Plan Revision 5 "Current Program"	Additional Funding Requirements
FY96	466	466	0
FY97	507	454	53
FY98	516	424	92
FY99	546	435	111
FY00	570	428	142
Total	2,605	2,207	398

Figure 1 below illustrates the Cumulative Canisters filled over the length of the program and the Total Program Cost in both FY 95 Constant Year Dollars for each of the Cases.

FIGURE 1: CASE COMPARISONS



Summary

The High Level Waste Program that can be supported with the FY97 Five Year Plan Target Funding results in:

- HLW Program completion in FY2065;
- HLW storage tanks being in service up to 107 years;
- Significantly increased risk of tank failure and environmental releases;
- Failure to meet the existing FFA regulatory commitments; and
- $18 Billion life cycle cost penalty (vs "Minimum Life Cycle Cost Program")

Due to these severe programmatic impacts and life cycle cost penalties, all possible attempts should be made to maintain the "Baseline Program" described in Revision 4 of the HLW System Plan. This program results in:

- HLW Program completion in FY2021;
- Success in meeting the existing FFA regulatory commitments; and
- $3 Billion life cycle cost penalty (vs "Minimum Life Cycle Cost Program")

Even with planned aggressive cost reduction programs, some additional funding will be required in the outyears to achieve the "Baseline Program". It will be the combination of aggressive cost cutting with the acquisition of some additional funding that will yield a cost effective and responsible program.

State of the HLW System

In response to the reduced funding projection described above, the HLW System Plan has been modified as follows:

- most elements of scope in the Waste Removal Program have been delayed;
- HLW System attainment is limited by funding to 15% or about 81 canisters per year for the duration of the program which is now projected to be complete in FY2065; and
- the FFA Waste Removal Plan and Schedule dates will not be met

The prolonged operation of the HLW System has resulted in a higher priority for Tank Farm infrastructure preservation projects. In the past, these projects were delayed to provide funding for higher attainment operation of the HLW System. The philosophy was that the infrastructure would not be as important once the waste had been removed from the tanks.

The projected DWPF startup date remains 1/1/96. It is projected that the Tank Farm will be able to support that startup date and subsequent operation albeit at a significantly higher program risk. This Plan describes a strategy for the operation of the HLW System based on the reduced funding profile.

The 2F Evaporator operated well when it operated in FY95, however, it experienced significant downtime due to failures in the support service systems. For FY95 through 3/31/95, the evaporator gained 182,000 gallons of space vs a goal of 350,000 gallons. This serves as an example of the increased need to refurbish and preserve the Tank Farm infrastructure as described above.

The 2H Evaporator operated ahead of its FY95 goal: 677,000 gallons of space gain versus a goal of 625,000 gallons. Planning is in progress to replace the evaporator vessel in late FY95 as it has exceeded its historical operating life.

The ITP startup test program, Readiness Self Assessment and Westinghouse Operational Readiness Review have been completed. The time required to resolve the remaining technical issues has caused startup authorization to delay from 3/1/95 to 7/1/95. The later startup date plus the increased cost of the readiness reviews have combined to defer the previously planned three production batches in FY95 to FY96.

Progress on completing sludge washing in ESP Tanks 42 and 51 has been slowed by the need to support the higher priority ITP program. Plans are to replace the leaking B-1 and H slurry pumps in Tank 51 with similar pumps originally slated for Tank 40 that have been modified with improved seals, complete washing the Tank 51 sludge and then start up DWPF using Tank 51 sludge. The Tank 42 slurry pumps will be repaired or replaced, Tank 42 sludge washing completed and the Tank 42 sludge combined with Tank 51 in FY98. This was modeled and is predicted to make acceptable glass with similar waste loading to the combined Tank 42 and 51 sludge.

The Diversion Box & Pump Pit Containment project was rescoped and rebaselined due to the soil stability concerns in the H-Area Tank Farm East Hill. The original plan of using a metal building with bridge crane has been revised in favor of a tension-fabric building with a pedestal crane. Startup is projected 3/15/96.

The New Waste Transfer Facility remains on schedule for a 12/29/95 startup, which supports the 1/1/96 DWPF startup.

Design and construction of the RHLWE continues on schedule in FY95. Erection of building steel is complete and the crane has been installed. The startup date used in Revision 4 of this Plan was 5/31/01. The schedule has since been rebaselined and shows a 25 month improvement to a 4/30/99 startup.

The refurbishment and upgrade of the F to H-Area Inter Area Line facility has been scoped, scheduled and estimated with a completion date of 12/31/95.

The Waste Removal Program is projected to receive about $210 million less funding for the period of FY96 - FY01 than was used to rebaseline the program in FY94. Installation of waste removal equipment on virtually every tank has been significantly delayed.

DWPF has completed the ammonia scrubber and hydrogen mitigation modifications outage and is well into the Waste Qualification Runs program having poured 24 canisters of simulated waste glass. The schedule for radioactive startup remains 1/1/96.

The design and construction of the Late Wash Auxiliary Pump Pit modifications remains on schedule. The radioactive startup date is 5/8/96 with introduction of radioactive precipitate 8/30/96.

Additional progress has been made in the area of System Integration and Production Planning:

- Revision 0 of the System Integration Management Plan (SIMP) has been issued that describes how planning is accomplished, the resources required, and the roles and responsibilities of each HLW organization;
- regular Production Planning meetings are held bi-monthly per the SIMP;
- the Material Evaluation Board as described in the SIMP has been chartered and formed;
- a new group in the HLW Engineering department has been established to operate the various modeling tools to develop facility and System Production Plans;
- the Process Interface Document has been improved and issued as Revision 1; and
- a linear programming production model called ProdMod has been developed and is in the final stages of checkout (this model has a run time on the order of seconds and will be used to replace other, less sophisticated spreadsheet modeling)

System Planning Improvement Opportunities

WSRC is constantly improving integrated planning for the HLW System in terms of planning tools, administrative controls and scheduling. While there is a strong basis for the Integrated HLW Schedule shown in Appendix F, additional effort is needed to assess the impact of the following actions:

- Reduction in Force;
- development and implementation of cost savings initiatives such as ITP Just-in-Time, use of Tank 42 in salt service, alternate waste removal techniques, operating with reduced manpower, etc.;
- resource loaded schedules at the Department and Division level;
- long range planning in support of the FFA Waste Removal Plan and Schedule;
- planning for compliance-related activities such as Waste Certification, DOE Orders and DNFSB recommendations;
- Tanks 21, 22 and 24 for dilute waste storage and reuse;
- return of empty salt tanks to salt receipt service;
- cooling coil replacement for Tanks 29-31; and
- Waste Removal programs that require resequencing and Baseline Change Control actions due to the budget reductions.

1.0 Introduction

This Plan describes the strategy for the integrated startup and operation of the High Level Waste (HLW) System based on the most efficient allocation of available and projected resources. This Plan is revised each time that there is a major perturbation in the planning basis. This revision documents the results of the FY97 Five Year Plan (FYP) planning process. One of the goals of this planning process is to continuously improve the Plan to better serve the needs of the Department of Energy (DOE). Revision 5 of this Plan incorporates several improvements since Revision 4:

- a one page HLW System Level 1 Schedule is now included in Appendix F;
- the tabular listing of the Tank Farm Material Balance in Appendix J.4 showing influents, effluents, and available tank space has been expanded to show salt formation in each of the three evaporator systems;
- the ITP Production Plan has been revised to incorporate source term modeling to help ensure that ITP's plans are consistent with DWPF and Saltstone requirements;
- a new table, Appendix J.2 has been added to show Saltstone grout production and Saltstone Vault consumption; and
- another new table, Appendix J.6, has been added to show DWPF canister production and Glass Waste Storage Building consumption.

The planning basis for this revision is stronger than the basis for Revision 4. In-Tank Precipitation (ITP) and the Defense Waste Processing Facility (DWPF) have made significant progress and thus reduced uncertainties. The uncertainties with the ESP slurry pumps has been reduced by revising the scope of the ESP Process Verification Test to include washing Tank 51 sludge only with repairs to the Tank 42 slurry pumps slated for the two year period following DWPF startup. RHLWE, NWTF and Diversion Box & Pump Pit Containment have rebaselined schedules.

The challenge for Revision 6 of this Plan will be to develop cost savings initiatives at the Site and HLW Division levels to enable all programs to complete the essential scope at reduced cost such that more funding can be allocated to needed Tank Farm infrastructure projects and a more efficient Waste Removal Program.

2.0 Mission Statement

The mission for the High Level Waste System is to:

- safely and acceptably store existing DOE high level waste;
- support critical Site production and cleanup missions by providing tank space to receive waste;
- volume reduce, and therefore stabilize, stored high level waste by evaporation;
- pretreat high level waste for further processing and disposition;

- immobilize and dispose of low level liquid waste onsite as Saltstone grout;
- immobilize and store onsite on an interim basis the high level liquid waste as vitrified glass for ultimate disposal in a geologic repository; and
- ensure that risks to the environment and to human health and safety posed by high level waste operations are either eliminated or reduced to prescribed, acceptable levels.

This will be done using the most technically effective and cost efficient means reasonably achievable while providing appropriate opportunities for public involvement.

That part of the HLW Mission that supports other Site Missions is increasing in priority. The Defense Nuclear Facilities Safety Board (DNFSB) 94-1 document contains nine distinct recommendations. The first is as follows:

> "That an integrated program plan be formulated on a high priority basis, to convert within two to three years the materials addressed in the specific recommendations below, to forms or conditions suitable for interim storage."

The SRS plan to address this recommendation is to convert F-Canyon plutonium solutions to metal, Pu-238 and Pu-242 solutions to oxide, H-Canyon plutonium and neptunium solutions to oxide, scrap and residual materials to oxide and americium/curium solutions to glass. The waste generated from the above processing is assumed in Appendix J.4. Other sites and other countries have similar materials that could be processed at SRS due to SRS's unique processing capabilities. This very important program, in whatever form it assumes, must be supported by the HLW System, even as funding for HLW System operations is rapidly decreasing.

3.0 Purpose

The purpose of this HLW System Plan is to document the baseline for the currently planned HLW operations from the receipt of fresh waste through the operation of the DWPF and Saltstone. This document is a summary of the key planning bases, assumptions, limitations, strategy and schedules for facility operations as supported by the FY97 FYP. This Plan will also be used as a base document for developing the FY96 AOP, for adjusting individual project baselines to match projected funding, and to project the Site's ability to support the FFA Waste Removal Plan and Schedule.

4.0 High Level Waste System Description

This Plan refers to the HLW System; key facilities of which are listed below. Descriptions of the individual facilities are provided in Appendix A. The HLW System includes Tank Farm operations from receipt of fresh waste to the processing and transfer facilities required to deliver feed to and receive recycle from the DWPF, the DWPF operation, and the key supporting operations such as Saltstone and the Consolidated Incinerator Facility as shown below:

High Level Waste
- F-Area Tank Farm
- 2F Evaporator
- H-Area Tank Farm
- 1H Evaporator
- 2H Evaporator
- Replacement High Level Waste Evaporator project
- New Waste Transfer Facility project
- Waste Removal Program project
- Diversion Box & Pump Pit Containment project
- In-Tank Precipitation
- Extended Sludge Processing
- F/H Effluent Treatment Facility
- F/H Interarea Line
- planned future projects

Defense Waste
- Defense Waste Processing Facility
- Late Wash
- Saltstone
- Saltstone Vaults
- planned future projects

Solid Waste
- Consolidated Incinerator Facility

5.0 Planning Constraints

Operation of the HLW System facilities is subject to a variety of programmatic, regulatory and process constraints as described in Sections 5.1 through 5.3.

5.1 Oversight Constraints

5.1.1 HLW System Plan Administration

Some uncertainty is inherent in this Plan. Lack of actual operating experience in the new processes, as well as emergent budget issues, changes to Canyon production plans, evolution of Site Decontamination & Decommissioning (D&D) initiatives, and other factors hinder "absolute" planning. Therefore, Department of Energy Headquarters (DOE-HQ), Department of Energy Savannah River (DOE-SR) and Westinghouse Savannah River Company (WSRC) personnel are continuously evaluating the uncertainties in the Plan and incorporating changes to improve planning and scheduling confidence. WSRC refines and updates the current Plan and Integrated Schedule after each significant perturbation to the planning basis.

The HLW Steering Committee provides the highest level of oversight of the HLW System. This Committee is formally chartered and consists of members from DOE-HQ, DOE-SR, the WSRC HLW Department and the WSRC HLW System Integration Manager. The committee meets approximately every 6 weeks for a formal review of the status and plan for the HLW System. The HLW System Plan is approved by DOE-HQ, DOE-SR, and WSRC HLW.

The WSRC HLW Management (HLWM) Division Program Board provides oversight and approval of the HLW System Plan and the schedules contained therein which form the schedule and cost "baseline" for the overall program. Maintenance of this "baseline," especially with regard to technology developments and alignment with the AOP, is controlled through a formal change control process. Board approval is required before line programs take action which could have a significant impact on the Integrated Schedule. The Board is also responsible for ensuring that actions to meet program objectives are accomplished through the responsible line management. The Program Board is chaired by the HLWM Division Vice President and General Manager, and is comprised of the HLWM Division's key Level 2 line program and support department managers.

5.1.2 HLW System Integration Management Plan (SIMP)

The High Level Waste System is comprised of several inter-dependent processing facilities, each of which is subject to numerous processing constraints and requirements as it acts upon complex waste streams. Effective production planning for such a complicated system requires the use of sophisticated planning and modeling tools and the cooperation and interaction of many organizations throughout the division. The HLW SIMP describes the production planning methodology applied in the HLWM Division, including the roles and responsibilities of particular organizations, the planning, modeling, and evaluation tools used, administrative controls applied to the process, and the resulting production planning document.

Three of the key elements described in the SIMP, the Process Interface Document (PID), the various modeling tools, and the Technical Oversight Steering Team (TOST), are explained below.

5.1.3 HLW Process Interface Document (PID)

The PID presents a summary description of each HLW facility, specifically describes the interfaces between those facilities and discusses the control of the interfaces. Each interface is administratively controlled by an Interface Control Document. Changes to technical baselines for facilities within the HLW System are reviewed to determine if they could impact the interfaces described in the PID before the changes are implemented within the individual facilities. Thus, the PID is a tool for ensuring that changes to facilities within the HLW System are consistent with the overall HLW Mission.

The PID has now been issued as Revision 1. The purpose of the revision was to add a description of the HLW system functions, and show how these functions relate to facilities and processes. The methodology used to select the process interfaces has also been expanded, and a table showing the species important to each process has also been added.

5.1.4 Modeling Tools

Several computer models are used to assist production planning efforts. The oldest of these is the Chemical Process Evaluation System (CPES), a steady-state model that was originally developed as a design basis document for DWPF. The strength of this model is the size of the database it can manage. The current version of CPES tracks 180 chemical compounds in 1,300 process streams connecting over 600 unit operations. Its output consists of a complete tabular material balance for all chemical compounds in each process stream. CPES models waste processing operations in one steady-state simulation. It assumes that all of the current and future waste inventories are present and well-mixed in one large batch. The drawback to this model is that since all waste is assumed blended in one large batch, any extreme conditions associated with an individual waste tank tend to be averaged over the whole batch. This may lead to indications that all processing requirements have been satisfied, when in fact some requirements may not be met some of the time.

The HLW Integrated Flowsheet Model (HLWIFM) is a dynamic simulation that addresses the issue of variability. The HLWIFM can model waste processing, including transient characteristics, against known processing constraints, such as safety parameters, source term limits, Interface Control Documents, operation limits, regulatory permit requirements, and others. However, running a three year simulation of the complete HLW system takes several hours. The HLWIFM is currently in the "Two Year Validation Run" phase.

To expedite modeling of different production planning scenarios, the individual facility modules of the HLWIFM can be run independently. The results of these facility-specific runs are available in seconds, not hours, and will be used to optimize facility operations. They are also useful as "real time" predictive and diagnostic tools while the facility is operating. Facility-specific models have been developed for ITP, ESP, the evaporators and DWPF.

The Production Model (ProdMod) is a linear programming based model using the same software as the HLWIFM. This model tracks far fewer chemical and radiochemical compounds than the HLWIFM. Its strength is that it can run to the end of the HLW Program (clean tanks), is cost loaded, and it has a run time of about one minute. This allows planners to quickly evaluate different operating scenarios while still tracking key parameters. This will be particularly useful during AOP and FYP development and is planned to be fully operational for the FY96 AOP development.

5.1.5 Technical Oversight Steering Team

The TOST provides the necessary oversight for all technical issues within the HLW System. Each major program (Tank Farms, Waste Removal, ITP/ESP, and DWPF) has a similar technical oversight committee that identifies, defines, assigns a unique number, tracks and resolves emergent technical issues. Issues range from those that may require several years to resolve such as "how clean is clean" for waste tanks to specific issues related to a startup milestones such as the ITP CLFL issue. The TOST organizes these committees to eliminate duplication of effort, identify common issues, focus management attention where needed, improve response time, set priorities and provide general oversight as required to effectively manage issue resolution. All issues are maintained in one large database. Issues are included in the facility schedules as appropriate. Each issue has been prioritized and assigned to an appropriate manager for resolution. Closeout of an issue is initiated at the facility level, presented to the TOST and closed per the TOST chairman's direction. In the future, the TOST will also approve the production planning document developed per the SIMP guidance.

5.1.6 Waste Acceptance Criteria (WAC)

All waste transferred to the HLW Tank Farms for interim storage must be compatible with existing equipment and facilities, must remain within the safety envelope, and must meet downstream facility requirements. In the past, influent waste streams were relatively constant in composition and volume, so maintaining an informal relationship with waste generators was sufficient to manage influent waste stream impacts. As the Site mission evolves and generators change their processes, waste characteristics are expected to vary from historically steady waste compositions. More formalized control of these influent waste streams is necessary.

The document "Waste Acceptance Criteria For High Level Liquid Waste Transfers To The 241-F/H Tank Farms" defines the new criteria. The HLW WAC identifies three categories of waste - Regular Waste, Irregular Waste, and Special Waste - based upon the variability of the species in a given stream and their concentrations. Characterization and reporting requirements are defined for each category. The WAC further defines specific criteria related to corrosion prevention, prevention of accumulation of flammable/explosive species, radionuclide content, regulatory compliance, criticality safety, compatibility with the Tank Farm's Authorization Basis, and downstream facility acceptance criteria. Waste generating organizations must develop, implement and maintain a Waste Compliance Program (WCP) document in which they define their program for complying with the Tank Farm WAC. The generator's WCP is jointly approved by the generator, HLW Engineering, HLW Operations, and HLW Environmental Compliance.

5.1.7 Public Participation

New and ongoing programs in the public participation arena are described below as they apply to the Site in general and the HLW System in particular.

Citizens Advisory Board (CAB): The Citizens Advisory Board advises the Site on environmental cleanup and waste management issues. The Board is comprised of 25 culturally and geographically diverse community representatives including: five public officials, three business representatives, three academic representatives, five general public representatives (including two politically or economically disadvantaged persons), two labor representatives, two minority issues representatives, and five environmental/activist representatives. The CAB is formally chartered and meets on a regular basis. SRS has been providing information to the CAB members on current Site missions, activities and issues as well as responding to questions and requests for additional information or tours. Input from the CAB will become part of the Site's decision-making process regarding current and future Site activities.

NEPA Activities: The National Environmental Policy Act (NEPA) requires federal agencies to assess the potential environmental effects of constructing and operating new facilities or modifying existing facilities, and to obtain public input prior to making decisions on such facilities. DOE has used innovative approaches to obtain the public's input on the DWPF Supplemental Environmental Impact Statement (SEIS), the Waste Management EIS and the Integrated Nuclear Materials Management (INMM) EIS. For additional information on current NEPA activities, refer to Section 5.2, below.

Public Meetings: DOE-SR is currently planning a series of periodic public meetings to increase opportunities for information exchange between site officials and members of the public. The meeting format will be kept informal, in order to encourage open and honest communication. Meeting locations will be varied in order to reach as many communities as possible.

5.2 Regulatory Constraints

5.2.1 Safety Documentation

Facility operations are conducted within the defined boundaries of the appropriate Safety Analysis Report (SAR) or other appropriate safety documentation such as Operational Safety Requirements, Process Requirements, Technical Standards, Process Hazards Reviews, etc. The highest level safety document for each facility is listed with current status and pertinent comments in Appendix B.1.

5.2.2 Environmental Permits and Regulatory Agreements

The primary environmental permits for each facility are listed in Appendix B.2

with current status and comments. A discussion of the major regulatory agreements and associated issues follows.

Benzene Abatement Regulations: As part of normal operations at ITP and DWPF, benzene is generated and a portion is released to the atmosphere. ITP and DWPF are permitted by the SCDHEC Bureau of Air Quality Control to release no more than 22.2 tons and 29.2 tons per year, respectively. Anticipated benzene generation rates during radioactive operations are within these limits at both facilities.

Benzene, a suspected human carcinogen, is one of the listed hazardous air pollutants regulated under both federal and state statutes. Current federal regulation of hazardous air pollutants evolves from the Clean Air Act Ammendments of 1990, which are organized around various "source categories." DWPF and ITP's expected annual benzene generation rates meet the definition of a "major source." As such, DWPF and ITP will be required to implement stringent emission control standards as and when promulgated by the EPA or SCDHEC, meet complex air permitting requirements, and initiate substantial data collection and record keeping.

Five NESHAP standards have been promulgated for specific industries and emissions sources. However, none of these apply to DWPF or ITP. Although the EPA is behind in its schedule for promulgation of NESHAP regulations, no emission control standards are proposed or anticipated pertaining to benzene abatement that would be applicable to DWPF or ITP. In the unlikely event that SCDHEC attempts to establish applicable regulations, DWPF and ITP would have three years from the date of promulgation to come into compliance.

WSRC issued a report entitled "Benzene Abatement Assessment for the Defense Waste Processing Facility and the In-Tank Precipitation Facility," in December 1994 which details these regulations and proposed facility modifications. For additional information on current status of benzene abatement projects, please refer to Section 8.13.

Clean Air Act - Title V Permitting: New air emissions permitting requirements now being imposed by the EPA and SCDHEC will have a substantial impact on the Savannah River Site. Work has already begun to develop a single, site-wide air emissions permit application, which will replace the individual facility permits currently in place. The permit approval process has been modified to include far-reaching opportunities for public involvement, which will extend permit approval time from 12 months to 18-24 months. The technical content of the permit will change as well, with copious details required to describe air emissions systems and equipment. Operating facilities will be subdivided into "Emissions Units," with specific limits imposed upon each unit. Careful planning is required in determining how to define these units, since any subsequent change to any one element of one unit could necessitate making similar changes to all other elements of that unit. For example, if all 51 HLW tanks were grouped into a single emissions unit, and during the course of the permit life SRS requests permission to make ventilation system changes to any one tank, SCDHEC could require SRS to make the same change on all 51 tanks. Also, any "alternative operating scenarios" that SRS might want to implement during the permit life must also be addressed briefly in the permit application, or else a brand new permit (with its attendant 18-24 month approval time) will be required. An example of an alternate operating scenario is running DWPF in a batch mode instead of continuous operations. The new permit application is due to SCDHEC by November 1995, although this date may be relaxed by SCDHEC to February 1996.

Land Disposal Restriction - Federal Facility Compliance Agreement (LDR-FFCA): This agreement, made between DOE and the Environmental Protection Agency (EPA) Region IV, provides a period of time for DOE to implement specific commitments made regarding the generation, storage and treatment of prohibited mixed wastes at the Savannah River Site until the Site Treatment Plan becomes effective. The recent "Bridging Amendment" contains the following commitment for DWPF:

> "Perform DWPF testing, startup and waste processing activities to meet the requirements and schedules of the Waste Removal Plan and Schedule established under the Federal Facility Agreement."

This commitment currently appears as an Appendix B (Tier 2) commitment, which is legally binding but does not carry any fines or penalties for violations. In the future, regulators could opt to make this an Appendix A (Tier 1) commitment, which would carry stipulated fines and penalties for violations.

Federal Facility Agreement (FFA): The FFA was executed by DOE, EPA and the South Carolina Department of Health and Environmental Control (SCDHEC) and became effective on August 16, 1993. The FFA provides standards for secondary containment, requirements for responding to leaks and provisions for the removal from service of leaking or unsuitable HLW storage tanks. Tanks that do not meet the standards set by the FFA may be used for the continued storage of their current waste inventories, but these tanks are required to be placed on a schedule for removal from service. The "F/H Area High Level Waste Removal Plan and Schedule," submitted to Regulators on November 10, 1993, shows specific start and end dates for the removal from service of each non-compliant tank, and commits SRS to remove the last non-compliant tank from service no later than 2028. However, current outyear funding projections may preclude SRS's ability to meet some or all of these schedule commitments. The regulators were advised of this possible conflict in the 3/95 submittal of the "F/H Area High Level Waste Tank Status Report".

In the past, SRS had proposed to negotiate a one year "rolling window" of commitments. These commitments for non-compliant Tanks 1-24 would be updated based on the current year AOP. However, SCDHEC has neither approved nor disapproved of this approach as of March 1995.

Site Treatment Plan (STP): The Federal Facility Compliance Act requires the DOE to prepare plans describing the development of treatment capacities and technologies for each DOE site generating or storing mixed waste. The information contained in the plans will allow DOE, Regulatory Agencies, the States and other stakeholders to efficiently plan mixed waste treatment and disposal by considering waste volumes and treatment capacities on a national scale. A tiered approach to the development of the STP provides an opportunity for early involvement of all stakeholders regarding technical and equity issues. A Conceptual Site Treatment Plan, which includes SRS's current inventory of high level waste and the high level waste treatment system, has been prepared, and a Draft Site Treatment Plan, which explores on-site and off-site treatment options in more detail, was completed in August 1994.

The Draft Site Treatment Plan identifies DWPF as the "preferred treatment option" for treating the Savannah River Site's liquid high level waste, and includes the following commitments:

> "Completion of non-radioactive test work and approval to commence radioactive operations is planned within the second quarter of FY96;"
>
> "Operations shall commence within 12 months after the successful introduction of radioactive test materials into DWPF. Commencing operations shall mean the initial transfer of high level waste to the DWPF vitrification building;" and
>
> "Provide schedule for processing backlogged and currently generated mixed waste within 120 days after commencing operations."

Although fines and penalties for violations of these commitments have not yet been defined, WSRC expects that they will be similar to those imposed in the FFCA.

5.2.3 National Environmental Policy Act Activities

The National Environmental Policy Act requires federal agencies to assess the potential environmental impacts of constructing and operating new facilities or modifying existing facilities. DOE is currently preparing three NEPA documents that directly effect the High Level Waste System.

DWPF Supplemental Environmental Impact Statement: DOE prepared a SEIS for the DWPF. The SEIS supplements the Final Environmental Impact Statement (FEIS) that DOE issued in 1982 (DOE/EIS-0082), and evaluates whether and how to proceed with the DWPF in light of the changes in processes and facilities that have occurred since the 1982 FEIS was issued. Process modifications evaluated in the SEIS include ITP, Saltstone Processing and Disposal, Late Wash, Nitric Acid Introduction, Hydrogen Modifications, Ammonia Mitigation Modifications, the Organic Waste Storage Tank, Failed Equipment Storage Vaults, Glass Waste Storage Building #2, and alternatives for benzene treatment.

The "No Action Alternative" is to continue waste storage and evaporation, with operation of the Effluent Treatment Facility (ETF) and Saltstone only. The

"Proposed Action" is to continue construction of the DWPF as currently designed, continue process and facility modifications, complete startup testing activities and operate the DWPF and the HLW System as currently planned. "Alternative Actions" included examining other reasonable system alternatives to the DWPF, such as mitigation measures, pollution prevention efforts, and facility design modifications that could reduce the risk of operating DWPF.

A Record of Decision (ROD) for the DWPF SEIS was signed by EM-1 on March 28, 1995. The ROD stated that DOE will implement the "proposed action".

Waste Management Environmental Impact Statement (WM EIS): DOE is preparing an EIS for the Site's Waste Management facilities. The WM EIS will address the operation of the F-Area and H-Area Tank Farms, the existing evaporators, the Replacement High Level Waste Evaporator, Waste Removal, the New Waste Transfer Facility and the Effluent Treatment Facility. The WM EIS will also be coordinated with the development of the Site Treatment Plan, and will address low-level radioactive waste, high-level liquid radioactive waste, hazardous waste, mixed waste, and transuranic waste.

The "No Action Alternative" consists of continuing waste generation and waste management practices as they are today, and include completing construction of, but not operating, the Consolidated Incinerator Facility (CIF). The RHLWE can be operated under the "No Action Alternative" as this operation is virtually the same as the existing evaporators. The "Proposed Action" encompasses the "No Action Alternative" scope plus programmatic and project-level actions to enhance waste management operations over the next ten years, comply with regulatory requirements, protect human health and the environment, and support SRS missions. The "Proposed Action" also calls for considering various combinations of pollution prevention, waste minimization, treatment, storage and disposal technologies, and identification of a preferred strategy for each waste type. A "Minimum Treatment, Storage, Disposal (TSD) Alternative" would provide a lower bound on future waste volumes and waste management activities, and assumes that some waste would be shipped offsite. A "Maximum TSD Alternative" will provide an upper bound on future waste volumes and waste management activities, and assumes that some waste may be received from offsite sources as a result of the Federal Facilities Compliance Act, the Environmental Management (EM) Programmatic EIS, and the Reconfiguration Programmatic EIS. Development of the EIS is working toward a Record of Decision by 6/95.

Interim Nuclear Materials Management Environmental Impact Statement: DOE is preparing an Environmental Impact Statement for the evaluation and disposition of useful nuclear materials, given the evolving requirements for the Nation's defense programs and the need to safely manage nuclear materials until disposition decisions can be finalized (in approximately five years). This EIS will determine which nuclear materials can continue to be safely stored as they are, and which materials require near-term stabilization to help maintain the health and safety of the workers and the public and to maintain environmental quality. A number of disposition options are being evaluated, some of which could impact the HLWM Division, as some nuclear materials (H-Canyon Plutonium-239, H-

Canyon enriched uranium, Plutonium and Uranium stored in vaults, Mark-31 targets, Mark-16 and Mark-22 fuels, and other aluminum-clad fuels) solutions could be transferred directly to the Tank Farms. Many potential nuclear safety concerns would have to be resolved for the entire HLW System before such transfers would be feasible. Currently, only aluminum-clad fuels and targets are being considered for transfer to HLW as the preferred alternative. HLWM Division personnel are providing input to these and other scenarios being evaluated in the EIS. The chosen option for dispositioning of the nuclear materials will be provided in the Record of Decision, which is expected in 6/95.

<u>F Canyon Plutonium Solutions Environmental Impact Statement:</u> After publishing the Notice of Intent to prepare the INMM EIS, DOE determined that the current condition of plutonium solutions stored in F-Canyon warranted consideration of stabilization in advance of the decisions to be made for the INMM EIS. Therefore, a separate EIS was prepared to address this situation. A Record of Decision was issued 1/95. DOE will use the existing PUREX process in F-Canyon and equipment in FB-Line to convert the plutonium solutions to metal. Processing has begun.

For additional information on related NEPA activities, refer to Section 5.1, Oversight Constraints, Public Participation Activities.

5.2.4 DOE Orders and 90-2

There are two programs in place on site to address compliance with DOE Orders and industry codes and standards.

<u>DOE Order Compliance:</u> The DOE Order Compliance Program assesses each facility's status of compliance with applicable DOE Orders. Administrative compliance (Phase 1) is measured by the adequacy of programs and procedures ("evidence documents") which implement DOE Order requirements. Field compliance (Phase 2) is measured by the extent to which facility personnel execute those programs and procedures. The results of the assessments are recorded. Non-compliances are corrected or exemptions are requested.

Phase 1 Order compliance assessments have been completed at HLWM facilities in accordance with the WSRC 8B Manual, "DOE Directives Administration." A division-wide configuration management program is in place to maintain the accuracy of the references cited in the administrative assessments. Phase 2 compliance assessment results for ITP have been verified during the facility's Readiness Self Assessment (RSA) in preparation for the Operational Readiness Review (ORR). The Phase 2 assessment for DWPF is in progress during the RSA and will be completed prior to the ORR. Performance opposite DOE Order requirements is evaluated during the RSA by using the SCD-4 card program as described in the WSRC SCD-4 Manual, "Operational Readiness Functional Area Requirements". These SCD-4 cards are also the basis for continuing self-assessment at each facility.

<u>90-2 Standards/Requirements Identification Document (S/RID) Program:</u> The 90-2 Program, named for Defense Nuclear Facility Safety Board Recommendation (DNFSB) 90-2, expands upon the DOE Order Compliance Program by addressing those applicable national consensus codes and standards which are related to Environmental, Safety & Health concerns. Appropriate requirements are identified for each facility, and recorded in a Standards/Requirements Identification Document (S/RID), which is organized around the 20 functional areas to be assessed. S/RIDs have been developed and approved by EM-1 for all applicable functional areas of DWPF. The site S/RIDS will supersede the DWPF S/RIDS when they are approved and issued.

Compliance assessments are being conducted for those S/RID requirements not already covered by the DOE Order Compliance program. The additional requirements will eventually be added to the SCD-4 cards for continuing self-assessment. Non-compliances, if any, will be evaluated and prioritized for disposition prior to startup, although implementation of some requirements may be deferred until after facility startup.

5.3 Operating Constraints

5.3.1 Waste Removal Sequencing Considerations

The following generalized priorities have been used to determine the current sequencing of waste removal from the HLW tanks:

1) Maintain adequate emergency tank space per the Tank Farm SAR;
2) Control tank chemistry including radionuclide and fissile material inventory;
3) Ensure blending of processed waste to meet the ITP, Saltstone and DWPF feed criteria;
4) Enable continued operation of the evaporators;
5) Remove waste from tanks with a history of leakage;
6) Remove waste from tanks which do not meet secondary containment and leak detection requirements;
7) Provide precipitate feed to DWPF and Late Wash when Late Wash is completed;
8) Maintain an acceptable precipitate balance in ITP;
9) Support the startup and continued operation of the RHLWE;
10) Maintain continuity of radioactive waste feed to the DWPF; and
11) Remove waste from the remaining tanks.

While the principal goal of the HLW System Plan is the removal of waste from the old-style tanks, it is necessary to remove salt waste from some of the Type III Tanks to support the cleanup of the older tanks. Removal of salt waste from new tanks is required to maintain the evaporator systems on-line and to provide space as required to receive the large transfers involved with the waste removal processes and DWPF recycle. Removal of salt from Type III Tanks 41, 25, 29, 38, and 31 must receive priority to support the key volume reduction mission of the 2H, 2F and RHLWE Evaporator systems. It is the complex interdependency of the safety and process requirements of the various HLW facilities that drives the sequencing of waste removal from tanks.

5.3.2 Process Considerations

Waste Removal from Type I, II and IV Tanks: HLW at SRS is stored in carbon steel tanks. The Type I, II and IV Tanks do not have adequate secondary containment and leak detection capabilities. Type IV Tanks have no secondary containment. Several of the HLW tanks have leaked in the past. While no tanks have active leak sites and a formal tank integrity monitoring program exists, the risk to the environment will be reduced by removing the waste from these tanks. Liquid waste will be removed from the HLW storage tanks and processed through the DWPF into a solid borosilicate glass waste form contained in stainless steel canisters. ITP, ESP, Late Wash, DWPF and Saltstone are all new operations supporting the mission of processing the waste into glass.

DWPF: DWPF is the cornerstone of the waste removal program and a first-of-a-kind facility. It is currently expediting startup testing to support radioactive operation beginning 1/1/96. The remainder of the HLW System must operate as necessary to supply feed to DWPF and to process the DWPF recycle stream.

Tank Space Availability: Ensuring the availability of sufficient operating space in specific tanks at specific need dates is a key consideration in the development of an operating strategy. Process strategy, in addition to providing safe storage of waste and a feed stream to DWPF, must also generate additional tank space to serve as surge capacity. This recovered tank space results from the operation of ITP or by processing of existing dilute HLW supernate through the evaporator systems. This space gain is extremely important for the following reasons:

- to maintain the evaporator systems on-line;
- to provide space to receive the large volume waste transfers which are a by-product of ESP, Waste Removal and DWPF operations; and
- to ensure flexibility to handle unanticipated problems that could require additional tank space.

6.0 Planning Bases

6.1 Reference Date

The reference date of this Plan is March 31, 1995. Schedules, budget, manpower, milestones, cost estimates, and operational planning were current as of that date. This date is also within three days of the transmittal date of the FY97 FYP Activity Data Sheets from WSRC to DOE-SR.

6.2 Funding

The funding required to support the HLW System Plan through FY01 is shown in Appendix M by individual Activity Data Sheet (ADS). The funding is based on the following:

- FY95 AOP funding in the amount of $538 million;
- additional FY95 3161 funding in the amount of $13 million (if needed) to train personnel from other WSRC divisions that can be used to fill vacancies in the HLW Division;
- FY95 pension reduction of $13 million such that this funding can be used to fund HLW projects and programs;
- FY95 encumbrance reduction of $11.5 million such that this amount can be applied to the RHLWE Total Estimated Cost (TEC);
- projected FY96 HLW funding in the amount of $483 million per DOE guidance and the SRS reprioritization strategy;
- projected FY97 - FY01 funding using the DOE-HQ prescribed Site EM funding projection and the SRS reprioritization strategy; and
- a 3% escalation of the FY01 projected budget for FY02 and beyond

Evaluations are in progress to develop and implement cost reduction initiatives which will recover as much of the Revision 4 scope and schedule as possible.

The total funding available to the HLW System is greatly reduced from the funding shown in Revision 4 of this Plan. The total reduction over the five year planning period is $522 million dollars, as shown below:

HLW System Plan	96	97	98	99	00	01
Revision 4	494.2	509.0	524.2	540.0	556.2	572.9
Revision 5	483.5	466.1	427.1	437.8	431.6	428.0
Delta	-10.7	-42.9	-97.1	-102.2	-124.6	-144.9
Cumulative Delta		-53.6	-150.7	-252.9	-377.5	-522.4

The available funding is allocated to the various HLW programs as shown in Appendix M. Some of the budget reduction was offset by reduced overhead costs and productivity improvements. The remainder of the reduction was absorbed in three areas: reduced HLW System attainment, an extension of the Waste Removal project and manpower. A quick reference funding table for Waste Removal is shown below. Manpower is discussed in Section 6.3.

The projected funding for the Waste Removal Program is less than the funding used to rebaseline this project in mid-1994 and is therefore less than the funding required to achieve the schedules shown in the project baseline. The shortfall (in millions of dollars) is shown below.

Waste Removal	FY96	97	98	99	00	01
WRP Baseline	52.4	56.6	60.0	48.0	43.8	45.1
FY96 & FY97 FYP	26.0	27.8	7.2	10.0	10.3	10.6
Delta	-26.4	-28.8	-52.8	-38.0	-33.5	-34.5
Cumulative Delta		-55.2	-108.0	-146.0	-179.5	-214.0

The funding levels used to develop Revision 4 of this Plan were about $100 million less than the baseline but more than the funding used to develop the FFA Waste Removal Plan and Schedule. The funding shown above is $214 million less than the baseline and is now less than the assumptions used for the FFA Waste Removal Plan and Schedule.

Another key factor is that Revision 4 of this Plan showed Waste Removal funding in FY01 of about $47 million. This value was escalated 3% per year thereafter. This Revision shows FY01 funding at about $10 million which, when escalated thereafter, never gets the Waste Removal program "healthy" as in Revision 4. At this funding rate, the Waste Removal Program can turn over one tank for waste removal operations every 15 months. The last tank turnover is in FY55.

Revision 4 of this Plan clearly stated that additional funding cuts similar to those experienced during the FY95 AOP development would result in the need to renegotiate the FFA Waste Removal Plan and Schedule. The recent FY97 FYP funding cuts were about twice the amount of the FY95 AOP cuts. To the positive, these funding cuts have resulted in reduced Site and Area Support expenses to the HLW Division thus enabling more of the remaining funds to be allocated to project work such as Waste Removal. This benefit has been incorporated into this Plan, however, it was not enough to offset all of the funding cuts.

6.3 Manpower

Projected HLWM Division manpower levels for FY95-01 are shown in Appendix K and include operations, maintenance, program management, engineering and Quality Assurance staffing. Support group manpower is not shown, however, it is available in the FY95 AOP and FY97 FYP. The values are in Full Time Equivalents (FTEs) which is the weighted average manpower level during the year (e.g., if the year is started with 0 and 1 person is hired per month, then the average manpower for the year (i.e., FTEs) would be 6.5). The manpower is listed by Activity Data Sheet (ADS).

FY95 is planned to be the peak manpower year for the HLW System. This is due to the ITP startup, the final preparations for the FY96 startups of DWPF, New

Waste Transfer Facility (NWTF) and Late Wash. Manpower will be reduced in ITP, NWTF, Late Wash and DWPF after those facilities are started up. The reduction is planned to be about 280 FTE's from FY95 to FY96. Overall; manpower is reduced by about 600 FTE's from FY95 to FY01. Similar reductions occur in support groups such as SRTC, ESH&QA and E&SCD.

Manpower is reduced in all facilites from FY95 to FY01 even though some take on new missions. An example is the H Tank Farm which adds the NWTF, RHLWE, 2H Control Room and Waste Removal operations yet reduces manpower. This is clearly shown in Appendix K.

6.4 Key Milestones and Integrated Schedule

Key milestones relate to the processes required to safely remove radioactive waste from storage and process it into canisters of glass or into Saltstone. The key milestones shown below are supported by the budget as described in Section 6.2 and Appendix M. New key milestones have been added to this revision as many of the original key milestones have been accomplished. A complete listing of HLW milestones is shown in Appendix H.

Key Milestone	rev. 2	rev. 3	rev. 4	rev. 5
• Start ESP Process Verification Test	*7/93*			
• Restart 1H Evaporator	*12/93*			
• Restart 2F Evaporator	3/94	*3/94*		
• Restart 2H Evaporator	4/94	*4/94*		
• Complete Late Wash Bypass	7/94	7/94	*7/94*	
• Start up In-Tank Precipitation	12/94	12/94	3/95	*7/95
• Start up New Waste Transfer Facility	10/95	11/95	11/95	11/95
• DWPF Radioactive Operations	12/95	12/95	12/95	12/95
• Start up Consolidated Incinerator Facility	1/96	2/96	2/96	2/96
• Start up Late Wash	12/95	3/96	6/96	6/96
• Precipitate ready to feed Late Wash	2/96	2/96	8/96	8/96
• Tank 25 ready for salt removal (2nd ITP)	10/96	10/96	6/96	3/97
• Start up RHLWE	11/97	11/97	5/01	4/99
• Tank 29 ready for salt removal (3rd ITP)	3/96	6/96	9/98	7/99
• H-Area control room consolidation		7/98	7/00	7/00
• Tank 8 ready for sludge removal (batch#2)	12/98	12/98	2/01	2/01
• Tank 38 ready for salt removal (4th ITP)	12/97	8/98	5/00	**5/04
• Tank 11 ready for sludge removal (batch#2)	6/99	6/99	11/02	9/05
• Tank 31 ready for salt removal (5th ITP)	6/97	5/97	5/01	**8/06
• Tank 15 ready for sludge removal (batch#2)	6/98	6/98	7/02	**9/06
• Sludge batch#2 ready to feed	11/01	11/01	11/04	3/10
• Sludge batch#3 ready to feed	7/05	7/05	7/08	11/19

italics = actual
* indicates receipt of startup authorization; chemical addition will be 10/1/95
** indicates current need date, confirmation of schedule pending

A detailed discussion of each startup, restart or operations milestone is provided in summary fashion in Section 8.2 and in detail in Sections 8.4 through 8.12. The Integrated Schedules are shown in Appendix F.

6.5 Long Range Planning and Site Infrastructure

SRS is now an EM Site. This change has actually had a positive impact to the HLW Mission. The HLW share of the SRS EM budget increased versus the DOE-HQ allocation as a result of the SRS prioritization exercise.

In this Plan, it is assumed that the Site will continue to provide the necessary infrastructure to support the HLW Mission through completion of that mission, such as:

- maintenance of roads and bridges;
- services such as electrical power, steam, well and drinking water;
- analytical capability;
- pilot and semi-works facilities as needed or required;
- design and construction services;
- spare parts and stores;
- environmental, quality assurance and safety support; and
- sanitary, hazardous, mixed and radioactive waste storage and disposal

The Site Long Range Planning function is integrated into HLW planning in two ways: 1) the Site Long Range Planning Manager is a standing member of the HLW Steering Committee, and 2) the HLW Integration Manager is a member of the Site Long Range Planning Committee.

The waste generation rates used in the Plan were provided by the Nuclear Materials Processing Division equivalent of the HLW System Integration Manager expressly for the development of this Plan. Planned F-Canyon operations are documented in NMP-EPA-95-0028, dated 3/2/95. The F-Canyon will continue to run on the caustic flowsheet until 6/95 when acid flowsheet operations will resume. Several small campaigns are planned to de-inventory the Canyon by 12/02.

Planned H-Canyon operations are documented in NMP-EHA-95-0055 dated 4/11/95. The H-Canyon will complete the Cassini mission 6/95. A series of smaller campaigns (Post-Cassini, Pu-242, Enriched Uranium Blend, MK 16/22 Tubes, Offsite Spent Fuel, Pu-239 Solutions & Residues to Oxide, Np-237 Solutions to Oxide) will continue through 12/02. For a historical perspective, HLW generation is shown from Site startup in 1954 to the present in Appendix I, "Summary of Waste Receipts".

There are other streams that may be sent to the Tank Farm which are being proposed or evaluated such as unevaporated 211-F waste water after the Canyons are shut down. These streams are listed as issues in Appendix G.

Significant shifts of Site overhead and responsibility for Site infrastructure were estimated and incorporated into outyear plans and therefore in this Plan. Future revisions of this Plan will incorporate Site overhead and infrastructure planning as it is developed.

7.0 Key Issues and Assumptions

Key issues effecting the HLW System are listed below. Programmatic Issues relate to cost and schedule but require no new technology development. Technical Issues are those issues that require some form of technical resolution or technology development and may or may not have schedule and funding impacts. Each issue is tied to an assumption and potential contingency actions. A complete list of issues is shown in Appendix G.

7.1 Key Programmatic Issues

Programmatic issues are those where corrective actions have been identified, but there may be insufficient time, manpower or funding to implement the corrective actions. Key Programmatic Issues are shown below. Additional programmatic issues and uncertainties are described in Appendix G.1.

- **Waste Removal FFA Plan and Schedule**

  Issue: The once conservative funding assumptions used to build the FFA Waste Removal Plan and Schedule are no longer conservative. There is only one tank, Tank 8, that is projected to meet its regulatory date. Eight other tanks can be completed before the last date referenced in the FFA (FY2028), however, none of these tanks will meet their individual dates.

  Assumption: The regulatory dates for each tank can be renegotiated with SCDHEC, or, a combination of SRS cost savings and funding increases will enable the FFA dates to be met.

  Contingency: Obtain additional funding, develop and implement cost reductions, or renegotiate.

- **Funding for the HLW System**

  Issue: Optimistic outyear funding expectations for the HLW System used in past Five Year Plans have historically eroded such that actual funding available for the AOP following the FYP is significantly less than expected. Over $1.1 billion of projected funding has been removed from the HLW Program from the FY95 FYP to the FY97 FYP (illustrated by comparing Revision 1 to Revision 5 of this Plan). Current funding levels for the

HLW System do not include any contingency for emergent work, although emergent work items are sure to occur. Emergent work takes the form of hardware, documentation and implementing or supporting new programs.

Assumption: Funds for emergent work items or new scope will be made available by cost reduction initiatives, deferring other currently funded scope thus slowing down the HLW Program, or by reprogramming funds made available from cost savings initiatives.

Contingency: WSRC HLWM Division personnel will maintain close communication with DOE-SR regarding budget status, emergent work issues, and availability of funds from cost savings initiatives.

- **FY96 Reduction In Force (RIF)**

Issue: Projected budget reductions and loss of key personnel are expected to adversely impact HLW System facility startup schedules. The RIF has already resulted in operator "pipelines" drying up such that trained operators will not be available when needed to fill vacancies due to attrition, promotion, etc.

Assumptions: The upcoming FY96 RIF will not leave SRS with a skill mix problem or result in significant reassignment of the existing trained workforce in any HLW facility. Overtime can compensate for vacancies until trained workers are available.

Contingency: Delay startup schedules and/or programs that generate waste.

- **Lack of Contingency**

Issue: This Plan, parts of the FFA Waste Removal Plan and Schedule, and most of the planned facility startups have no funding or schedule contingency. Commercial nuclear and chemical industry history is quite clear on the need for contingency in all planning activities; particularly in the "first-of-a-kind" type of facilities described in this Plan. An argument could be made that a plan with no contingency is pre-destined for cost overruns and schedule delays.

Assumption: Funds for emergent work items or new scope will be made available by cost reduction initiatives.

Contingency: If the assumption above proves to be incorrect, then contingency actions could include: slowing down the HLW

Program by deferring other work, not supporting Canyon programs or obtaining additional funding from other programs.

- **Age of HLW Facilities**

Issue: Many HLW facilities constructed from the early 1950's to the late 1970's are continuing to show signs of age. The Tanks 1-8 transfer line encasement in F-Area has failed in one place and is leaking in several others. Groundwater intrusion into Tanks 19 and 20 has been observed. Routine repairs to service systems in the F and H-Area Tank Farms have escalated into weeks of unplanned downtime due to the poor condition of the service piping and obsolete instrumentation. The aging problem is compounded by reduced budgets that extend the duration of the HLW Program to the point where single-walled tanks are now projected to be in service for more than 100 years. Aging facilities may cause excessive unplanned downtime, addition of unplanned scope to existing projects or the need for new Line Item projects to ensure that the Tank Farm infrastructure will be able to support the HLW Program. It should be noted that the Tank Farm can't be "shut down" as it contains over 30 million gallons of highly readioactive, highly mobile liquid waste.

Assumption: The H-Area encasement will not fail, the H-Area Type IV Tanks will not leak or fail, there can be sufficient funding allocated to plant life extension of the Tank Farms, and planned Line Item projects in FY96, 99 and 00 will remain on schedule to help refurbish and preserve the Tank Farm infrastructure.

Contingency: Accept a slowdown of the HLW Program and increased life cycle costs due to the degraded condition of the Tank Farm infrastructure, accept increased environmental risks as tanks age, slow down the HLW Program to reallocate funding to support infrastructure, or obtain additional funding.

- **Life Cycle Cost of Operating the HLW System**

Issue: Nearly one billion dollars of projected funding has been removed from the HLW Program in the last two years. In order to balance these reductions, the duration of the HLW Program has been extended. The funding required to keep the HLW facilities operational for the additional years amounts to billions of dollars in increased Life Cycle Costs.

Assumption: The assumption is that nothing can be done in the near term to improve this situation and that government agencies and the public will accept the increased Life Cycle Costs.

Contingency: An Addendum to this Plan (Appendix Q) describes alternative funding cases and the impacts of the alternate funding cases. Additional funding and cost reduction initiatives can significantly improve Life Cycle Costs.

- **Plans to Avoid Saltbound Condition in Tank Farm Evaporators**

Issue: The 2F Evaporator has seven salt receipt tanks, six of which are full. The 2H Evaporator has two salt receipt tanks with about one quarter of one tank of space remaining. The RHLWE will have one salt receipt tank when it starts up. The 2H Evaporator system is of greatest concern because of the small amount of salt space remaining and because the 2H Evaporator is needed to evaporate the future DWPF recycle stream. In this Plan, five years of downtime are projected for the 2H Evaporator due to the saltbound condition. Also, it is difficult to measure the actual volume of saltcake in a tank due to the way the salt forms. The only planned method to remove salt depends on the startup of ITP which is experiencing delays.

Assumption: Tank 38, in the 2H Evaporator system, does not contain more than the estimated amount of salt. ITP will receive startup authorization 7/1/95, start the first production batch 10/1/95, and execute the ITP Production Plan as shown in Appendix J.1.

Contingency: Slow down the HLW Program to achieve near term cost reductions, slow down planned Canyon programs or delay startup of the DWPF until the Tank Farm is in a better position to support it.

- **Environmental Impact Statements**

Issue: The DWPF SEIS, the Waste Management EIS, the Interim Nuclear Materials Management EIS and the Plutonium Solutions Disposition EIS as discussed in Section 5 could have significant impact on the startup schedules for ITP, Late Wash, and DWPF as well as the decision to select the existing technology or process for each step in the HLW System. All of these EISs are on very tight schedules for development, approval and publication of the Record of Decision. Startups could be delayed if the EISs are delayed, or if the Records of Decision include recommended actions which are different from what is currently assumed in the HLW Mission. An ROD of "No Action" could result in an indefinite delay in the execution of the HLW Mission while alternative actions are being developed; therefore leading to an increase in life cycle cost to complete the HLW Mission.

Assumption: Records of Decision will support current HLW System plans, and will be published in a timely manner; startup and operations schedules will not be adversely impacted.

Contingency: The contingency is to accept the ROD of "No Action", regroup and develop a new plan. This would be a complete change to the HLW System Plan.

- **Analytical Laboratory Capacity**

Issue: The startup of ITP, ESP, Waste Removal, DWPF and Late Wash will increase the analytical burden on the Site laboratories. The attainment of each facility in the HLW System is dependent upon the timely turnaround of sample results. Analytical results are required to confirm that some processing steps have been satisfactorily completed before proceeding to the next step. Future analytical needs for the HLW System may exceed the laboratory capabilities.

Assumption: Minimum analytical needs can be identified and appropriately scheduled and accommodated by onsite facilities such that HLW System attainment will not be adversely impacted.

Contingency: Alternative analytical methods which can decrease turnaround time are being evaluated as substitutions for previously planned, longer turnaround methods. Also, the Analytical Support and Methodology TOST Team is comparing projected analytical needs against current Site capabilities, and will facilitate changes in sample schedules or recommend improvements in Site resources as appropriate.

- **Funding for Cost Savings Initiatives**

Issue: The "inexpensive to implement" cost savings have been incorporated into this Plan. Other cost savings ideas require some amount of up-front investment to develop and incorporate the cost saving idea to eventually realize the savings. This "seed money" is not readily available and can only be obtained by deferring other activities.

Assumption: SRS will continue to develop cost savings ideas at a rate similar to FY95. Cost saved will equal emergent work such that other activities will not be deferred.

Contingency: The HLW System operation can be slowed down or the waste generating programs can be slowed down.

- **Availability of Direct Support**

Issue: The RIF has potentially resulted in several support divisions with manpower levels that are potentially insufficient to support the program described in this Plan. Areas of concern are SRTC and E&CSD. Evaluations are in progress determine support needs accross the Site to assess the magnitude of this issue. A related issue is the ability of the supporting divisions to staff up to meet HLW needs if some of the funding cuts are restored.

Assumption: HLW will obtain the necessary support at the expense of other programs.

Contingency: The HLW System operation can be slowed down or the waste generating programs can be slowed down.

7.2 Key Technical Issues

Technical issues are primarily emergent issues that were identified during startup testing. The bulk of the known technical uncertainties relate to the operation of the DWPF and ITP processes. There are a few issues concerning the interaction between facilities such as the ability to meet the downstream facilities' feed specifications. Key technical issues are listed below. These issues are described in Appendix G.2.

- **ITP Composite Lower Flammability Limit (CLFL)**

Issue: The ITP SAR requires that the time to reach CLFL be maintained greater than three days in the event that normal tank ventilation is lost. Analysis shows that up to three days may be required to place backup Emergency Purge Ventilation Exhausters on line to ventilate the tanks. The current ITP safety basis is built upon safety analyses made with lumped parameter models describing a well-mixed vapor space. Additional analytical studies and field tests are needed to confirm that the "well mixed vapor space" assumption is valid.

Assumptions: A program is in place which is expected to confirm the adequacy of the "well-mixed vapor space" assumption by using three-dimensional Computational Fluid Dynamics models, laboratory testing and in-plant testing.

Contingency: Initial ITP operating parameters will be limited to control benzene generation rates to levels at which molecular diffusion is known to be adequate to maintain benzene concentrations below CLFL levels.

- **Resolution of DWPF Technical Safety Issues**

Issue: Recent safety studies for the DWPF re-evaluated accident scenarios resulting in revised consequences which the current facility design did not adequately address. Upgrading existing systems to a higher safety classification is required. Facility modifications to achieve equivalent safety classification (to the degree appropriate for a backfit situation), along with additional administrative controls, are being implemented. Facility modifications have been proposed for the process vessel purge/inerting systems, the Zone 1 ventilation system and its supporting systems, the vitrification building effluent monitoring system, and select chemical storage tanks, to ensure that on-site and off-site personnel will be adequately protected from exposure to radiological and non-radiological materials in the event of a Design Basis Earthquake. DWPF personnel have presented their plans to the DNFSB and DOE's Office of Nuclear Safety, with favorable responses from both groups. Design and construction activities are proceeding in support of a 1/1/96 DWPF startup.

Assumption: Work can be completed without impacting the DWPF startup schedule, and the "equivalent safety class" modifications with compensatory actions are adequate as proposed.

Contingency: If the proposed actions and compensatory actions are not acceptable, then the DWPF startup plan will be rebaselined and the delay to startup minimized to the extent possible.

- **Sludge Suspension in ESP Tank 42**

Issue: Preliminary data from the ESP Process Verification Test indicate that the existing pumps in Tank 42 will not be able to suspend all of the sludge in the tank. This can effect washing, aluminum dissolution, and the size of the batch. If the sludge was not adequately suspended in the 1983 ESP demonstration, then additional aluminum dissolution could be required. A significant rework in Tank 42 is not scheduled or budgeted at this time.

Assumption: Plans to replace the pumps in Tank 42 with higher capacity pumps will be developed and implemented such that "sludge batch #1b" can be combined with Tank 51 sludge in FY98.

Contingency: Operate Tank 42 as is and process as much of the sludge as possible.

8.0 Integrated Production Plan

8.1 General

The overall HLW System attainment is now projected to be 15% with program completion in FY2065. Almost all of the FFA Waste Removal Plan and Schedule commitments are projected to be missed. Additional funding coupled with further development and implementation of cost savings initiatives could recover most of the Revision 4 schedule.

The ITP startup effort is progressing towards a 7/1/95 startup authorization with a first chemical strike in 10/1/95. ESP is preparing to replace two slurry pumps in Tank 51 and having the Tank 51 sludge washed and ready to feed to DWPF by 12/29/95. The NWTF schedule is slightly behind but is projected to be able to support the 1/1/96 DWPF startup. The F to H-Area Inter-Area Line upgrades have been scoped, estimated, scheduled and are in progress. The RHLWE project startup schedule has been rebaselined to 4/30/99. The Diversion Box & Pump Pit Containment project has dedicated staff asigned and a recently rebaselined scope and schedule. The Waste Removal Program continues to generate quality schedules with each new funding scenario. Late Wash is proceeding on schedule for a 5/8/96 startup. The DWPF startup schedule remains unchanged at 1/1/96. Other schedules are based on demand dates such as Tank 41 Return to Salt Service and Tank 42 slurry pump replacement. Overall, the facility-level planning bases are stronger for Revision 5 than Revision 4 of this Plan.

The major unknowns in this Plan occur at the HLW System level. There has not been adequate time to incorporate the full magnitude of the budget cuts into this Plan. Several cost reduction alternatives are being evaluated that could improve the outcome of this Plan, however, the alternatives were not sufficiently developed at the time of this Plan to take credit for them.

8.2 Operational Plan Summary

This section is a brief summary of the remainder of Section 8. Additional detail is provided in Sections 8.3 through 8.12.

The 1H Evaporator was restarted 12/93 and operated until 3/94 when it was shut down due to a failed tube bundle. Delays in the F and H Canyon restarts result in a diminished need for the 1H Evaporator and this evaporator will remain down. Cleanout of the evaporator system remains to be completed.

2F Evaporator space gain in FY95 has been below goal due to several problems with support service systems. The shorfall is recoverable.

2H Evaporator FY95 space gain is well ahead of goal. 2H is planned to go down in 4/95 for a two month outage to replace the feed pump and to perform all other preventive/corrective maintenance activities. Operations will then resume until 9/95 when it will go down for a second two month outage to replace the evaporator vessel which is nearing the end of its life expectancy.

ESP Sludge Batch #1 has been divided into two smaller batches: #1a and #1b. Sludge Batch #1a consists of the sludge in Tank 51. The two failed slurry pumps in Tank 51 will be replaced, two washes completed, and washed sludge will be available for feed to DWPF by 12/29/95. The Tank 42 sludge will be blended in later in FY98.

ITP is planned to attain startup authorization 7/1/95. The first chemical addition is planned for 10/1/95. Washed precipitate for feed to Late Wash is projected to be available 8/30/96.

The NWTF schedule has been rebaselined and shows startup occurring 12/29/95. This supports the planned 1/1/96 DWPF startup but not the DWPF Mercury Runs. The recycle from the Mercury Runs will be processed in the ETF or stored for future salt dissolution water.

DWPF is currently performing Waste Qualification Runs and a total of 24 canisters of simulated waste glass have been poured. The startup schedule remains 1/1/96.

Late Wash is progressing towards a 5/8/96 startup authorization with precipitate feed available 8/30/96.

8.3 HLW System Material Balance

The Tank Farm Material Balance is the key planning tool used to develop this Plan. The balance between influents to the Tank Farm and effluents to DWPF and ETF is critical during the next ten years due to the lack of space in the Tank Farm. The lack of tank space impacts the ability to receive influents from Separations and DWPF and to store salt concentrate from the Evaporators. A review of the forecasted influents and effluents and their impact on the HLW System is provided below. This is also listed in tabular and graphic form in Appendix J.4.

Working Inventory of Tank Space

Influents and effluents are listed only as they impact the Type III Tanks that are used to store and evaporate HLW, herein referred to as the "working inventory" of tank space. The old-style tanks are not considered part of the working inventory because the Tank Farm Wastewater Operating Permit does not allow fresh waste to be added to old-style tanks. ITP Tanks 48-50 and ESP Tanks 40, 42 and 51 are also not part of the active inventory because there is no plan to use these tanks for anything other than the pre-treatment of HLW (the one exception is Tank 42 which is planned to be used for emergency spare service in between sludge batches #1 & 2). Also, each Tank Farm is required to maintain 1.271 million gallons of space in Type III Tanks as emergency spare. The "Working Inventory" column in Appendix J.4 is the total available tank space in the working inventory of Type III Tanks after deducting 2.542 million gallons for emergency spare space.

The goal is to get a 3,000,000 gallon working inventory of available tank space before DWPF starts up 1/1/96. In this Plan, about 2.2 million gallons of tank space is projected at DWPF startup with less than 4 million gallons of tank space during the first five years of operation. This is much less than in Revision 4 of this Plan. Evaluations are in progress to change the service of one tank in H-Area to make up this shortfall. There is a high degree of confidence that this change can be implemented prior to DWPF startup and that this change can be incorporated into Revision 6 of this Plan.

Influents

F-Area LHW and HHW

The F-Area Canyon is currently operating on a caustic flowsheet through 5/95. The F-Area Canyon will resume normal acid flowsheet operations 6/95 and operate through 12/02 de-inventorying the various tank contents and flushing the facility. Several campaigns will be conducted: Pu Solutions, Mk 31's, Mk 16/22's, FRR, etc. Influent volumes to the Tank Farm range from 32,000 to 38,000 gallons per month while the F-Area Canyon is operating. All suceeding volumes are shutdown flows.

H-Area LHW and HHW

HB-Line is currently completing the Casini Mission. After Cassini, several smaller campaigns in H-Canyon (Pu-242, Mk 16/22's, Pu-239, Np-237, etc.) will be conducted to de-inventory the facility. A conservative assumption is used in that processing of the onsite aluminum clad Spent Nuclear Fuel is included although there is not an agreement to do this at this time. All of these campaigns will be completed by 12/02. Waste volumes range up to 51,000 gallons per month; 15,000 gallons of which is from the General Purpose Evaporator.

DWPF Recycle

The DWPF recycle is based on the planned attainment for each of the six batches of sludge feed and the age of the DWPF plant. The recycle volume at 15% attainment is generally about 2 million gallons per year.

Tank Washwater

The waste tank interiors of all tanks that are to be removed from service are water washed as part of the waste removal program. The annulus of each tank with a leakage history is also water washed. The volume of the tank interior wash is planned to be 140,000 gallons which is a level of about 40 inches in most tanks. The annulus wash is assumed to be two 25,000 gallon washes which is a level of about 24 inches in the annulus for each wash.

ESP

The ESP washwater values are planned for the remainder of Sludge Batch #1 washing and based on a CPES model for each of the remaining five batches. All of the washwater is assumed to be evaporated although the last few washes of each batch could be stored and re-used as salt dissolution water. The washwater for each batch is generated during the 30 month period immediately before the batch is fed to the DWPF. No differentiation is made in Appendix J.4 between the water used to slurry and transport the sludge to the ESP tanks, aluminum dissolution waste, and sludge washwater.

Other Influents

Influents from the 100-Areas were listed in previous revisions of this Plan but are now planned to be zero. There are no plans to support the Reactor Basin water quality programs using HLW tanks. Also, the ETF evaporator bottoms that are transferred to Tank 50 do not impact the Tank Farm inventory as Tank 50 is not used to store and evaporate HLW. The RBOF impact on the working inventory is projected to be zero because all of this waste will be stored in Tank 23 and used to dissolve salt in Tank 41 and subsequent salt tanks.

Effluents

2F Evaporator

The 2F Evaporator space gain is based on the forecasted FY95 Canyon waste generation and evaporation of the remaining backlog of F-Area HHW. Space gain after FY95 is based on the projected volume of the waste streams allocated to the 2F Evaporator as described in Section 8.6.3. In general, these streams are F-Area and H-Area HHW, F-Area LHW, sludge washwater from pre-washing F-Area sludge in F-Area prior to transfer to the ESP tanks, and tank washwater for the F-Area tanks. This evaporator is assumed to go down for one 6 month outage in FY99 for a vessel replacement.

2H Evaporator

The 2H Evaporator space gain is based on the projected volume of waste streams allocated to the 2H Evaporator as described in Section 8.6.2. In general, these streams are H-Area LHW, ESP washwater and 50% of DWPF recycle per year. Two separate outages are planned in FY95: the first to replace the Tank 43 feed pump and perform preventive/corrective maintenance activities, and the second to replace the pot. The split outage enables the 2H Evaporator to support the completion of ESP Tank 51 sludge washing. This evaporator is projected to become saltbound in FY03 for period of five years due to the low attainment operation of the System. The waste load is shifted to the 2F and RHLWE evaporators during this period.

RHLWE

The RHLWE is planned to start up 4/30/99. Space gain is based on the projected volume of waste streams allocated to the RHLWE as described in Section 8.6.4. In general, these streams are DWPF recycle, ESP washwater generated from H-Area sludge pre-treatment, and tank washwater generated from H-Area waste tank retirement.

In-Tank Precipitation

ITP space gain occurs when concentrated supernate is fed directly to ITP or when a salt tank is returned to salt receipt service. The space gained with each batch of dissolved salt removed from a salt tank is not shown because the plan is to empty the tank completely. A 1,271,000 gallon space gain is generally shown at the completion of salt removal from each tank. ITP space gain is based on executing the ITP Production Plan shown in Appendix J.1. This Plan produces about 80,000 gallons of 10 wt % precipitate per year.

Other

The "Other" column lists waste transfers into and out of the Type III Tank working inventory as well as redeployment of waste tanks. ESP washwater is shown as an influent to the working inventory but may show as space gained in the "Other" column if the washwater is transferred out of the working inventory into Type IV Tanks. Redeploying Tank 42 from ESP use during the processing of sludge batch #1 to active storage use is also space gain. This tank is later deducted from the working inventory when it is redeployed to begin processing sludge batch #1b or sludge batch #2.

Salt Space

As each evaporator gains space, saltcake and a caustic-rich concentrated supernate is formed in the salt receipt tank. When the saltcake level reaches one million gallons, the tank is considered to be full. The remaining space typically contains concentrated supernate. At this time, another salt receipt tank is required or the evaporator will become saltbound and shut down.

Pages 5 through 7 of Appendix J.4 show the salt formation in each of the three evaporator systems. The 2H Evaporator has two salt receipt tanks: 38 and 41. Tank 38 is currently filling. When it is full, Tank 41 is returned to salt service. Tank 41 will contain about 300,000 gallons of salt when it is returned to salt service. While this does not cause a problem in the near term, it does result in a saltbound condition in FY03. The 2H Evaporator is down from FY03 until salt removal from Tank 38 is completed in FY08. This occurs despite shifting much of the feed that would normally be allocated to the 2H Evaporator to other evaporators.

The 2F and RHLWE Evaporators are able to avoid becoming saltbound. These evaporators have five and seven salt receipt tanks, respectively, and are thus not as prone to becoming saltbound.

8.4 In-Tank Precipitation

Startup Schedule

Receipt of startup authorization is planned to occur 7/1/95 with the start of ITP batch #1 beginning 10/1/95. The startup authorization date and batch #1 start date were both 3/1/95 in Revision 4 of this Plan. Startup was delayed due to emergent work and the difficulty of fully dispositioning all technical and safety issues. There was no contingency in the FY95 AOP to draw upon to maintain the 3/1/95 startup date. An additional $5.1 million has been budgeted to ITP with an additional $4.1 million pending. These change control actions should ensure a 7/1/95 startup authorization. The first addition of STPB to Tank 48 is scheduled for 10/1/95. This could occur earlier, however, there is no funding in FY95 for chemical procurement. Evaluations are in progress to identify FY95 funding for chemicals.

Startup Authorization

The WSRC Readiness Self Assessment and Operational Readiness Review have been completed. The DOE-HQ ORR is scheduled to start 5/15/95 and last for two weeks. It is anticipated that findings can be dispositioned and startup authorization received by 7/1/95.

Startup Driver

The startup of ITP is driven in the near term by the need to provide salt space in the evaporator systems to support the continued operation of DWPF. The evaporators will be needed to evaporate the DWPF recycle stream and future ESP washwater stream. The planning basis is for DWPF to start up 1/1/96 and then transition to sludge and precipitate feed within the first nine months of operation. The Tank Farm will therefore need to be able to handle forecasted Canyon receipts, DWPF recycle and ESP washwater generated during the processing of sludge batch #2.

The best evaporator system to handle the DWPF recycle stream is the 2H Evaporator due to the piping configuration in the H-Area Tank Farm. The 2H Evaporator system has two salt receipt tanks: Tank 41 which is full of saltcake, and Tank 38 which is about three quarters full of saltcake with most of the remaining tank space containing concentrated supernate that cannot be evaporated further. It is imperative to remove all or most of the salt from Tank 41 before Tank 38 fills with saltcake to enable the 2H Evaporator system to continue to operate and thus handle the DWPF recycle stream. The only viable plan to remove the salt from Tank 41 is to feed it to ITP. The 10/1/95 ITP startup date supports the planned 1/1/96 DWPF startup date with precipitate feed available to DWPF on 9/5/96. The ITP startup delay does not support removing all of the salt from Tank 41. Only 907,000 of the 1,231,000 gallons of salt will be removed from Tank 41 before Tank 38 is full. Tank 41 will therefore be placed back in salt receipt service with 324,000 gallons of salt in it. This does not cause a problem in the near term but it does result in five years of 2H Evaporator downtime starting FY03. This is shown in Appendix J.4. Efforts are underway to identify a possible third salt receipt tank for the 2H Evaporator. This is discussed in Section 8.14.

Production Capacity

The current ITP flowsheet cycle is based on performing three 40 day batches followed by a 40 day wash for a 160 day cycle. Each cycle will produce, on average, about 140,000 gallons of 10 wt % precipitate. ITP is therefore capable of producing about 319,000 gallons of precipitate per year. This rate will support 75% DWPF attainment during Sludge Batch #1. The ITP facility is therefore not expected to be a limiting factor in the near term. Funding constraints limit ITP production as described below.

Production Plan

The ITP Production Plan is shown in Appendix J.1. The first three ITP batches work off the precipitate and washwater heels in Tanks 48 and 49 that remain from the 1983 ITP Demonstration. This waste is blended with some Tank 41 dissolved salt and some concentrated supernate from Tanks 25, 29, 32 and 38. All ITP feed will be staged in Tank 40 to allow insoluble solids to settle. These will be small volume batches increasing in size from about 400,000 gallons for ITP batch #1 to the flowsheet average of about 800,000 gallons for ITP batch #3 so that ITP can ensure adequate mixing in Tank 48. The F-Area material from Tank 25 serves two purposes: 1) to increase the precipitate volume to provide enough precipitate to feed Late Wash in three ITP batches instead of four as was assumed in Revision 4 of this Plan, and 2) to "dilute" the higher Pu concentration in H-Area salt solution. Precipitate is ready for feed to Late Wash 8/30/96.

The duration of Cycle #1 is planned to be 330 days (3 batches at 70 days each plus 1 wash at 120 days) versus the normal cycle time of 160 days. The 70 day batch time is an allowance for the initial startup of a one-of-a-kind facility and a planned technical evaluation at the end of each batch filtration. Likewise, the wash step is planned to require 120 days versus 40 days to accommodate the post-wash evaluation. The batch time is limited to a maximum of 70 days during Cycle #1 to limit the radiation dose to the excess unreacted STPB in each batch. This is a mitigating action due to Composite Lower Flammability Limit concerns.

ITP will produce three batches containing about 142,000 gallons of 10 wt % precipitate in FY96, and about 80,000 gallons of precipitate per year thereafter. This may require between one to five batches per year because the cesium and potassium concentration in each batch varies. The long term operation of ITP is therefore limited to about 15% attainment similar to the rest of the HLW System.

Absorbed Precipitate Dose

Currently, the precipitate level in Tank 49 is administratively limited to 565,000 gallons assuming the design maximum radionuclide concentration of 39 Ci/gal. This liquid level in Tank 49 is based upon the rate of flammable gas generation in an unventilated tank and the assumption that up to three days may be required to re-establish tank ventilation after a seismic event.

The design basis for DWPF was based upon processing precipitate with an absorbed dose of 200 megarads or less. Additional dose results in the increased formation of Biphenyl, m-Terphenyl, p-Terphenyl and carbazole. These compounds result in precipitate that is difficult to filter in Late Wash, high-boiling organics that foul the DWPF offgas system, and the recycle of these products to the Tank Farm evaporators. Recent modeling shows that the absorbed dose with the Revision 4 production plan would be in the range of 400 to 500 megarads. While it is not known exactly how much dose is "too much", it is generally considered that 400 to 500 megarads is "too much".

The reason for the high dose is the low attainment of the HLW System. At 75% attainment, precipitate is produced at a rate of 420,000 gallons per year and consumed by DWPF at that rate. Starting with a full tank of precipitate, the average precipitate residence time in Tank 49 was about two years. The Revision 4 production plan residence time was more than four years.

It is now planned to maintain the ITP precipitate production rate at about 80,000 gallons per year such that the precipitate level in ITP will vary from 152,000 gallons to about 200,000 gallons. Using the current ITP flowsheet, the low liquid level limits are 152,000 gallons in Tank 48 and 112,000 gallons in Tank 49. These limits are based on the slurry pump elevations and the liquid cover required above the pump suction to prevent cavitation. An alternate ITP flowsheet is being evaluated that could eliminate the need for Tank 49 in ITP service thus eliminating the 112,000 gallon heel in Tank 49 and reducing the absorbed dose. The date at which precipitate is ready to feed Late Wash is the same in either case. This is further discussed in Section 8.14.

The chart in Appendix J.5 entitled "ITP Precipitate Balance" shows the ITP Precipitate Balance and is based on the planned feed to ITP described in this section and in Appendix J.1.

8.5 Extended Sludge Processing

Scope

Sludge Batch #1 was to have consisted of the sludge currently in Tanks 42 and 51. Because the pumps in Tank 42 do not adequately mix the entire tank contents and two of the Tank 51 pumps have excessive seal water leakage, a decision has been made to focus on completing pump repairs in Tank 51, finishing washing that sludge and starting up DWPF on Tank 51 sludge only. The pumps in Tank 42 will be replaced after DWPF startup and the Tank 42 sludge will eventually be washed and blended with Tank 51 to complete Sludge Batch #1. The Tank 51 sludge is referred to as Sludge Batch #1a. The blended Tank 51 and 42 sludge is Sludge Batch #1b. CPES modeling has shown Tank 42 sludge, Tank 51 sludge, and the combined sludge to be similar. Acceptable glass is expected to be produced from any combination.

Slurry Pump Problems

The slurry pumps in Tank 51 have been started up and operated. Slurry pump seal leakage experienced in Tank 51 has been far greater than expected; on the order of tens of gallons per minute per pump from two of the four pumps versus the expected cc's per minute per pump. It is generally believed that the bottom seal has failed on the B-1 and H slurry pumps, however, this cannot be confirmed without inspecting the seals. To replace the seals, the pumps would have to be raised, the bottom two sections disconnected from the top seven sections, the bottom sections sent somewhere to be decontaminated and have the seal replaced, etc. There is no facility readily adaptable for slurry pump maintenance. At this time, the plan is to replace the two pumps with two new pumps originally slated for Tank 40. The new pumps have improved seals. A third pump, in the Tank 51 G riser, may be on the verge of failing as indicated by recent increases in the seal water leak rate.

The Tank 42 pumps have been started and briefly operated. Initial data shows that seal leakage has been within specifications. Two of the pumps on Tank 42 are not drawing amperage indicative of the work expected, i.e., pumping sludge. It is theorized that the pumps are submerged in sludge and are mixing only a small volume, raising the temperature of the "captive" sludge and cavitating. A test has been proposed which would raise these two pumps into the liquid, operate them to check amperage, and then lower them in ten inch increments to resuspend the sludge. The other two pumps are operating well but the arrangement of the four pumps is not expected to fully suspend all of the sludge in Tank 42. An alternative processing plan is being developed for Tank 42 but will not be available until late FY95 or early FY96.

Production Capacity

The planning bases for the ESP facility are that 700,000 gallons of sludge can be processed in two ESP tanks using the co-washing flowsheet. The combined aluminum dissolution, sludge washing, and sludge consolidation into one tank steps require 30 months to complete. Each of the planned six batches of sludge will produce an average of 1,000 canisters of glass.

Production Plan

It is planned to wash the Tank 51 sludge to 9 +/- 1 wt % Na using two washes. It is also planned to use the 170,000 gallons of washwater in Tank 42 as part of the first wash. The two wash volumes will be 400,000 gallons and 250,000 gallons. The first wash will be completed after replacing the B-1 and H slurry pumps. The G slurry pump will then be replaced enabling Tank 51 to use all four slurry pumps. The second wash will then be completed. Enough sludge will be available in Tank 51 to produce 750 canisters of glass.

Schedule

The goal of ESP is to have washed sludge in Tank 51 by 1/1/96 to support DWPF Test Plan FA-20 "Transition to Radioactive Operations". The failed B-1 and H slurry pumps will be replaced 6/95. The first wash in Tank 51 will be completed 7/95. The failed G slurry pump will be replaced after the first wash. The second wash will be completed 9/95. The Tank 51 sludge will be ready to feed 10/95. After washing is complete, a Line Management Assessment and the Tank 51 Valve Box tie-ins will be completed. All preparations to feed sludge to DWPF are scheduled to be complete 12/28/95.

At this time, there is no formal plan for Tank 42 as all efforts are focused on Tank 51. For planning purposes, the following is assumed in this document:

- a Tank 42 Action Plan will be developed in FY95 or early FY96,
- slurry pump repairs or replacement will be completed in FY96,
- washing the Tank 42 sludge and consolidating it with the remaining sludge in Tank 51 will be completed by the end of FY97, and
- feeding combined Tank 42 and 51 sludge to DWPF in FY98

This planning assumption will be replaced with the formal plan ias soon as possible.

8.6 Evaporators

The 2H and 2F Evaporators will volume reduce the various waste streams coming into the Tank Farms in the near term. The operation of these two evaporators is crucial to the success of HLW and Site Missions. The Tank Farm currently has about 1,078,000 gallons of working inventory available in Type III Tanks, excluding the ITP/ESP tanks and emergency spare requirements. The evaporators must reduce the volume of the remaining backlog of F-Area waste (nearly complete) and keep current with new waste generated by Canyon operations and ESP. There is no near term plan to evaporate the 5 million gallon backlog of unevaporated HHW in H-Area as the salt and concentrate from this waste would consume the remaining salt receipt space if evaporated. This waste will gradually be fed to ITP as supernate.

The goal for the evaporators is to have the Tank Farm in a position where the Tank Farm can be deemed "ready to support DWPF startup" by 1/1/96. This state of readiness can generally be described as:

- ITP started up and running well;
- salt removal projects proceeding on schedule;
- tank space available in each evaporator system to handle the DWPF recycle stream;
- interarea transfer capability between F and H-Areas; and
- adequate tank space to support non-routine Tank Farm and DWPF operations with a high degree of confidence.

A key planning assumption is the volume of the working inventory of tank space that is needed at the time of DWPF startup. The DWPF recycle stream is regarded in this Plan as a stream that cannot be "turned off" if there are evaporator problems. This is due to the negative effects of thermally cycling the DWPF melter. This drives the Tank Farm to recover a significant amount of tank space that will permit DWPF to continue operating if the Tank Farm has some serious upset condition, such as an evaporator pot failure or a technical problem that shuts down both evaporators for an extended period of time.

The Tank Farm goal is to have about 3,000,000 gallons of available tank space at the time DWPF starts up, not including tank space that must be held in reserve as emergency spare tank capacity should a waste tank fail. This value is proposed as the minimal contingency for unplanned events such as:

- prolonged evaporator outages;
- evaporator utility less than planned;
- space gain less than planned;
- additional evaporator pot failures beyond those expected;
- a tank leak;
- ITP operating at less than its planned rate;
- the Separations Canyons or DWPF generating waste above forecast;
- a Separations vessel failure resulting in contaminated cooling water that must go to the Tank Farm; and
- changing Site missions

Most of the events listed above have occurred in the past at SRS, many as recently as FY94-95. The Tank Farm should always be in a condition where it can support these unplanned yet reasonable upset scenarios in addition to routine operations. Experience shows that total tank space in an evaporator system of less than 200,000 gallons is bordering on a "waterlog" condition. The evaporator system can be operated when waterlogged, however, it is very inefficient until more space is gained because of the following:

- the contents of the salt receipt tank must be frequently transferred back to the evaporator feed tank in small transfers;

- this frequency is about every 10 days when the tank space in the system is 200,000 gallons which does not allow the salt to completely cool in the salt receipt tank prior to transfer back to the evaporator feed tank; and
- the transfers back to the feed tank occur as the salt receipt tank is receiving salt concentrate from the evaporator

It could therefore be said that total tank space in the Type III Tanks must remain above 600,000 gallons (200,000 gallons for each of the three planned evaporator operations), assuming an optimal distribution of tank space, to avoid a waterlog or gridlock condition for the entire Tank Farm. The 3,000,000 gallons recommended is not overly conservative given the high volume and intermittent streams that must also be handled such as ESP decant water (this water is used to suspend and transfer the sludge from the sending tank to ESP), ESP aluminum dissolution waste and ESP washwater. The ESP washwater will routinely be about 400,000 gallons per wash while the other two ESP streams can be up to 900,000 gallons per batch. The DWPF shutdown flow is about 1,080,000 gallons per year. It is recommended in this Plan that at least one year of equivalent space be maintained to receive the DWPF recycle and maintain other operations assuming that no evaporators are operational. If 900,000 gallons of tank space is required to periodically receive waste from ESP, 1,080,000 gallons is required to support DWPF shutdown operations for one year, and total tank space must not dip below 600,000 gallons to support evaporator operations, then total working inventory of tank space of 3,000,000 gallons at the time of DWPF startup is not overly conservative.

At the time DWPF starts up, about 2.2 million gallons of tank space is projected. Evaluations are in progress to change the service of one tank in H-Area such that it could be used for emergency spare service. This would result in an increase in available space of up to 1.27 million gallons. This evaluation should be complete before DWPF starts up and before the next HLW System Plan is issued. This topic is further discussed in Section 8.14 under the heading "Just-in-Time ITP Option #1".

After DWPF starts up, the space gain from the 2F and 2H Evaporators and from ITP will be sufficient during the next five years to offset the waste generation until the RHLWE starts up. It is important to achieve as close to the 3,000,000 gallons of available tank space by 1/1/96 as possible in anticipation of the higher waste receipts thereafter.

Evaporator space gain is defined as the difference between evaporator feed and evaporator concentrate corrected for flush water and chemical additions necessary to operate the evaporator system. Space gain is predicted based on evaporation of each waste stream generated by one of the evaporators and on the chemical constituents of each waste stream. This is further described in Sections 8.6.1 through 8.6.4.

8.6.1 1H Evaporator

The 1H Evaporator vessel has a leaking tube bundle. Because this evaporator is planned to remain down, the condition in the Tank Farm Wastewater Operating Permit to remove the 1H Evaporator from active service by 1/1/98 has essentially been met. At this time, the 2H and 2F Evaporators are projected to be able to support the HLW Mission until the RHLWE starts up 4/30/99.

FY95 activities include development of a decontamination plan to leave this system in a lay-up state suitable for future D&D. Implementation of the decontamination plan will be attempted in FY95 or early FY96, depending on the impact of the Reduction in Force.

8.6.2 2H Evaporator

The primary role of the 2H Evaporator will be to evaporate the 221-H Canyon LHW stream, the ESP Tank 51 sludge washwater and 50% of the future DWPF recycle stream. The forecast for H-Area fresh LHW is about 11,000 gallons per month in FY95. After H-Canyon starts up in 9/97, this rate increases to about 51,000 gallons per month and remains there through FY02. All H-Area LHW is received directly into the 2H Evaporator system and evaporated.

There will be two more ESP washwater decants in FY95-96 at 400,000 and 250,000 gallons. Both will be transferred to the 2H Evaporator system. The salt and concentrated supernate generated by these streams has been modeled and is included in Appendix J.4.

A two part outage is planned to replace the aging 2H Evaporator vessel with a new vessel and to complete several other needed maintenance activities. All of the activities will be completed in the first outage except the pot replacement which is in the second outage. The existing vessel is nearly ten years old which is about six months beyond the average life span. The goal is to have a new vessel in place before DWPF starts up. A failed vessel after DWPF startup would cause the working inventory of tank space to be consumed at a rate of about 160,000 gallons per month unless DWPF were shut down. The new vessel will have a Hastelloy tube bundle and warming coil that is expected to last for 30 years.

In the near term, it is crucial that the 2H Evaporator system gets into a position where it can support the DWPF recycle stream starting 1/1/96. This position is defined as follows:

- the existing 2H Evaporator vessel has been replaced;
- the evaporator has been restarted and is operating;
- ITP has started up and operating; and
- there is available salt receipt space in Tank 38 to last until another tank is ready for salt receipt service.

The planned 2H operation that would support DWPF startup 1/1/96 is based on a planned utility of 60% with a space gain as shown in Appendix J.4 and a two part outage for pot replacement.

Space gain for this evaporator is driven by the volume and salt content of H-LHW, DWPF recycle and ESP Tank 51 washwater streams. The Appendix J.4 Material Balance Database uses an algorithm to forecast space gain. All H-LHW is planned to be evaporated in the 2H Evaporator. It is assumed that the volume reduction for H-LHW will be 71% based on historical and laboratory test data. In addition, 50% of DWPF recycle will be evaporated in the 2H Evaporator. It is assumed that the volume reduction for this stream will be 96% based on the latest CPES Material Balance. It is also planned that the 252,000 gallon 2/95 decant from Tank 51 as well as the future 7/95 and 9/95 decants will be evaporated in the 2H Evaporator. Each decant will generate more space gain and less salt than its predecessor. This has been calculated and is shown below. The algorithm in gallons per month is therefore:

2H Space Gain = (H-LHW)*(0.71) +
(0.50)*(DWPF Recycle)*(0.96) +
(ESP 3/95 decant)*(0.88) +
(ESP 7/95 decant)*(0.95) +
(ESP 9/95 decant)*(0.98)

Based on the algorithm, the space gain for the 2H Evaporator increases to a high of about 2,000,000 gallons per year. The ability of this evaporator to attain this space gain with dilute feed is well documented in previous and recent FY94 experience.

Appendix J.4 shows that Tank 38 fills with salt before Tank 41 is emptied via ITP. Tank 41 is placed back into salt receipt service prematurely and therefore fills up before Tank 38 can be emptied. This results in five years of 2H Evaporator downtime from FY03-08. All feed streams are routed to the RHLWE during this time. Efforts are ongoing to identify a third salt receipt tank for the 2H Evaporator system to preclude this saltbound condition. This study will be complete by the next revision of this Plan.

8.6.3 2F Evaporator

The primary role of the 2F Evaporator will be to evaporate 221-F Canyon LHW, HHW and the remaining backlog of F-Area HHW. Once this is complete and after the startup of DWPF, the 2F Evaporator's role will transition to becoming the primary HHW evaporator for F and H-Area HHW, F-Canyon LHW waste, and 50% of the DWPF washwater until the RHLWE starts up. After the RHLWE starts up, the 2F Evaporator's role will transition again by eliminating the DWPF recycle stream and adding washwater from pre-washing the F-Area sludge in F-Area prior to transferring the sludge to ESP and adding F-Area old-style tank washwater.

Prior to 1/1/96, it is crucial that the 2F Evaporator system gets into a position where it has worked off all available F-Area feed and can support the 2H Evaporator as needed after DWPF startup and during ESP sludge batch#2 washing. This position is defined as follows:

- the 2F Evaporator is operating;
- the NWTF and F to H-Area Inter-Area Line are operating; and
- there is available salt receipt space in Tanks 27 and 46 to last until Tank 25 is empty and returned to salt receipt service.

2F Evaporator utility is planned to be 60% with a space gain of 58,333 gallons per month during FY95. This is based on waste transfers made in late FY94 and availability of feed in FY95. These rates are below FY94 rates due to the low volume of fresh waste forecast and because evaporation of the backlog of F-HHW was nearly completed in FY94.

Starting in FY96, an algorithm is used to forecast space gain for the 2F Evaporator as shown in the Appendix J.4 Material Balance Database. All fresh F-LHW, F-HHW and H-HHW is planned to be evaporated with a space gain factor of 71%. This is based on historical experience as well as laboratory test data. Of the tank washwater shown in Appendix J.4, 50% is allocated to the 2F Evaporator as F-Area has 44% of the waste tanks that will be water washed. The space gain factor for this stream is conservatively estimated at 90%. ESP washwater will be generated in F-Area as sludge will be pre-washed in-situ before transfer to ESP. This waste stream is estimated to be the value in the "ESP" column of Appendix J.4 times 0.36 (36% of all sludge is in F-Area) times a space gain factor of 80%. This algorithm is therefore:

2F Space Gain before DWPF startup = 58,333 gal/month

2F Space Gain after DWPF startup = (F-LHW)*(0.71) +
(F-HHW)*(0.71) +
(H-HHW)*(0.71) +
(0.50)*(DWPF)*(0.96)

2F Space Gain after RHLWE startup = (F-LHW)*(0.71) +
(F-HHW)*(0.71) +
(H-HHW)*(0.71) +
(0.36)*(ESP washwater)*(0.80) +
(0.44)*(tank washwater)*(0.90)

8.6.4 Replacement High Level Waste Evaporator

The RHLWE is currently in the design and construction phase. The planned startup date in Revision 4 of this Plan was 5/01. This date was a draft date as the schedule was being rebaselined to accomodate the funding reductions initiated by the FY95 Annual Operating Plan and outyear funding guidance planning process. The startup date has since been set at 4/30/99. Efforts are being made to improve the schedule even further. At this time, WSRC is optimistic that this can occur.

The Total Estimated Cost (TEC) portion of the project is progressing on schedule in FY95. Concrete placement, erection of building steel, installation of the Gravity Drain Line (GDL) to Tank 37 up to the clean area boundary, and installation of the remotely operated crane is complete. Fabrication and installation of piping and electrical continues.

Installation of the building siding and roof is scheduled to begin 5/95. The evaporator vessel is scheduled to be received on site 7/95. Excavation and radiation surveys for future process line tie-ins up to the clean area boundary will be completed 9/95. Activities for the remainder of FY95 include installation of the vessel in the cell, installation of the GDL's to Tanks 29-31 and the Tank 32 feed line up to the clean area boundary, iinstallation of the cell liner, development of the Startup Plan and WSRC ORR Plan of Action, and completion of the building roofing and siding. FY95 Other Project Cost (OPC) activities will be minimal; primarily supporting design and construction and revising the project schedule.

The RHLWE is planned to operate at 80% utility and at a space gain based on the forecasted availability of feed. This space gain values shown in Appendix J.4 are well within the expected capacity of the RHLWE. The design basis is 7,600,000 gallons per year of overheads assuming feed at 33 gpm at 25-35% dissolved solids.

The plan for the RHLWE is to evaporate 50% of the DWPF recycle stream, plus the ESP washwater generated in H-Area (H-Area has about 64% of all sludge thus 64% of the sludge washwater is allocated to the RHLWE) plus the tank washwater generated in H-Area used to clean tanks that will not be returned to service (H-Area has 28 of the 50 tanks thus 56% of the tank washwater is allocated to the RHLWE). Space gain factors for these streams are the same as decribed in the previous section. The algorithm used to forecast RHLWE space gain in gallons per year is therefore:

RHLWE Space Gain = (0.50)*(DWPF recycle)*(0.96) +
(0.64)*(ESP washwater)*(0.80) +
(0.56)*(tank washwater)*(.90)

The RHLWE will start up filling Tank 30 with salt. Tank 30 is full of supernate but contains virtually no saltcake. By the time that the salt content in Tank 30 has reached 1,000,000 gallons, Tank 29 will be empty and ready for salt receipt service.

A logic tie has been added to the Integrated HLW System Schedule in Appendix F that shows RHLWE radioactive startup as a predecessor activity to the start of processing sludge batch #2 in ESP. Aluminum dissolution and washing of sludge batch #2 generates about 4,100,000 gallons of wastewater over a period of thirty months. The existing 2F and 2H Evaporators cannot handle this waste in addition to the other influents (see Appendix J.4). The RHLWE is needed to evaporate this waste when it is generated.

The justification for this project has been the subject of ongoing reviews and is therefore not a primary objective of this Plan, however, the chart in Appendix J.4 clearly shows that the RHLWE (or some other form of space gain) is needed to support the long term operation of the HLW System, particularly at attainments above 15%. Some of the required space gain could be achieved by treating the DWPF Slurry Mix Evaporator Condensate Tank (SMECT) waste, however, the WSRC recommendation is to complete and start up the RHLWE as soon as possible. There is less risk to the HLW Mission with the RHLWE operating as it can process any type of waste and it provides this type of capacity when the 2F or 2H Evaporators are down. The SMECT evaporator is envisioned to treat only a specific, very dilute, low activity waste stream.

8.7 Waste Transfer Facilities

8.7.1 New Waste Transfer Facility

The radioactive operations startup date remains 12/29/95. This date supports the 1/1/96 start of the DWPF radioactive operations.

The previous Plan briefly described the need to resolve the pump tank pump vibration problems which was the last technical issue associated with this project. That issue has since been resolved and the pumps are performing as designed.

The logistics of tie-ins to other diversion boxes and jumper changes in the other diversion boxes connected to the NWTF continue to be planned at the time of this report. These activities will cause localized outages in parts of the H-Area Tank Farm that could impact ITP, ESP and Evaporator operations. There is coordination between the various facilities intended to minimize or eliminate the impacts. This subject requires additional planning and coordination and is managed within HLW and reported in the weekly HLW Plan of the Week meetings. At this time, it appears that the impacts can be managed.

8.7.2 F/H Interarea Line

The F to H-Area Interarea Line (IAL) connects the F-Area and H-Area Tank Farms. A description of the IAL is provided in Appendix A. All F-Area waste must be transferred through the IAL to be processed in ITP or ESP. DWPF Recycle and future H-Area HHW will be transferred from H-Area to the F-Area Tank Farm via the IAL. The maintenance and operation of the IAL is therefore critical to the HLW Mission.

At this time, the capability does not exist to transfer waste from H-Area to F-Area. Resuming H to F-Area transfers would require maintenance and repair of control equipment and instrumentation and some degree of post-maintenance testing.

This work has not been completed because no need was forecast to transfer from H-Area to F-Area before the NWTF starts up. Startup of the NWTF enables H-Area to F-Area transfers to be made using the NWTF equipment and controls. Transfers from H-Area to F-Area will be performed after the NWTF starts up 12/29/95.

The capability to transfer from F-Area to H-Area also does not exist at this time. Process controls and F-Area Pump Tank-1 support facilities must be upgraded. Scoping and engineering studies have been completed and field work is progressing towards an early FY96 completion. This date will support the earliest planned transfer from F-Area to H-Area which is salt supernate from Tank 25.

8.8 Diversion Box & Pump Pit Containment

This project was originally scoped to install a ventilated pre-fabricated building and remotely operated bridge crane over several diversion boxes in the F and H-Area Tank Farms. In the early 1990's, this project was descoped to include only H-Area Diversion Box-7 (HDB-7). HDB-7 is the most utilized diversion box in either Tank Farm and is the hub for all transfers into ITP and ESP, all transfers from the H-Area Canyon to the H-Area Tank Farm, future DWPF recycle transfers, and all transfers associated with the 2H Evaporator System.

Soil quality and seismic concerns have driven the project design away from the bridge crane in favor of a tension-fabric containment building with a pedestal crane. This lightweight building requires a much less substantial foundation than its pre-fabricated counterpart. The pedestal crane requires one deep pier support versus the large foundation used to distribute the bridge crane load.

The current design and construction can be completed within the project TEC. The project is scheduled to be construction complete 2/14/96, fully operational 3/15/96 and the Line Item closed out 4/30/96.

8.9 Waste Removal

The cost, scope and schedule of the Waste Removal Program was rebaselined in early FY94 based on funding projections and assumptions provided by DOE-SR. Since then, the total funding for HLW programs in the FY97 Five Year Planning period has been reduced by $522 million dollars. About $210 million of this reduction was taken from the Waste Removal Program as shown below:

Waste Removal	FY96	97	98	99	00	01
WRP Baseline	52.4	57.1	57.5	46.3	43.5	44.8
System Plan, R. 5	26.0	27.8	7.2	10.0	10.3	10.6
Delta	-26.4	-29.3	-50.3	-36.3	-33.2	-34.2
Cumulative Delta		-55.7	-106.0	-142.3	-175.5	-209.7

For the purposes of this Plan, it has been assumed that the Waste Removal FY01 funding is escalated by 3% per year from FY02-65. Thus, the Waste Removal Program never gets "healthy" again. At this funding, Waste Removal turns one tank over to the Operations group for waste removal every 15 months on average. The Waste Removal project finishes in FY55. In Revision 4 of this Plan, the program funding was about $44 million per year in FY00 dollars with the project finishing in FY11.

8.9.1 Salt Removal

The salt removal sequence has changed since Revision 4 of this Plan. Tank 38 is now the fourth tank, after Tanks 41, 25 and 28, in the queue to be fed to ITP. This change was driven by the delay in ITP startup from 3/95 to 10/95, by the decision to evaporate ESP Sludge Batch #1 washwater in the 2H Evaporator and by the reduced HLW System attainment after DWPF startup.

The sequence listed below does not support the goal of having 3 million gallons of tank space available when DWPF starts up and does not support the continued operation of the 2H Evaporator. It is, however, the best sequence for the salt tanks given the current status of the HLW System.

Tank 41 Salt Removal

Tank 41 will be the first salt tank fed to ITP. There are still outstanding criticality issues specific to Tank 41 due to the relatively high concentration of fissile U and Pu. The concern is that insoluble fissiles can concentrate in low spots in the salt formation inside Tank 41. Previous sampling and analytical studies indicate that the majority of the U is soluble and that initiation of salt dissolution can safely proceed. There has been limited progress in this area since Revision 3 of this Plan. Completed evaluations indicate that the top 50" of saltcake can be safely dissolved without additional criticality safety controls.

It is anticipated that all H-Area salt solution will need to be blended with F-Area salt solution due to the higher Pu concentration in H-Area salt. Straight H-Area salt feed to ITP will exceed the SAR Pu source term limit. The need for this was not forecast in the past.

As before, there is a strong need to feed Tank 41 to ITP as soon as possible in order to maintain the operation of the 2H Evaporator. While salt dissolution in Tank 41 can be safely initiated, it is still not known if all of the salt can be removed, the size of the batches or the rate of salt removal. Additional sampling and analyses are necessary to characterize the tank contents. The planning basis is that only a portion of the salt will be removed from Tank 41 and fed to ITP prior to raising the pumps and preparing Tank 41 to return to salt receipt service. This is the first Plan where the need to do this has been forecast. This is most undesireable as Tank 41 will refill quickly and the 2H Evaporator System will be in a saltbound condition again by FY01.

Salt removal from Tank 41 is scheduled to begin before ITP starts up. This is necessary to ensure that there will be an adequate supply of Tank 41 dissolved salt to feed to ITP in the second ITP batch and the next several batches. The initial salt removal from Tank 41 will be slow due to the lack of working capacity in the tank and the sampling requirements. As salt is removed, larger and larger salt removal batches can occur. As stated in Section 8.4, Tank 40 must be available to stage the dissolved salt from Tank 41 to allow insoluble solids to settle prior to transferring to Tank 48.

There will be alternate feeds to ITP during and after processing of Tank 41, i.e., feeding existing concentrated supernate directly to ITP. A caustic rich liquor accumulates in evaporator systems that cannot be further evaporated. This concentrated supernate takes up space in the evaporator system that could be used to form saltcake. Currently, there are significant quantities of concentrated supernate in the 2F and 2H Systems. It has been determined that Tanks 26, 27, 29, 30, 38 and 43 can be fed to ITP without excessive dilution or criticality concerns. Alternate feeds must be very carefully planned as they contain from four to ten times the potassium concentration versus the ITP feed flowsheet average, thus they generate large quantities of precipitate which rapidly fill Tank 49.

Tank 25 Salt Removal

Tank 25 will be the second tank fed to ITP. Tank 25 must be empty and returned to salt service before Tanks 27 and 46 are filled with salt. Tank 25 will be ready for waste removal 6/96 with the first transfer of salt solution to ITP occurring 2/97. Tank 25 dissolved salt will be blended with Tank 41 dissolved salt and concentrated supernate from Tanks 28 and 29 as well as unconcentrated supernate from Tank 32 to manage the Curie content of the feed to ITP. Slurry pump run-in and installation, and completion of construction punchlist activities comprise the bulk of the remaining Tank 25 TEC scope.

Because Tank 25 will be the first tank to undergo the waste removal graded startup process, it is referred to as the "Programmatic Waste Removal Tank". The startup approach used on Tank 25 will be the template for all succeeding tanks. Tank 25 will be the first F-Area tank to undergo waste removal. It will require completion of the F-Area common area support infrastructure as a predecessor to startup. These facilities include the motor control center, instrument control room, distributed control system, and bearing water makeup and distribution. Succeeding F-Area tanks will use this infrastructure. Tank 25 will also require the F/H IAL upgrade to be complete (see Section 8.7.2).

Tank 29 Salt Removal

Tank 29 will be the third tank to be fed to ITP. Now that the 1H Evaporator is planned to remain down, the RHLWE will start up dropping salt concentrate to Tank 30 instead of Tank 29. Tank 30 is projected to be filled by FY07. Tank 29 must therefore have all of the salt removed, the cooling coils replaced (if needed) and the tank returned to salt receipt service by FY07. Tank 29 is currently projected to be empty by FY06.

The Tank 29 concentrated supernate and subsequent dissolved salt will increase the Curie content of precipitate to close to the 36 Ci/gal ITP limit. This is important because H-Area has very little LHW salt that can be used to blend with HHW salt. Processing straight Tank 41 salt solution to ITP effectively reduces the available stock of blending material for HHW salt. Tank 29 concentrated supernate will therefore be "metered" into the ITP feed stream to avoid inefficiencies in future operations.

Tank 38 Salt Removal

Tank 38 will be the fourth tank fed to ITP. It must be emptied before Tank 41 is refilled or the 2H Evaporator will become saltbound. Tank 41 is projected to fill again by FY02 as all of the salt will not be removed in the first Tank 41 salt removal operation. Design on Tank 38 began in FY94 with the capital funding portion of Activity Data Sheet (ADS) 314-LI but was suspended in FY95 due to funding reductions. Salt removal is now scheduled to begin in Tank 38 in FY04 and complete FY08. This results in 2H Evaporator being down for five years (FY03 to FY08). Several options are being evaluated to provide a third salt tank for the 2H Evaporator system and/or to accelerate waste removal from Tank 38. This will be complete before the next revision of this Plan.

Tank 31 Salt Removal

Tank 31 will be the fifth tank fed to ITP. Salt removal from tank 31 must be complete before Tank 29 refills with salt in FY17. Salt removal from Tank 31 is scheduled to start in FY07 and be complete in FY11. Tank 37 is being considered in lieu of Tank 31. This is due to the difference in cooling coils. The Tank 31 coils will have to be replaced if the tank is refilled with salt. Tank 37 has coils similar to the newer Type III Tanks thus it will not require coil replacement.

Other Salt Tanks

The remaining salt tanks to be fed to ITP are shown in Appendix C.2. While almost all of the first sixteen sludge tanks emptied will be the old-style tanks, the same cannot be said of the salt tanks. The needs of the Tank Farm to handle normal waste receipts combined with sludge washwater and DWPF recycle dictate that those tanks that can be reused to store salt (i.e., the new-style tanks) must be emptied first. Of the old-style salt tanks, only Tanks 17, 19, 20 and 24 (all Type IV tanks emptied in the mid '80's) will be emptied of salt before the turn of the century.

8.9.2 Sludge Removal

Sludge removal is performed in a manner that yields six discreet batches (sometimes called "macro-batches" to distinguish them from the smaller batches used in ITP and DWPF) of sludge which will be individually segregated and characterized after pretreatment in ESP. Sludge batch #1 is currently in process in ESP Tanks 42 and 51. Sludge removal to support sludge batch #2 is several years away as only one of the three tanks that will constitute sludge batch #2 is in the early stages of design. The six batches are shown in Appendix J.2. All six batches have been modeled using CPES and PCCS and are projected to make an acceptable glass waste form.

At the time of this Plan, the limiting factor for HLW System attainment was the ability to fund waste removal operations on the salt and sludge tanks. The System attainment for the duration of the waste processing campaign will average 15% with a high of 16% for sludge batch #1.

8.10 Defense Waste Processing

8.10.1 Vitrification

The 12/95 DWPF startup schedule remains the same as in Revisions 2, 3 and 4 of this Plan. DWPF achieved several important milestones since Revision 4 of this Plan. The planned hydrogen/ammonia mitigation outage was completed. Waste Qualification Runs have started.

DWPF Startup Schedule

The startup schedule for DWPF remains unchanged from Revisions 2, 3 and 4 of this Plan. WSRC plans to declare readiness to start radiological operations 11/15/95. The DOE ORR is scheduled to be complete by 12/15/95. Two weeks are scheduled to complete resolution of findings, thus setting radioactive operations at 1/1/96. Radioactive Operations will commence with the introduction of a dilute sludge feed to confirm melter off-gas decontamination capability. This will occur per startup test FA-20, "Transition to Radioactive Operations" under the guidance of the DWPF Joint Test Group. Actual radioactive waste will continue to be incrementally introduced into the process so that final operating conditions and waste compliance criteria can be confirmed.

The current plan is to preceed FA-20 with a radioactive spike test. Eliminating the spike test has been proposed as dilute sludge can accomplish the same objective. This Plan assumes that the spike test has been eliminated although approval is still pending.

This schedule is shown in Appendix F. Note that there are outages scheduled for melter replacement after radioactive startup. The life of a melter is estimated to be two years, with five months assumed for replacement and restart. Melter life is not known and will be refined as operating experience is gained.

Startup Testing Program

The DWPF Vitrification Facility is currently undergoing a rigorous startup testing program, which is being implemented in five major phases: Integrated Water Runs, Cold Chemical Runs, Melter Heatup, Waste Qualification Runs, and Radioactive Operations. Integrated Water Runs were conducted from September 1990 through May 1991 to verify the basic operability and performance of facility systems required to support process operation. Water was used as the test fluid. Integrated Water Runs verified the operability of instrumentation, controls and interlocks for steam, condensate, service and instrument air, cooling water, HVAC and electrical distribution. Cold Chemical Runs were conducted from March 1993 through October 1993 to verify that the DWPF meets process design attributes. Tests were conducted using approved system operating procedures to demonstrate that functional design requirements were met. Cold Chemical Runs provided the first opportunity for integrated facility operation with process chemical and feed simulants to establish baseline process operating data, and to fully exercise all facility systems in support of startup testing. Cold Chemical Runs also verified process flowsheets, acceptable operating procedures, and operator performance. Cold Chemical Runs were followed by Melter Heatup testing, from April to August 1994, in which the DWPF melter was heated for the first time, and optimum control parameters for the melter and melter off-gas system were established.

DWPF began Waste Qualification Runs in December 1994. This testing phase will demonstrate plant-scale capability to make a quality canistered waste form, and will also demonstrate that the glass product will meet the requirements of the Waste Acceptance Product Specifications, which identify the requirements for canistered waste product acceptance at the federal repository. During Waste Qualification Runs, DWPF will be processing a non-radioactive simulated sludge and precipitate waste feed, whose composition will be varied over the range expected for actual radioactive wastes to demonstrate operating limits. Waste Qualification Runs will also test the facility's ability to recover mercury from the waste feeds. Mercury is a residual waste component resulting from separations processes, but it is incompatible with vitrification, and therefore it must be removed from the waste stream.

Production Capacity

In the near term, the average attainment of DWPF, and therefore the HLW System, will be limited by annual funding. This is different than previous revisions of this Plan where the ability to provide sludge feed for the next sludge batch was the limiting factor. Available funding has now been allocated in such a manner that no one facility limits the System attainment rate. Over the long term, the attainment rate is planned to be 15%.

Attainment is defined as the design capacity times the design utility of the DWPF plant. The DWPF, as well as the pre-treatment facilities, were designed to support glass production at 228 pounds per hour, 24 hours per day. The design capacity of DWPF is therefore calculated as follows:

$$\frac{228 \text{ lbs glass}}{\text{hr}} \times \frac{\text{can}}{3{,}705 \text{ lbs glass}} \times \frac{24 \text{ hr}}{\text{day}} \times \frac{365.25 \text{ day}}{\text{yr}} = 540 \frac{\text{cans}}{\text{yr}}$$

Therefore, 540 cans/yr is the design capacity, sometimes referred to as the instantaneous or nameplate capacity, of the DWPF. The DWPF design utility is 75%. Therefore, the maximum long term average attainment is (.75)*(540 cans/yr) = 405 cans/yr. This value is referred to as 75% attainment.

In FY96 and FY97, a period where funding is not so restrictive, attainment will average 26%. In the long term, attainment will average 15%. The attainment for each sludge batch and for the entire campaign is shown below. Note that the DWPF and the pre-treatment facilities can run at much higher attainments when not funding limited.

batch	start	glass poured (cans/batch)	batch duration (years)	glass poured (cans/yr)	attainment as % of 540 cans/yr (%)
1	1/96	1,236	14.23	87	16
2	4/10	782	9.65	81	15
3	12/19	1,513	18.68	81	15
4	8/38	971	12.00	81	15
5	8/50	774	9.56	81	15
6	3/60	441	5.44	81	15
		5,717	69.56	82	15

Recycle Handling

As a part of its normal operations, DWPF generates an aqueous recycle waste stream, which originates from two sources in the DWPF process: the melter's Off Gas Condensate Tank (OGCT) and the Slurry Mix Evaporator Condensate Tank (SMECT). A fixed amount of recycle waste is generated as long as the melter is heated because the melter's off-gas system is a major contributor to this stream. Additional recycle volume is generated with increasing attainment. From Melter Heatup through the end of Waste Qualification Runs, this stream is being trucked to ETF for treatment prior to release to a permitted outfall. However, after the start of Radioactive Operations, the recycle stream will be returned via the NWTF to the H-Area Tank Farm, where it will be stored and evaporated.

During radioactive operations, the recycle rate is calculated as folows:

$$\text{gpm} = 2.50 + (4.43)(\text{att}) + (0.16)(n)$$

where: att = attainment expressed as a fraction
n = the number of years after DWPF startup to a max of 4

Thus, the recycle over the long term is 2.5 + (4.43)(0.15) + (0.16)(4) = 3.80 gpm = 2,001,000 gallons per year. It is also important to note that the recycle rate when the plant is down is 2.50 gpm or 1,315,000 gallons per year. The source of this waste is the melter offgas system. Operation of the offgas system is required if the melter is to be maintained at temperature to avoid thermal cycling.

Mercury Disposal

Mercury, which becomes entrained in the sludge as a result of Separations processing, is removed from the sludge during DWPF processing. Initial plans for disposition of this mercury stream called for the mercury to be returned to the Separations facilities for re-use in their processes, but evolving site missions have precluded re-use of the mercury stream. Since mercury is a listed, hazardous substance under RCRA, it must be disposed in compliance with RCRA regulations. The current Best Demonstrated Available Technology (BDAT) for mercury disposal is amalgamation, and three options for dispositioning the mercury are currently being evaluated: offsite sale, amalgamation in DWPF, and amalgamation at INEL. Contaminants in the DWPF mercury stream may necessitate pre-treatment before amalgamation, or they may preclude amalgamation altogether. Samples of actual mercury generated after the start of DWPF Radioactive Operations will be collected and tested to verify what disposal options are technically feasible. Until such a determination is made and disposition plans are finalized, the DWPF mercury will be stored at an on-site permitted storage facility.

Replacement Melters

Ongoing vitrification operations will require periodic melter replacement. Deposition of noble metals, which would short-circuit the melter electrodes, is the most likely mode of melter failure. SRTC estimates that the life expectancy for a melter will be two years. Replacement melter projects are therefore planned accordingly.

Melter #1 is already installed and is being used for DWPF startup testing. Melter #2 is onsite and construction modifications are approximately 95% complete. The melter vessel and frame for Melter #3 are on site and other major components (riser pour spout assembly, dome heaters, drain valve, refractories, etc.) are in procurement.

Overall lead time for a replacement melter project, from project inception through actual installation in the DWPF, is approximately 5 years. This allows for: procurement of special materials such as Inconel stock and components which can take one year; construction of the melter vessel and frame which is also a one year-long effort; 6-9 months of on-site assembly of the various components; and two years of standby in the event of a pre-mature melter failure.

8.10.2 Late Wash

Startup Schedule

Late Wash remains on schedule for a 5/8/96 startup authorization. Design and construction is proceeding on schedule to support that date. The operating staff assigned and operator training was well underway, however, this staff was lost due to the Reduction in Force. It is planned to staff Late Wash from within the existing Vitrification plant staff. Washed precipitate is projected to be available as feed to Late Wash 8/30/96. Efforts are ongoing at ITP to improve this date.

Testing Program

The startup testing program for Late Wash will build upon the programs utilized in DWPF. A series of planned equipment tests will be conducted to verify the operability of each system. Field testing will be followed by a WSRC Readiness Self-Assessment (RSA) addressing design, construction, testing, training, procedures, and safety documentation. Other functional areas will have been covered by the DWPF RSA.

Production Capacity

The Late Wash cycle time is planned to be 93 hours. This cycle time is based on cleaning the crossflow filters after every batch. It is possible that less cleaning will be required, particularly as precipitate absorbed dose is reduced, however, the conservative assumption is used until radioactive operations data is available. The batch size is planned to be 4,000 gallons per batch. Operating with no downtime, Late Wash could support a DWPF attainment of 90%. If Late Wash operates at 75% attainment, then it could support a DWPF attainment of 67%.

8.10.3 Saltstone Facility

ITP schedule delays and decreased ETF throughput have begun to limit Saltstone's opportunities to operate. Production runs were initially scaled back to once per quarter, but concerns remained that this was too infrequent to maintain operator skills and equipment reliability. Therefore, short production runs are now scheduled on a monthly basis, using clean water as the feed material. An additional option may be to continue treating the DWPF recycle stream at ETF, but divert the treated recycle to Tank 50 instead of releasing it to the outfall. The latter option is not sufficiently developed to include in this Plan.

Operating plans for a two-shift operation have also been scaled back to a single shift operation because of limited feed. The single-shift schedule will continue during ITP's initial operations. Overtime will be used if necessary to keep pace with ITP filtrate production levels.

Vaults

Saltstone operations require periodic construction of additional vaults, capping of filled vault cells and construction of permanent roofs for Vaults #1 and 4. The required schedule for these repetitive projects is dependent upon the ITP production plan. As described in Section 8.4, this production planning process has been started and is providing information to assist in vault planning. Each vault cell can hold 232,000 cubic feet of saltstone, or approximately 1.1 million gallons of Tank 50 salt solution. The timing of Vaults #2 & 3 supports the planned near term ITP production plan, as shown in Appendix J.2. Saltstone operations and vault construction are shown in Appendix F. The timing of outyear vaults is based on the ITP flowsheet average.

Currently, construction of Vault #1 is complete and the vault is in service. Vault #1 has 6 cells, 2.5 of which are already filled. The Vault #1 operating plan is as follows: as each cell is filled, a 1 foot thick clean concrete isolation cap is installed and the Rolling Weather Protection Cover (RWPC) is moved to the next set of two cells. When all 6 cells are filled and capped, the RWPC will be dismantled and discarded, and a permanent roof installed.

Vault #4 construction is complete and this vault is also in service. One of its twelve cells has already been filled. Preparation of design and procurement specifications for a permanent roof, which can be installed more cost effectively before further filling of the vault, for Vault #4 is on hold pending availability of funding. Vault #4 filling is projected to resume in FY97.

Like Vault #4, Vault #2 has been designed with twelve cells. Unlike Vault #4, Vault #2 design includes a permanent roof. The design is complete and ready to put out for bids, pending availability of funding. The Vault #2 design is the prototype for future Saltstone vaults. Vault #2 filling is projected to start in FY99.

8.11 Consolidated Incinerator Facility

The CIF is currently scheduled to be complete in mid-1995, followed by a trial burn in October, 1995. There is a FFCA commitment to begin mixed waste operations by February 2, 1996. The CIF will become an integral part of the HLW system at the time when the 150,000 gallon Organic Waste Storage Tank at DWPF becomes full. Due to the low HLW System attainment operation, less cesium/potassium tetraphenylborate will be fed to DWPF, and therefore less benzene will be generated when compared to the design basis for the size of this tank. CIF is not expected to be required to support the HLW system until after FY99, well after CIF's forecasted startup date. Therefore, CIF is treated in a summary fashion in this document.

There is a CIF concern that could impact the HLW System operation. The CIF is included in the Waste Management EIS in parallel with continuing construction of the facility. Publication of the Waste Management EIS ROD is a prerequisite for the trial burn. There is a concern is that the ROD could delay CIF startup.

8.12 New Facility Planning

New Start Projects

Planned FY96 - 01 new start projects pertinent to the HLW System are shown in Appendix N. These projects can be identified by fiscal year as well as Activity Data Sheet number (38-LI for HLW New Facility Planning projects and 25-LI for DWPF). The projects that are supported in the FY95 AOP and FY97 FYP have a fiscal year designation. Unfunded projects have a "TBD" designation in the "FY" column. Note that the two Benzene Abatement projects, which could be needed in FY98 or shortly thereafter, are not funded.

Repetitive Projects

The Saltstone Vaults, DWPF Glass Waste Storage Building, Replacement Glass Melters, and Failed Equipment Storage Vault projects have been deferred consistent with a "just in time" philosophy. There is some program risk inherent in this approach particularly with the latter two projects as there is no actual operating data on the DWPF first-of-a-kind melters. The assumption of this risk was determined to be necessary to maintain the attainment of the HLW System as high as possible after DWPF startup. While this approach to balancing the projected funding generates significant funding for other programs, it also means that future attempts to accelerate the HLW System attainment must accelerate the entire series of each of these repetitive projects.

Tank Farm Services Upgrade (H-Area)

The FY96 Tank Farm Services Upgrade project is part of an overall program to upgrade the deteriorating conditions in aging Tank Farm facilities and is required for environmental protection and compliance with DOE Orders. This project is primarily focused on H-Area with some F-Area scope included. This project has four parts: service piping upgrades, new steam supply lines and waste transfer equipment for Tanks 35-37, cooling system upgrades for the H-Area Tank Farm "East Hill," and electrical upgrades for the F-Area Tank Farm. The existing service lines have been developing below grade leaks that are difficult to locate and expensive to repair. The upgrades will correct this situation by installing new above grade piping to enhance accessiblity, minimize future maintenance costs, and improve reliability. The new steam supply lines and waste transfer equipment for Tanks 35-37 will reduce the potential for backflow of waste into steam supply lines, which could lead to waste being released to the environment in the event of a steam leak. The cooling upgrades for the East Hill will ensure that the ESP and ITP facilities will be able to operate efficiently and within specified Operational Safety Requirements. The F-Area Tank Farm electrical upgrades will correct an overload condition, which is currently causing power interruptions and operational downtime.

These upgrades are required to support planned operations and to maintain the aging Tank Farms in a safe condition. Further delays in this project would result in reduced HLW System attainment levels, unnecessarily high maintenance costs, non-compliances with DOE Order 5820.2A, and increased environmental risks.

Tank Farm Storm Water Upgrades

This FY99 project will provide equipment to relieve the current storm water flooding that occurs in the Tanks 9-12 area of the H-Area Tank Farm. In the past, this condition has resulted in storm water standing on top of Tanks 9-12 and actually leaking into the tanks. In a worst case scenario, the head space in a waste tank could be filled with water causing direct communication between the tank contents and the standing water in the Tanks 9-12 area. The same could happen with the HDB-2 complex. As an interim measure, three foot tall dikes have been constructed around the perimeters of Tanks 9-12 to keep the flooding out. This project is also a predecessor to designing and installing waste removal platforms on Tank 11. Without this project, the hydrostatic loading on Tank 11 must be considered in addition to the weight of the slurry pumps and support structures.

Tank Farm Support Services Upgrades (F-Area)

This FY00 project will replace the aging, below grade support services in the F-Area Tank Farm with new above grade lines. These services include steam, chromated cooling water, domestic water, plant and instrument air, and breathing air. The need for this project is evidenced by the extended steam outages experienced by the 2F Evaporator in FY94 and FY95. What should have been routine three or four day outages became one and two month outages. Once excavated, long line segments have been found to be in poor condition rather than isolated leaks or point failures. These conditions are indicative of the age of the services, the newest of which were constructed in 1978-80.

8.13 Alternate Technologies

Alternate technologies are continually being investigated, albeit at a reduced rate given the budget, to replace existing processes at a cost savings. Several such technologies are described below and are part of the HLW Technology Plan.

SMECT Evaporator

The Slurry Mix Evaporator Condensate Tank (SMECT) is a vessel in DWPF that collects the condensed overheads from the Slurry Mix Evaporator. This stream is later combined with other waste streams in the Recycle Collection Tank for transfer back to the Tank Farm for evaporation. The SMECT portion of the recycle stream is about half of the total volume and is expected to be low in radionuclides. Therefore, this stream could be segregated from other recycle stream components for later reuse in the Tank Farm or it could be treated and disposed by some inexpensive method such as evaporation, ion exchange, etc. Funding was provided in the FY95 AOP to investgate disposition or traetment of this stream. The study is complete and the report is being drafted. The preferred option will be to segregate the SMECT stream and store it in the Tank Farm for salt dissolution.

Ion Exchange Skid Testing

An existing 20 gpm skid unit was previously purchased using OTD funding, with the intention of using it to conduct test runs with waste simulating conditions at Hanford, Oak Ridge and SRS. The objective of the test program was to determine resin physical strength, resin stability, hydraulic degradation, fines removal, column pressure drop, decontamination factors, resin life, elution characteristics, filtration attributes and resin removal techniques. Construction activities to connect the unit to support services and tankage were nearly completed when funding ran out. In the wake of funding uncertainties, Oak Ridge has withdrawn from the effort and is conducting their own research in-house. Hanford has issued a bid request for their work, and SRS has submitted a bid to conduct the tests using the skid unit. In the meantime, work on SRS applications has been limited to bench-scale testing in SRTC's High Level caves.

DWPF Analytical Laboratory Improvements

DWPF Analytical Laboratory personnel and SRTC personnel are jointly investigating methods to improve waste sample analysis turn-around time in the DWPF Analytical Lab, which has been highlighted in the past as a limiting factor in DWPF attainment. Current efforts are focusing on use of a direct slurry dissolution technique, in which sample analyses can be conducted directly upon a smaller sample of waste, instead of drying, grinding, redissolving and vitrifying a larger sample. This method would be applied the samples drawn on the SRAT, SME and MFT, where a combined sample cycle turnaround time could be reduced from approximately 80 hours to approximately 40 hours. A statistical analysis of the proposed method is being conducted to determine how much on-line data is needed to satisfy PCCS needs. At the same time, an interdisciplinary team is developing a protocol for implementing this and other laboratory changes as needed in the future. The new technique will require little if any hardware changes, and so should be on-line before the start of Radioactive Operations.

Long term improvements will focus on increasing redundant capabilities in the lab. This would allow similar analyses for different samples to be conducted in parallel, and would minimize laboratory downtime (and thus process downtime) in the event of an equipment failure.

Benzene Abatement Projects

Some preliminary studies have been conducted to identify what types of design modifications might be required if and when new regulations are promulgated. Catalytic oxidation, thermal oxidation and open flaring, carbon adsorption, and other emerging technologies have been considered. When compared on the bases of fire safety, industrial safety, radiological safety, proven technology and performance, environmental concerns and flexibility to handle variable process conditions, catalytic oxidation emerged as the most favorable option. Several facility modification scenarios for implementing benzene abatement at DWPF and ITP have been proposed, but none have been studied in detail. DOE has determined that since no applicable benzene emission standards have been promulgated, no regulatory driver exists for implementing benzene abatement equipment, and therefore no funding has been allocated to this effort to date.

WSRC issued a report titled "Benzene Abatement Assessment for the Defense Waste Processing Facility and the In-Tank Precipitation Facility," in December 1994 which details these regulations and proposed facility modifications.

Canister Fabrication Techniques

The current DWPF canisters are assembled from four components made of 304L stainless steel. The body of the canister begins as a flat plate, which is annealed, pickled, rolled, and conventionally welded longitudinally. The top and bottom heads are hot formed, annealed, pickled, and reformed cold to meet dimensional specifications. The top and bottom heads are welded to the canister body, and the nozzle is welded to the top head. Four hundred of these canisters are being fabricated by Coors.

Although the Repository's long term (5,000 years) performance requirement for the vitrified waste is based on only the glass matrix, the canister does provide confinement of the the glass waste form during on-site storage and shipment to the Repository. Since stainless steel is a relatively new material, its long-term performance has not been established, but we do know that welds in stainless steel are vulnerable to failure. Therefore, other canister designs with fewer welds, or with welds in non-glass contact areas, are being evaluated.

Deep drawn canisters are made of top and bottom halves that are deep drawn and annealed and then conventionally welded at half height, with a nozzle welded to the top head. Two deep drawn canisters fabricated by Norris Industries have been received at DWPF and filled with simulated waste glass during Waste Qualification testing. These canisters are being subjected to extensive analytical testing at TNX and PNL. A report on the test results is expected in FY95.

Stirred Melter

Slurry-fed melters have been developed in the United States, Europe and Japan for the conversion of high level wastes to borosilicate glass for permanent disposal. These melters fall into four categories: batch melters, continuous pot melters, Joule-heated ceramic lined melters (in use at DWPF), and stirred melters. The stirred melter is the newest design. It's advantages include combining the high production rates and high glass quality features of the Joule-heated melters with the low cost, compact size and simple maintenance features of the pot melters. However, further engineering design and test demonstrations are needed to determine the feasibility of operating a stirred melter on a large scale.

Recognizing some of the possible handicaps of a Joule-heated melter design, an Advanced DWPF Glass Melter Team was formed in the late 1980's to develop an alternative melter design in case the existing DWPF melter design was not feasible. In FY92, WSRC and Westinghouse Hanford Company (WHC) began a joint test program to develop a full scale (240 pounds per hour) stirred melter for possible use in the DWPF and the Hanford High Level Waste Disposal Program. A full-scale stirred melter was purchased from Stirred Melter, Inc. and delivered to SRS in October 1994. No further work is planned at this time due to budget cuts.

Researchers at Clemson University have been operating a small-scale stirred melter since 1993. Although this melter pot measures only 6" x 6", it mimicks the existing DWPF Joule-heated melter in every way except for the lack of superheaters on the stirred melter pour spout. A variety of simulated wastes have been successfully vitrified in the Clemson stirred melter, including waste water treatment sludges; M-Area sludge; resorcinol-formaldehyde ion exchange resin mixed with DWPF feeds; Oak Ridge wastes, and Rocky Flats wastes. Further testing is planned with other ion exchange resin formulations. This work is ongoing, and is funded through the DOE Office of Technology Development.

8.14 Alternative Process Evaluations

• "In-Situ" ESP Sludge Washing

This alternative is based on washing sludge "in-situ" in the tank in which it currently resides, i.e., Tank 8 sludge would be washed in Tank 8 prior to transfer to ESP Tank 40 or 51. This alternative takes advantage of the fact that the equipment required to remove sludge from a tank is virtually the same as the equipment required to wash sludge in a tank. The advantages of this alternative are:

- the ESP washwater load can be easily spread among the three evaporator systems after the RHLWE is operational,
- the salt resulting from evaporation of the ESP washwater can be spread anmong several salt tanks in each area (F or H),
- washing of two or more tanks can proceed in parallel, and
- the possibility exists to eliminate the need for using Tank 42 as an ESP tank and utilize it for salt receipt service, thus eliminating the projected five year downtime for the 2H Evaporator in FY03-08.

The disadvantages of implementing this alternative are:

- the expense of outfitting Tank 42 for salt receipt,
- the increase in wash water requirements when not co-washing,
- the expense of resolving technical and engineering issues, and
- the expense of outfitting Tanks 40 and 51 with aluminum dissolution equipment .

Technical concerns identified to date center around removing the sludge in Tank 42 prior to placing salt in the tank and the increased hydrogen generation rate as the nitate is washed out of the sludge . The cost of outfitting a tank for salt removal is being estimated. This option is being pursued aggressively.

• "Just in Time" ITP Option #1

This alternative involves concentrating and washing precipitate in Tank 48 and feeding Late Wash directly from Tank 48. Using this flowsheet, ITP would produce a 40,000 gallon batch of washed precipitate in about 33 days, then go down for 60 days while feeding Late Wash. Tank 49 would be used as the emergency spare for Tank 48 and, hopefully, for the H-Area Tank Farm as well. The advantages of this flowsheet are:

- reduced precipitate absorbed radiation dose and all ill effects attributed to dose,
- reduced source term in the ITP facility,
- reduced Composite Lower Flammability Limit concerns,
- reduced STPB requirements and better cycle times at Late Wash, and
- the potential to eliminate the need for Tank 49 in ITP service.

The disadvantages of this option are:

- the expense of outfitting Tank 49 for spare service,
- ITP and Late Wash would be coupled more closely,
- the expense of revising procedures and safety documents, and
- the reduced blending downstream of ITP that occurs in Tank 49 in the current ITP flowsheet

The technical concerns identified to date center around precipitate blending issues.

• Batch Operations

This alternative involves changing the operating schedule in several facilities from continuous to batch. An example is "Just in Time" ITP above. ITP operates one month, then goes down two months while DWPF and Late Wash come up to consume the feed prepared by ITP. Another example is ETF. This facility operates 3 days and is then down for 4 days. The idea is to find an operating schedule for each facility that can support all of the other facilities but with less manpower. It may be possible to have one group of operators that can operate two or more facilities. Thus far, the major issues concern the time and money to cross-train the operating, technical and maintenance staffs to work in more than one facility. This alternative will continue to be evaluated.

• Alternate Waste Removal Options

This alternative involves developing and demonstrating different methods to remove waste from tanks that are less expensive than slurry pumps. One option under evaluation will use water monitors, sometimes called water cannons or water jets, to dissolve salt or suspend sludge. This technique has been used successfully at Oak Ridge, Hanford and SRS. In the application envisioned at SRS, a high pressure water jet is installed in a waste tank with heated inhibited water impinging on exposed salt. A transfer jet located deep in the salt matrix is operated at the same rate as the water addition. As the water travels through the salt matrix, it will gradually approach saturation. Another option under evaluation is referred to as "modified density gradient" which is believed to be an improved version of the process used to remove salt from Tanks 10 and 20.

This alternative can be combined with other operations or applications. It has been used for sludge removal at Hanford and Oak Ridge. The use of water jets could reduce the number of slurry pumps required on salt and sludge tanks. They could also be used for spot cleaning of sludge or zeolite masses not removed by conventional techniques.

The advantage of this alternative is reduced cost versus slurry pumps. The disadvantages may be that additional salt solution is generated and any technical concerns that arise. Technical issues identified to date concern criticality and dissolution kinetics. This alternative will continue to be pursued.

- "Just in Time" ITP Option #2

This option would use a 16,000 gallon stainless steel tank to precipitate, wash and feed Late Wash. This enables a more continuous flowsheet versus ITP Option #1 above. The benefits of Option #2 are the same as for Option #1 except that the absorbed radiation dose is much less; on the order of a few megarads, and Late Wash could be eliminated. The annual operating cost savings could be very significant, possibly on the order of $10 million per year.

There are two disadvantages of Option #2 versus Option #1: 1) a new Line Item project would be required or a major addition to an existing Line Item project on the order of $20-50 million, and 2) the time required to design, build, test and start up a new facility. For these reasons, this alternative is not being pursued.

- "Just in Time" ESP

This alternative would replace the ESP facility with a new facility containing several small tanks arranged in series and used to conduct a leach-heat treatment for aluminum dissolution and a second series of tanks to conduct a counter-current decantation thickening process. A total of 12 tanks would be needed, none with a working capacity of more than 6,000 gallons.

The advantages of this process are reduced washwater generation and the potential to return two of the three ESP tanks back to salt service. The disadvantages are that a new Line Item project would be required to implement this alternative and blending of sludge could be reduced depending on how the concept is implemented. This alternative is not being pursued.

Appendix A - HLW System Description

High Level Waste

High Level Waste is defined as the highly radioactive waste material that results from the reprocessing of spent nuclear fuel. This includes liquid waste produced directly in reprocessing and any solid waste derived from the liquid. HLW contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation.

SRS liquid waste, as received in the waste tanks, is made up of many waste streams generated during the recovery and purification of transuranic products and unburned fissile material from spent reactor fuel elements. The waste is neutralized to excess alkalinity (pH 10 to 13) before transfer to the Tank Farm underground storage tanks.

HLW is segregated in the F and H-Area Canyons according to Curie and heat content. High Heat Waste (HHW) is generated during the first extraction cycle in the Separations Canyon and contains most of the radioactivity. Low Heat Waste (LHW) is generated from the second and subsequent extraction cycles in the Canyons. HHW is aged one year or more in HLW tanks to reduce the concentration of short-lived radionuclides before evaporation.

Waste Tanks

Waste Management operates 51 waste tanks and 2 evaporators (two other evaporators have been retired and there are no plans to reactivate them) for the purpose of safely storing and volume reducing liquid radioactive waste. The major waste streams into the F and H-Area Tank Farms include HHW, LHW, receipts from RBOF, and DWPF recycle (future). Other major miscellaneous inputs internal to the Tank Farm include additions and byproducts of processes required for preparation of DWPF feed such as sludge washwater, sludge removal decant water, sludge aluminum dissolution washwater, tank interior and annulus spray washing, inhibitor additions for corrosion control, caustic used for aluminum dissolution, and recycle of washwater from the planned Late Wash facility.

Of the 51 tanks, 29 are located in the H-Area Tank Farm and the remainder are located in the F-Area Tank Farm. All of the tanks were built of carbon steel inside reinforced concrete containment vaults, but they were built with four different designs. The newest design (Type III) has a full-height secondary tank and forced water cooling. Two designs (Types I and II) have five foot high secondary annulus "pans" and forced cooling. The fourth design (Type IV) has a single steel wall and does not have forced cooling.

Evaporators

Each Tank Farm has two single-stage, bent-tube evaporators that are used to concentrate waste following receipt from the Canyons. HHW is segregated and allowed to age before evaporation. The aging allows separation of the sludge and supernate and also allows the shorter-lived

Appendix A - HLW System Description

radionuclides to decay to acceptable levels. LHW is sent directly to an evaporator feed tank. The sludge settles to the bottom of the feed tank, and the supernate can be processed immediately through the evaporator. Salt crystallized from high-heat waste and low-heat waste is also segregated in separate tanks because the high-heat waste salt must be stored for a number of years (up to 12 years), primarily to allow decay of ^{106}Ru before ITP/DWPF/Saltstone processing. The low-heat waste can be processed in 0 to 3 years.

Radioactive waste, as received and stored in the Tank Farms, can be reduced to about 25% of its original volume and immobilized as crystallized salt by successive evaporation of the liquid supernate. Such a dewatering operation has been carried on routinely in F-Area since 1960 and in H-Area since 1963. Since the first evaporator facilities began operation in 1960, approximately 105,000,000 gallons of space has been reclaimed. Seventy additional waste tanks valued at more than $50 million each would have been required to manage this waste had evaporation not been used.

The 2F Evaporator currently processes high and low-heat waste. The 2H Evaporator processes low-heat waste only. The 1H and 1F Evaporators are planned to remain down. Another evaporator, the Replacement High Level Waste Evaporator (RHLWE), is being constructed to enable the Tank Farm to process future waste loads. The new evaporator will have more than twice the capacity of the 2H and 2F Evaporators and will be able to accept the DWPF recycle (a low activity waste stream of about 1.5 to 3.6 million gallons per year that contains very little solids) in addition to high-heat waste.

Each evaporator is equipped with a Cesium Removal Column (CRC) located in a riser through the top of a waste storage tank. These columns remove cesium from the evaporator overheads condensate produced by the concentration of waste supernate. The columns are normally maintained off-line and placed in service only if required to reduce the cesium concentration prior to transferring the condensate to the Effluent Treatment Facility. The CRC is capable of achieving cesium decontamination factors of 10 to 200 depending on the cesium concentration of the feed. When the zeolite becomes fully loaded, it is discharged directly to the waste tank and replaced.

Waste Removal Program

The primary objective of the High Level Waste System is shifting from waste storage to removal of radioactive waste from the older style tanks to prepare the waste, including liquid, salt, and sludge, for feed to the DWPF. The waste removal program includes removal of salt and sludge by mechanical agitators, cleaning the tank interior by spray washing of the floor and walls, and steam/water cleaning of the tank annulus if necessary. The waste processing program includes decontamination of the salt and liquid for incorporation into saltstone and aluminum

Appendix A - HLW System Description

dissolution and washing of the sludge for feed to the DWPF.

The schedules for waste removal and waste processing are closely linked to each other and with the DWPF schedule. The scheduling objective is to remove the waste from the Types I, II, and IV Tanks as rapidly as possible without exceeding the capacity of the Tank Farm processes or the DWPF.

Processes and equipment for waste removal and waste processing have been developed and demonstrated in several successful full-scale radioactive demonstrations. Sludge removal by hydraulic slurrying and chemical cleaning with oxalic acid has been demonstrated in Tank 16. Salt removal and sludge removal using mechanical agitation has also been demonstrated on Tanks 15, 17-22 and 24. Facilities have been designed using data and experience gained from these demonstrations. To date, 2.3 million gallons of salt and 1.1 million gallons of sludge have been removed from Types I, II, and IV Tanks.

The Waste Removal Program is a series of projects that install waste removal equipment on the existing waste tanks. The objective of the Waste Removal Program is to remove the waste contained in the tank primary vessel so that the tank can be reused or retired. In general, the Type III tanks will be reused while the Type I, II and IV tanks will be retired when all waste has been removed. The tanks to be retired will also undergo a water washing operation in the primary vessel and an annulus cleaning operation in the annulus if the annulus is contaminated.

Waste removal equipment consists of slurry pump support structures above the tank top, slurry pumps (typically three for salt tanks and four for sludge tanks), bearing water and electrical service to the slurry pumps, motor and instrument controls, tank sampling equipment, tank interior water washing piping and spray nozzles, pressurized wash water supply skids and H&V skids to augment the existing tank H&V during spray washing.

On salt tanks, the slurry pump discharges are positioned just above the saltcake level. Water is added to the tank, the slurry pumps are started and salt is dissolved. The dissolution ratio is typically 2 parts water to 1 part saltcake although this can vary up to 4 parts water per 1 part saltcake. The slurry pumps serve to displace the boundary layer of saturated water in contact with the saltcake and expose the underlying salt to unsaturated water. When the water is fully saturated, the dissolved salt solution is transferred to ITP; the slurry pumps are lowered and the process is repeated.

On sludge tanks, the four slurry pumps are typically positioned in the top layer of sludge, water is added and the pumps are started. When the layer of sludge is well mixed (i.e. the sludge is suspended) as indicated by sampling, the transfer pump is started and the suspended sludge is transferred to ESP. Note that the slurry pumps continue to operate during

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the transfer so that the suspended sludge does not resettle. The pumps are then lowered, more water is added, and the process is repeated. Sludge tanks require more pumps than salt tanks because the sludge must be agitated vigorously to suspend the sludge particles as opposed to dissolving saltcake.

For tanks that contain mixed salt and sludge, the salt will be removed followed by the sludge. The process is similar to salt removal described above except that the sludge is allowed to resettle before the saturated salt solution is transferred out of the tank.

When the salt or sludge contents have been removed from the old-style tanks, the tank interior is washed with heated water. The water is sprayed throughout the tank using rotary spray jets installed through the tank risers. The water is supplied to the jets by a skid mounted tank and pump system. For those tanks with contaminated annuli, recirculating jets are installed in the annulus through annulus risers and heated water is circulated in the annulus and then transferred to the waste tank primary. At the completion of water washing, there may be some residual waste that cannot be removed with water. Removal of this waste is not part of the scope of the existing Waste Removal Program and will be handled on a case-by-case basis as the Transition and Decontamination & Decommissioning missions are developed. Oxalic acid cleaning has been demonstrated in Tank 16 as a viable process to remove residual waste.

New Waste Transfer Facility

The NWTF is currently undergoing final startup testing activities. The facility consists of four pump tank cells and a large diversion box cell located inside a building outfitted with a remotely operated crane. This facility is the hub for transfers between the F-Area Tank Farm, the H-Area Tank Farm, and DWPF. It is currently scheduled to begin hot tie-ins in mid-1995 and hot operation in late 1995. The NWTF will replace the HDB-2 complex. It's primary mission will be to serve as a highly reliable and flexible receipt and distribution point for the DWPF recycle and Intra-Tank Farm streams.

F/H Interarea Line

The F/H IAL connects the F-Area and H-Area Tank Farms. The IAL is approximately 2.2 miles long with a high point at the middle and low points at each end. The line segments terminate at the high point in a small diversion box-type structure that is used to flush and/or vent the transfer lines. Flushing capability is provided by a portable 10,000 gallon tank that is filled by truck. The line segments that terminate at the low points do so in FDB-2 and HDB-2. These diversion boxes can be configured such that any tank in either Tank Farm can be transferred to any tank in the other Tank Farm.

The IAL piping consists of two three inch diameter core pipes inside of individual four inch diameter jackets. The core pipes are constructed of 304L

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Four slurry pumps in each processing tank supply the agitation for washing. Washwater that results from this process will either be transferred to an evaporator system or stored for reuse to dissolve saltcake, depending on the salt concentration. Tanks 21 and 24, both Type IV tanks, will be used for staging this washwater.

In-Tank Precipitation

Salt will be removed from the waste tanks and processed via ITP. ITP conducts a precipitation/adsorption reaction with sodium tetraphenylborate and sodium titanate in Tank 48. The resultant precipitate slurry is continuously pumped to a filter cell, filtered, and then returned to Tank 48. Filtering is continued until the precipitate reaches 10 wt % solids. The filtrate produced during the filtering step is collected, stripped of benzene, sampled and then pumped to Saltstone to be incorporated into a cement/flyash/furnace slag grout. The concentrated precipitate is washed to reduce the sodium content using the same filters as before and then transferred to DWPF. At DWPF, the washed precipitate is blended with washed sludge and incorporated into the glass product. ITP is the only currently planned process to remove salt from the Tank Farm inventory and thus keep the Tank Farm from becoming "saltbound".

F/H Effluent Treatment Facility

Low level aqueous streams currently sent to the F/H ETF from the 200-Areas consist of: segregated cooling water, contaminated surface runoff from the Tank Farms, some evaporator overheads, cesium removal column effluent, condensate from the Separations general purpose evaporator and acid recovery units located in Building 211-F, selected liquid regeneration wastes from the resin regeneration facility in H Area, and water collected in the H-Area catch tank from transfer line encasements.

The F/H ETF treats the waste water that was previously sent to seepage basins. The treatment process includes pH adjustment, filtration, organic removal, reverse osmosis, and ion exchange. The facility consists of process waste water tanks, treated water tanks, basins to collect contaminated cooling water and storm water runoff and a water treatment facility.

Facilities had not previously been available for treating all types of contaminated water releases from the Canyons nor were there facilities to send contaminated water in the retention basins to the Tank Farms for storage and/or treatment via the Tank Farm evaporators. The F/H ETF corrected this by providing treatment facilities for all types of low-level waste water.

The ETF has been used to support DWPF Cold Chemical Runs. Water and cold chemicals used in the DWPF Cold Chemical Runs test program after

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stainless steel while the jackets are carbon steel. The jackets are supported by concrete pedestals bearing on a concrete pad that runs the length of the IAL. There is also a protective concrete pad overlaying the IAL. The piping and concrete structures are below grade.

The IAL is currently out of service due to process support deficiencies in F and H-Areas. When the NWTF starts up, the H-Area end of the IAL will be disconnected from HDB-2 and connected to HDB-8. At that time, H-Area to F-Area transfers will be possible using the NWTF control and support systems. F-Area to H-Area transfers will not be possible until the F-Area support system is upgraded.

Once the IAL is fully operational, all F-Area waste will eventually be transferred to the H-Area ITP or ESP facilities for further processing. Also, H-Area HHW and future dilute waste from DWPF (recycle) and ESP (spent washwater) will be transferred to F-Area as feed for the 2F Evaporator.

Diversion Box & Pump Pit Containment

This project provides a containment building outfitted with a remotely controlled crane for H-Area Diversion Box 7 (HDB-7). The building will be a tension fabric design with a pedestal crane. HDB-7 is the hub for all transfers within H-Area as required to support H-Canyon, ITP, ESP and the 2H Evaporator. This project increases the reliability and utility of HDB-7 as well as reduces radiation exposure to personnel during routine maintenance.

Extended Sludge Processing

Sludge that is removed from waste tanks is washed in the ESP facility to reduce the concentration of soluble salt in the sludge before it is fed to the DWPF. Sludge processing includes four processing steps: 1) aluminum dissolution (required for H-Area HHW sludge) using sodium hydroxide and elevated tank temperature, 2) washing with inhibited water to remove dissolved solids, 3) gravity settling, and 4) decanting the salt solution to the Tank Farm for evaporation. Before washing, H-Area HHW sludge is transferred to Tank 42 and then mixed with sodium hydroxide to dissolve excess aluminum. The quantity of aluminum in other waste tanks is low and therefore does not require aluminum dissolution.

After aluminum dissolution in Tank 42, subsequent processing steps are conducted using two of three tanks (40, 42 and 51) that are rotated in round-robin fashion. For Sludge Batch 1, Tanks 42 and 51 will be used to wash sludge concurrently, with the wash water from the first tank being reused to wash the sludge in the second processing tank. When all washing is complete, the sludge is consolidated into one tank (Tank 51) to be fed to the DWPF. Processing begins again using the third tank (Tank 40) for co-processing with the empty tank from the prior batch (Tank 42).

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melter heatup have been trucked to the ETF because this stream could not meet the acceptance criteria of Horse Creek Valley, a local Publicly Owned Treatment Works. The Mercury Runs test program generates a similar waste stream that is spiked with trace amounts of mercury. In the past, this stream was to be trucked to the Tank Farm. Studies conducted by SRTC have shown that it is feasible to process this stream in the ETF. There is an aggressive program underway to make the necessary piping and process changes to enable the ETF to process the mercury runs recycle.

Defense Waste Processing

The DWPF consists of several facilities: the Vitrification process (commonly called DWPF), Saltstone, and Late Wash. These facilities will be discussed below. These facilities require several recurrent projects to maintain operations: additional Glass Waste Storage Buildings, Saltstone Vaults, Glass Melters, and Failed Equipment Storage Vaults (used to store failed melters and other large equipment). The recurrent facilities will not be discussed but will be shown on the Integrated Schedule and in Appendix N.

Late Wash Facility (LW)

The Late Wash Facility, located at the former Auxiliary Pump Pit, will receive washed precipitate from ITP. Late Wash will reduce the nitrite concentration in the precipitate by a filtration/dilution process in a stainless steel facility utilizing a crossflow filter. Sodium nitrite is added to ITP to mitigate pitting corrosion of carbon steel waste tanks and components. Nitrite, if not removed in Late Wash, results in high boiling organics in the DWPF process which foul heat transfer surfaces and plug filters and instrumentation. The Late Wash batch operation is designed to process approximately 4,000 gallons of precipitate every 91 hours. During the process, cesium in the precipitate slurry is reprecipitated, re-concentrated to 10 wt %, and washed to reduce the nitrite content in the slurry to ≤ 0.01M using a filtration process. The washed slurry is transferred to the Low Point Pump Pit for subsequent transfer to the DWPF. The filtrate produced during the filtering process is stripped of benzene, chemically adjusted, and transferred to Tank 22 for reuse in the ITP process.

Vitrification (DWPF)

The objective of the DWPF Vitrification process is to receive the liquid high-level radioactive waste which is processed in ITP and ESP and permanently immobilize it as a glass solid. The vitrification operations include chemically treating two unique waste streams, mixing them with ground borosilicate glass and then heating the mixture in a Joule heated melter to 1,130 degrees centigrade. The molten mixture is then poured into ten foot tall by two foot diameter stainless steel canisters and allowed to harden. The outer surface of each canister is then

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decontaminated to Department of Transportation standards, welded closed and temporarily stored onsite for eventual transport to and disposal in a permanent federal geological repository.

Saltstone (Z-Area)

The Z-Area Saltstone facility processes low-level radioactive liquid waste salt solution from the In-Tank Precipitation Facility and the Effluent Treatment Facility. The solution is mixed with a blend of cement, flyash and blast furnace slag to form a grout. The grout is pumped in disposal vaults where it hardens into a solid non-hazardous waste form for permanent disposal.

Solid Waste

Consolidated Incineration Facility (CIF)

The CIF, while not currently a portion of the HLW System, will play an important role in the success of the waste removal mission in the future. Benzene generated from the DWPF processing of the ITP precipitate will be incinerated in the CIF.

The CIF is being built to treat various site-generated combustible waste before final disposal and to reduce the volume of the current inventory of waste stored at SRS. The waste to be treated will include waste defined as hazardous by South Carolina Hazardous Waste Management Regulations and federal RCRA regulations, waste contaminated with low levels of beta-gamma radioactivity, and mixed waste that is both hazardous and low-level radioactive. The facility will not treat waste containing dioxins or polychlorinated biphenyls.

Facilities to be provided on the CIF project consist of a main process building which includes an area for boxed waste receipt and handling, a rotary kiln incinerator, ash removal, offgas cleaning, control room and support facilities. The rotary kiln primary combustion chamber will be used for the incineration of solids and various organic and aqueous liquid wastes. A secondary combustion chamber will also incinerate organic solvent waste as well as destroy any remaining trace hazardous constituents in the primary offgas. Offgas exiting the secondary combustion chamber will be cooled and treated by a wet offgas treatment system. Pollutants in the offgas will be removed to below regulatory limits before the offgas is discharged to the atmosphere.

Appendix B.1 - HLW System Safety Documentation

Process	Safety Documents	Comments
F and H Tank Farm	1, 7, 9, 10, 14, 15, 16,18, 21, 22, 23, 24, 26	
Evaporators	1, 7, 9, 10, 14, 15, 16, 21, 22, 23, 24, 26	
Replacement High Level Waste Evaporator	1, 7, 9, 10, 14, 15, 16, 21, 22, 23, 24, 26	Additional RHLWE-specific safety documentation will be developed.
Sludge Waste Removal	1, 7, 9, 10, 14, 15, 16, 21, 22, 23, 24, 25, 26	
Salt Waste Removal	1, 7, 9, 10, 14, 15, 16, 21, 26, 27	
Extended Sludge Processing	1, 6, 7, 8, 9,12, 14, 15, 16, 18, 21, 24, 25, 26, 29	
In-Tank Precipitation	1, 6, 7, 8, 9, 14, 15, 16, 18, 19, 21, 26, 27, 28	DOE approval of ITP SAR Addendum pending.
Defense Waste Processing Facility	2, 3, 13	DWPF safety documentation will transition from the CCR Safety Envelope to a complete SAR as facility startup testing proceeds.
Saltstone	4, 17	A JCO is in effect until the SAR is approved by DOE.
F/H Effluent Treatment Facility	30, 31	Current authorization basis for ETF is that it will be maintained as a Low Hazard facility.
Transfer Facilities (New Waste Transfer Facility, Diversion Boxes, Inter-Area Lines, Pump Pit Facilities)	1, 7, 9, 10, 14, 15, 16, 21, 22, 23, 24, 26, 33	
Consolidated Incineration Facility	5	The SAR has been approved by WSRC. DOE approval is expected 3/95.
299-H Maintenance Facility	14, 32	Current authorization basis for 299-H Maintenance facility is that it will be maintained as a Low Hazard facility.

Appendix B.1 - HLW System Safety Documentation

Note: The following list contains the primary nuclear safety documents associated with the High Level Waste System. It is not intended to be an all-inclusive list.

Safety Analysis Reports

1. DPSTSA 200-10, SUP18, August 1988
   "Safety Analysis - 200 Area Savannah River Plant Separations Area Operations/ Liquid Radioactive Waste Handling Facilities"

2. DPSTSA 200-10, SUP-20
   "Safety Analysis, 200 S-Area, Savannah River Site, Defense Waste Processing Facility, Operations"

3. WSRC-RP-92-975, Rev. 2, April 15, 1994
   "Defense Waste Processing Facility, Safety Envelope"

4. WSRC-SA-3, DOE Review Draft, September 1992
   "Safety Analysis Report, Z-Area, Savannah River Site, Saltstone Facility"

5. WSRC-SA-17 (Draft), December 1993
   "Safety Analysis Report, Savannah River Site, Consolidated Incinerator Facility"

Addenda to Safety Analysis Reports

6. WSRC-SA-15, Rev. 7, March 1995
   "Addendum - 1, Additional Analysis for DWPF Feed Preparation by In-Tank Processing"
   (Addendum to DPSTSA 200-10, SUP 18)

7. WER-WME-921136, Rev. 7, December 29, 1993
   "Tank Farm SAR Addendum Database (Error Corrections List)"

Operational Safety Requirements

8. WSRC-RP-94-303, Rev. 3, March 1995
   "241-82H Control Room - Operational Safety Requirements"

9. DPW-86-103, Rev. 1, February 1989
   "Operational Safety Requirements for Waste Management Operations"

10. WSRC-RP-92-1044, Rev. 0, January 1994
    "Interim Operational Safety Requirements for F and H-Area High Level Radioactive Waste Tank Farms"

Appendix B.1 - HLW System Safety Documentation

Operational Safety Requirements, con't

11. WSRC-RP-90-1124, Rev. 3, June 1993 (WSRC Approved)
"Operational Safety Requirements In-Tank Precipitation Process"

12. WSRC-RP-93-224, Rev. 1, August 1993 (WSRC Approved)
"Operational Safety Requirements Extended Sludge Processing"

13. WSRC-RP-92-838, Rev. 1
"Cold Chemical Runs Operational Safety Requirements"

Basis for Interim Operations/Justification for Continued Operation

14. WSRC-RP-92-964, Rev. 0, January 1994
"Savannah River Site Liquid Radioactive Waste Handling Facilities - Justification for Continued Operation"

    Note: DOE approved this document on April 5, 1994, for interim use while the Basis for Interim Operations is being developed.

15. SR-HLW-93-1736, Attachment 4, September 1993
"Hydrogen Deflagration in HLW Tank 241-FH" (Attachment to HLW-930743)
Expires May 1, 1994

    Note: An extension of the JCO was requested with authorization basis change noted in HLW-OVP-940106 that replaces this JCO.

16. HLW-OVP-940106, September 2, 1994
"Revised Authorization Basis Change Resolving the Hydrogen Deflagration Event Scenario for the Tank Farm Facilities"

    Note: Upon approval, this document replaces the SIRIM JCO SR-HLW-93-1736.

17. WSRC-RP-92-444, March 31, 1992
"Justification for Continued Operation of the SRS Saltstone Facilities (Z-Area)"

18. HLW-OVP-940168, December 1994
"Justification for Continued Operations of the H-Tank Farm Under Interim Seismic Safety Basis"

Appendix B.1 - HLW System Safety Documentation

Test Authorizations

19. WSRC-OX-89--15-001, Rev. 6, June 8, 1994
"Transfer of Salt Solution from Tank 50H to Saltstone"
Expires June 8, 1995

Technical Standards

21. DPSTS-241, Rev. 2, February 1992
"Technical Standard - Waste Tank Farms"

Safety Evaluations and Other Documents

22. SR-HLE-93-341, February 1993
"USQD - Potential Inadequacy in the Authorization Basis for Criticality Safety in the Waste Evaporators"

23. WSRC-TR-93-081, February 1993
"Evaluation of Potential Accumulation of Uranium and/or Plutonium in the HLW Evaporator System"

24. SR-HLE-93-557, March 1993
"USQD - Potential Inadequacy in the Authorization Basis for Criticality Safety Involving Evaporation of ESP Batch One Wash Water"

25. WSRC-TR-93-115, February 1993
"Nuclear Safety of Extended Sludge Processing on Tank 42 and 51 Sludge (DWPF Sludge Feed Batch One)"

26. SR-HLE-93-1736, September 1993
"USQD - Hydrogen Deflagration in HLW Tank 241-F & H"

27. WSRC-TR-93-171, March 1993
"Nuclear Criticality Safety Bounding Analysis for the In-Tank Precipitation (ITP) Process"

28. WSRC-TR-92-427, Rev. 3, June 1994
"Safety Evaluation of the ITP Filter/Stripper Test Run and Quiet Time Run Using Simulant Solution (U)"

Safety Evaluations and Other Documents, con't

29. WSRC-TR-93-207, Rev. 1, August 1994

Appendix B.1 - HLW System Safety Documentation

"Safety Evaluation of the ESP Sludge Washing Baseline Runs"

30. WSRC-TR-93-031, Rev. 1, April 1993
"Hazards Assessment Document Effluent Treatment Facility Balance of Plant"

31. SRL-NPS-920001, Rev. 1, January 1993
"Safety Envelope Evaluation of ETF Alarm Failure Incident"

32. PHR 200-H-33, Rev. 2, October 1990
"Periodic Process Hazards Review"

33. WSRC-RP-92-1396, (Draft) (Upon WSRC Approval)
"Safety Evaluation for the New Waste Transfer Facility"

Appendix B.2 - HLW System Environmental Documentation

Process	Environmental Documents	Comments
F and H Tank Farm	1, 2, 6, 10, 18, 19, 24, 25, 26, 34, 35	
Evaporators	1, 2, 6, 10, 18, 19, 24, 25, 26, 34, 35	
Replacement High Level Waste Evaporator	1, 2, 6, 10, 28	
Sludge Waste Removal	1, 2, 6, 10, 18, 19, 24, 25, 26, 34, 35	
Salt Waste Removal	1, 2, 6, 10, 18, 19, 24, 25, 26, 34, 35	
Extended Sludge Processing	1, 2, 6, 10, 18, 19, 25, 34	
In-Tank Precipitation	1, 2, 4, 6, 10, 18, 20, 24, 25, 34	
Defense Waste Processing Facility	3, 4, 5, 7, 8, 9, 11, 14, 16, 21, 23, 24, 30, 37	
Saltstone	3, 4, 8, 12, 16, 22, 31, 33, 38	
F/H Effluent Treatment Facility	1, 2, 13, 15, 24, 29, 36	
Transfer Facilities (New Waste Transfer Facility, Diversion Boxes, Inter-Area Lines, Pump Pit Facilities)	NWTF: 1, 2, 10, 24, 27 All Others: 1, 2, 6, 8, 10, 18, 19, 24, 25, 26, 34, 35	
Consolidated Incineration Facility	1, 7, 8, 16, 17, 24, 32	

Note: The following list contains the primary environmental documents associated with the High Level Waste System. It is not intended to be an all-inclusive list.

National Environmental Policy Act:

1. ERDA-1537, "Final Environmental Impact Statement - Waste Management Operations - Savannah River Plant - Aiken, South Carolina."

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2. DOE-EIS-0062, "Final Environmental Impact Statement - Supplement to ERDA-1537 - Waste Management Operations, Savannah River Plant, Aiken, South Carolina - Double Shelled Tanks for Defense High Level Radioactive Waste Storage."

3. DOE-EIS-0082, "Final Environmental Impact Statement - Defense Waste Processing Facility - Savannah River Plant, Aiken, South Carolina "

4. DOE/EIS-0082-S, "Final Supplemental Environmental Impact Statement, Defense Waste Processing Facility, November 1994, Department of Energy, Savannah River Site, Aiken, South Carolina

5. DOE-EA-0179, "Environmental Assessment - Waste Form Selection for SRP High-Level Waste"

Federal Facility Agreement:

6. Savannah River Site Federal Facility Agreement, Administrative Docket Number: 89-05-FF, effective August 16, 1993.

Land Disposal Restriction-Federal Facility Compliance Agreement:

7. Federal Facility Compliance Agreement; Savannah River Site, EPA Docket #91-01-FFR, EPA ID #SCI 890 008 989, March 13, 1991.

Resource Conservation and Recovery Act:

8. RCRA Part A Permit #SC1890008989 for Savannah River Plant, June 30, 1987.

9. RCRA Part B Permit Application for the Organic Waste Storage Tank, Volume VI, Interim Status.

South Carolina Department of Health and Environmental Control Industrial Wastewater Permits:

10. Permit #17,424-IW: F/H Area Tank Farms, March 3, 1993.

11. Permit #16783: Vitrification Facility, August 14, 1992.

12. Permit #12683: Saltstone Facility, July 18, 1988.

13. Permit #12870 and Addendums: Effluent Treatment Facility, September 30, 1988.

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14. Permit #17,596-IW, Late Wash, December 2, 1993

National Emission Standard for Hazardous Air Pollutants:

15. A033677, NESHAP Approval for Construction of the Effluent Treatment Facility; March 17, 1988.

16. EPA NESHAP Approval for Construction of ITP and DWPF; April 25, 1988.

South Carolina Department of Health and Environmental Control Air Quality Control Permits:

17. Permit #0080-0041-H-CG for the Consolidated Incinerator Facility, November 25, 1992.

18. Permit #0080-0041, Permit to Operate Seven (7) Diesel Generators at Waste Management Facilities in H-Area; May 18, 1993.

19. Permit #00800-0045, Permit to Operate Five (5) Diesel Generators at Waste Management Facilities in F-Area; February 20, 1990.

20. Air Quality Control Construction Permit #0080-0046-CE for Diesel Generator at the ITP Facility (241-4H).

21. Air Quality Control Permit #0080-0066 and Addendums, (DWPF Canyon Exhaust Stack); August 1993.

22. Air Quality Control Permit #0080-0080 and Addendums, (Z-Area Standby Diesel); October 9, 1989.

23. Permit #0080-0041-H-CH, Late Wash [DWPF]; August 18, 1994

National Pollution Discharge and Elimination Systems:

24. Permit # SC000175, NPDES Permit for Savannah River Site; September 24, 1986.

South Carolina Department of Health and Environmental Control Domestic Water Permit

25. Permit SC#405556: H-Area Facilities; April 21, 1988.

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26. Permit SC#405566: F-Area Facilities; May 3, 1988.
27. Permit SC#401118: New Waste Transfer Facility; April 18, 1988.
28. Permit SC#LS91007: Replacement High Level Waste Evaporator; May 2, 1991.
29. Permit SC#LS-233-W: Effluent Treatment Facility.
30. Permit SC#402186 and Addendums: Defense Waste Processing Facility, Domestic Water Distribution, Tank and Treatment; June 30, 1989.
31. Permit SC#400737: Saltstone, Domestic Water Lines and Tank; May 26, 1988.
32. Permit #M0023E1: 261-H CIF Domestic Water Permit; April 5, 1994.

South Carolina Department of Health and Environmental Control Landfill Permit

33. Permit #IWP-217, Saltstone Solid Waste Disposal Site, approved October 17, 1989.

South Carolina Department of Health and Environmental Control Sanitary Water Permit

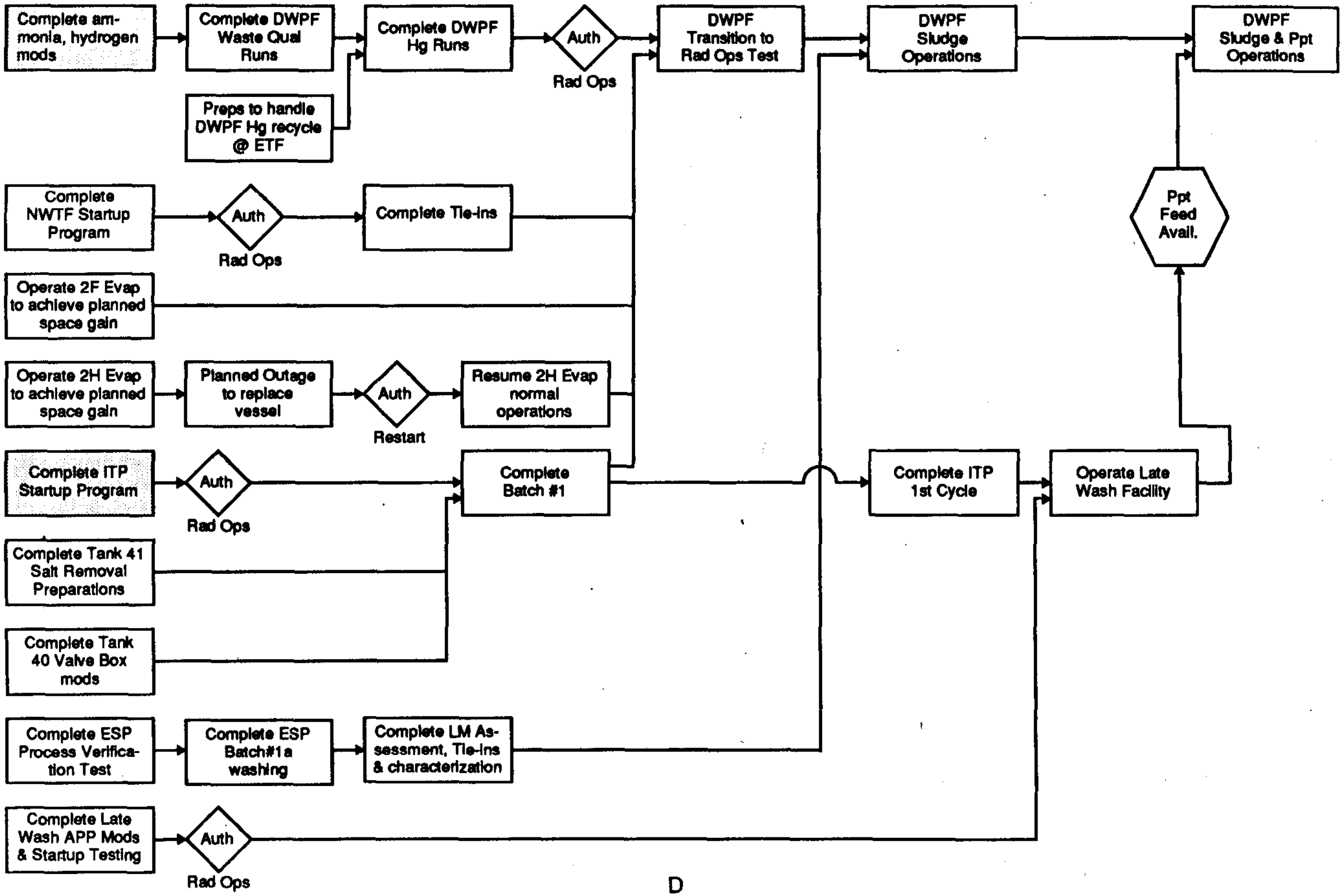
34. Permit #12910 and Addendum: H-Area Facilities.
35. Permit #9326 and Addendum: F-Area Facilities.
36. Permit #9998 and Addendum: Effluent Treatment Facility.
37. Permit #9888 and Addendum: Defense Waste Processing Facility; July 2, 1985.
38. Permit #13717: Saltstone, May 23, 1988.

Appendix C - Waste Removal Schedule

Tank	Leakage History ?	FFA Commitment Date (Fiscal Year)	Tank Emptied By Fiscal Year:												
			2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065
1	yes	2015					x								
2		2017						x							
3		2021							x						
4		2010				x									
5		2015							x						
6		2017							x						
7		2025				x									
8		2006		x											
9	yes	2014				x									
10	yes	2016					x								
11	yes	2006			x										
12	yes	2010				x									
13	yes	2016							x						
14	yes	2010				x									
15	yes	2005			x										
16	yes	na													
17		2027												x	
18		2027												x	
19	yes	2027											x		
20	yes	na											x		
21		2027											x		
22		2028												x	
23		2026												x	
24		2027												x	

Note: Sludge Batch #5 consists of Type III Tanks, thus there are no old-style tanks cleaned out from 2035 to 2050.

Appendix D - Process Logic Diagram



Appendix E - Process Logic Interactive Matrix

Process	Limiter	Solution	Dependent Upon
1. **Sludge Waste Removal**	1. Funding 2. Qualified manpower 3. Blending requirements 4. ESP processing rate 5. Evaporator capacity 6. Analytical lab capacity	1. Implement WSRC Site Prioritization Strategy; productivity improvements; slow down program 2. Ability to attract and keep qualified workers; maintain funding for core TEC and OPC groups 3. Continue to model batches; improve models 4. Complete ESP PVT to generate useful data 5. Tie the start of processing sludge batch #2 to the startup of the RHLWE 6. Complete ongoing study evaluating lab capacity vs needs, take corrective actions	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Impacts of RIF 3. Quality of sample data & analyses and models 4. Sludge settling time 5. Funding for the RHLWE 6. Priority of completing study vs other needs
2. **Salt Waste Removal**	1. Funding 2. Qualified manpower 3. Saltstone requirements 4. ITP startup date 5. ITP processing rate 6. ITP feed requirements 7. DWPF startup and processing rate 8. Analytical lab capacity	1. Implement WSRC Site Prioritization Strategy; productivity improvements; slow down program 2. Ability to attract and keep qualified workers; maintain funding for core TEC and OPC groups 3. Sample salt tanks and blend 4. Provide full funding, complete ITP ORR and start up asap 5. Complete evaluations at end of first three batches and first wash 6. Sample salt tanks and blend accordingly, evaluate higher Cl concentrations 7. Full fund DWPF and start up asap 8. Complete ongoing study evaluating lab capacity vs needs, take corrective actions	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Impacts of RIF 3. Quality of sample data & analyses and models 4. Funding; extent of ITP ORR findings 5. Funding and qualified engineers to evaluate data 6. Quality of sample data & analyses and models 7. Funding; extent of DWPF ORR findings 8. Priority of completing study vs other needs
3. **Evaporation**	1. Funding 2. Qualified manpower 3. Available salt receipt space 4. Availability/Utility of evaporators 5. Timely WM EIS ROD	1. Implement WSRC Site Prioritization Strategy; productivity improvements; slow down program 2. Ability to attract and keep qualified workers; maintain funding for core TEC and OPC groups 3. Provide funding to support timely salt removal from salt receipt tanks 4. Run ITP to process salt or concentrated supernate removed from salt receipt tanks 5. Develop a high quality WM EIS asap	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Impacts of RIF 3. Funding 4. Start date and processing rate of ITP 5. Availability of support for EIS development, justification for planned action, willingness of the public to accept planned action

Appendix E - Process Logic Interactive Matrix

Process	Limiter	Solution	Dependent Upon
4. Replacement High Level Waste Evaporator	1. Funding 2. Qualified manpower 3. Concentrate receipt space with adequate cooling 4. Timely WM EIS ROD	1. Implement WSRC Site Prioritization Strategy; productivity improvements; slow down program 2. Ability to attract and keep qualified workers; maintain funding for core TEC and OPC groups 3. Replace cooling coils in Tank 29; consider refilling Tank 37 in lieu of Tank 31. 4. Develop a high quality WM EIS asap	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Impacts of RIF 3. Funding for Tank 29 coil replacement, ability to empty Tk 29 before Tk 30 fills 4. Availability of support for EIS development, justification for planned action, willingness of public to accept planned action
5. In-Tank Precipitation	1. Funding 2. Qualified manpower 3. Startup Authorization 4. Technical Concerns: •Tank 41 Criticality •CLFL 5. Available Feed from Salt Tanks 6. Tank 49 not full 7. Saltstone operational 8. Saltstone Vaults	1. Implement WSRC Site Prioritization Strategy; productivity improvements; slow down program 2. Ability to attract and keep qualified workers; maintain funding for core TEC and OPC groups 3. Perform thorough RSA, resolve findings, justify readiness to start up 4. Justify and support studies/technical bases 5. Provide funding for salt removal tanks 6. Start up and operate Late Wash/DWPF; carefully control potassium content of planned ITP feed 7. Provide funding to operate Saltstone 8. Provide funding to construct new vaults	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Impacts of RIF 3. Quality of readiness reviews; willingness of DOE to quickly authorize startup 4. Willingness of oversight groups to accept WSRC/DOE-SR conclusions 5. Funding; other priorities 6. Knowledge of tank contents 7. Funding; other priorities 8. Funding; other priorities; lead time to build vaults
6. Extended Sludge Processing	1. Funding 2. Qualified manpower 3. Slurry pump seal leakage 4. Completion of PVT 5. Available feed from sludge tanks 6. Evaporator capacity 7. DWPF feed specs	1. Implement WSRC Site Prioritization Strategy; productivity improvements; slow down program 2. Ability to attract and keep qualified workers; maintain funding for core TEC and OPC groups 3. Complete PVT; conduct testing/evaluation in parallel; implement pump repairs 4. Complete PVT on schedule; fund emergent work through productivity improvements 5. Provide funding for sludge removal tanks 6. Fund and start up RHLWE, reuse washwater as possible 7. Complete development of specs; model batches; adjust accordingly	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Impacts of RIF 3. Successful completion of ITP startup and funding for repairs 4. Successful completion of ITP startup and allocation of resources to ESP 5. Funding; other priorities 6. Funding 7. Funding; knowledge of tank contents

Appendix E - Process Logic Interactive Matrix

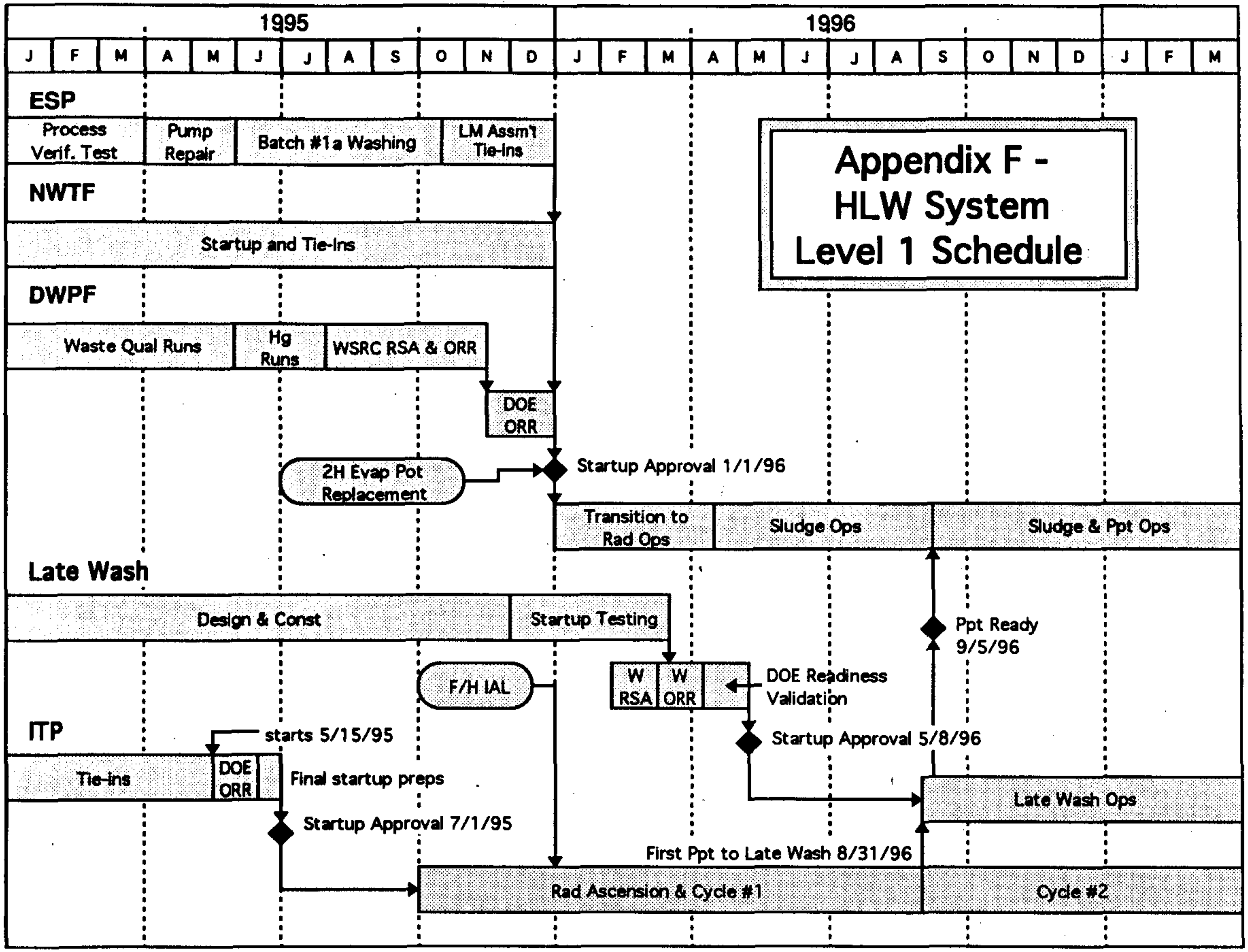
Process	Limiter	Solution	Dependent Upon
7. Late Wash	1. Funding 2. Qualified manpower 3. Startup Authorization 4. Technical Concerns: •Filter Operation •Benzene Stripping 5. Tank 22 available for recycle of wash water 6. Feed available from Tank 49	1. Implement WSRC Site Prioritization Strategy; productivity improvements; slow down program 2. Ability to attract and keep qualified workers; maintain funding for core TEC and OPC groups 3. Conduct thorough RSA, resolve findings 4. Complete ongoing process development and testing at TNX and Late Wash Filter Demonstration Unit 5. Complete post-startup actions required to get Tank 22 ready 6. Start up ITP as soon as possible and execute production plan	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Impacts of RIF 3. Quality of readiness preparations, willingness of DOE to authorize startup 4. Funding, priority 5. Successful ITP startup to free up resources to work on Tk 22 6. ITP startup
8. Defense Waste Processing Facility	1. Funding 2. Qualified manpower 3. Startup Authorization 4. Successful Waste Qual Runs 5. Availability of sludge feed 6. Availability of precipitate feed 7. Tank Farm capable of handling recycle water 8. Liquid benzene appropriately stored or incinerated	1. Implement WSRC Site Prioritization Strategy; productivity improvements; slow down program 2. Ability to attract and keep qualified workers; maintain funding for core TEC and OPC groups 3. Conduct quality readiness reviews, thoroughly resolve all findings 4. Complete hydrogen & ammonia mods, start test 5. Complete ESP PVT and batch#1 washing 6. Start up ITP and Late Wash 7. Start up ITP and remove salt from tanks 8. Start up CIF	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Impacts of RIF 3. Quality of readiness preparations, willingness of DOE to authorize startup 4. Process performance, accuracy of modeling, scale testing 5. Successful ITP startup to reallocate resources to ESP; fixing seal leakage problems 6. ITP startup, funding for STPB 7. Funding for ITP and Waste Removal 8. Regulations and public support planned action
9. Saltstone	1. Funding 2. Qualified manpower 3. Single shift operation 4. Vaults	1. Implement WSRC Site Prioritization Strategy; productivity improvements; slow down program 2. Ability to attract and keep qualified workers; maintain funding for core TEC and OPC groups 3. Staff 2nd shift to match ITP process rate 4. Timely funding and construction of new vaults	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Impacts of RIF 3. Funding, headcount ceiling 4. Funding, ITP process rate

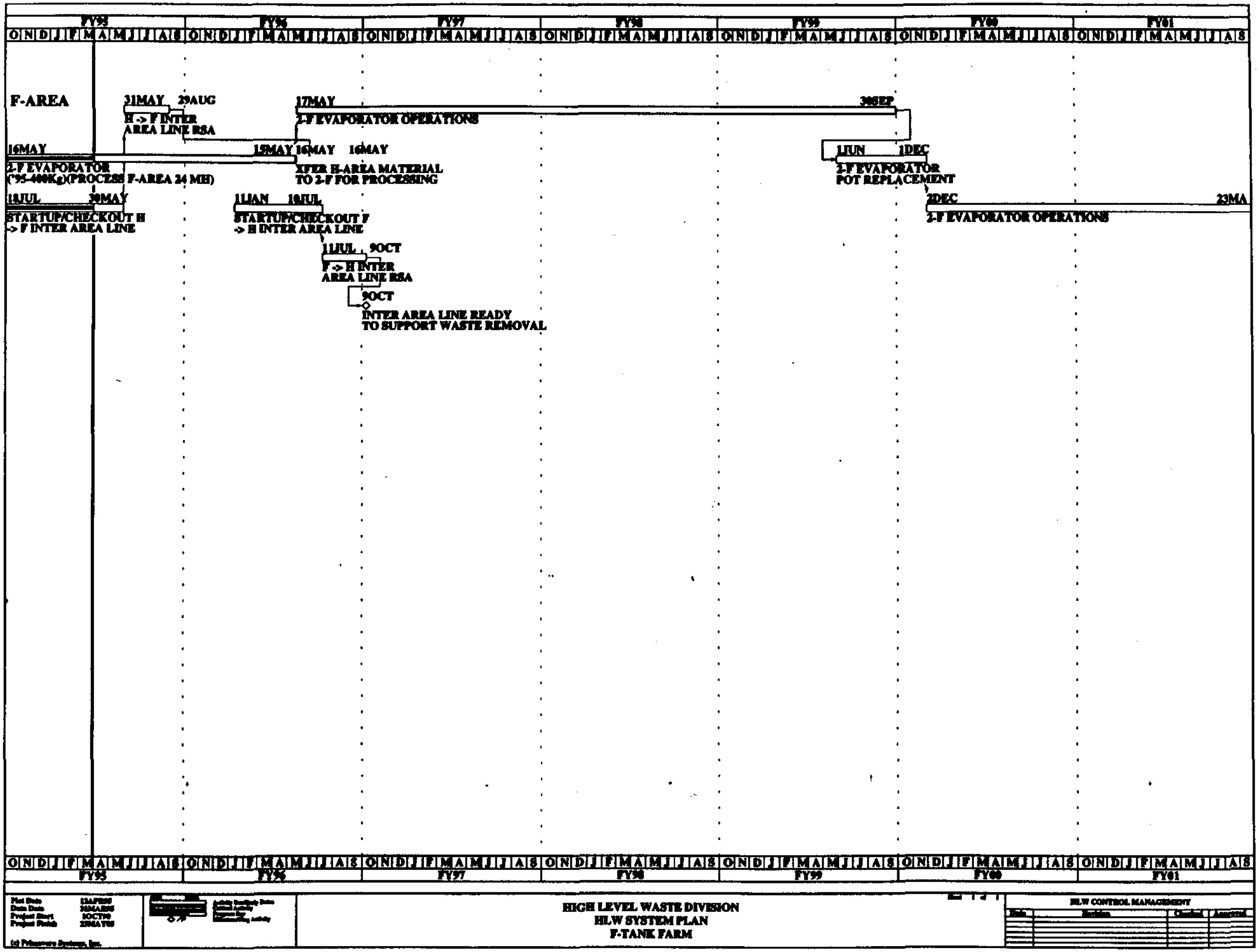
Appendix E - Process Logic Interactive Matrix

Process	Limiter	Solution	Dependent Upon
10. F/H Effluent Treatment Facility	1. Funding 2. Qualified manpower 3. Feed acceptance criteria 4. Operational utility 5. Tank 50 not full 6. Ready to receive DWPF Hg Runs Recycle 7. Timely WM EIS ROD	1. Implement WSRC Site Prioritization Strategy; productivity improvements; slow down program 2. Ability to attract and keep qualified workers; maintain funding for core TEC and OPC groups 3. Establish & maintain controls on generators 4. Implement utility improvements as required 5. Operate Saltstone 6. Implement vendor proposal to pretreat Hg recycle 7. Support and justify planned action	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Impacts of RIF 3. Evaporator operations 4. Funding 5. Saltstone funding 6. Funding, priority 7. Availability of support for WM EIS development, justification for planned action, willingness of public to accept planned action case
11. Transfer Facilities	1. Funding 2. Qualified manpower 3. NWTF startup 4. DB & PP Containment startup 5. F to H IAL startup 6. Operational utility 7. Timely WM EIS ROD	1. Implement WSRC Site Prioritization Strategy; productivity improvements; slow down program 2. Ability to attract and keep qualified workers; maintain funding for core TEC and OPC groups 3. Complete startup program, tie-ins and operate facility 4. Complete construction, finalize startup plan, allocate resources and start up 5. Complete scope and estimate development; start up facility 6. Continue ongoing repairs and refurbishing activities 7. Justify and support planned action	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Impacts of RIF 3. TEC funding, successful readiness reviews 4. OPC funding requirements, TEC funding, type of startup 5. Priority; FY96 funding 6. Ability to preserve funding for repairs 7. Availability of support for WM EIS development, justification for planned action, willingness of public to accept planned action case
12. Consolidated Incinerator Facility	1. Funding 2. Qualified manpower 3. Permitting Process 4. Startup Authorization 5. Secondary waste treatment or disposal 6. Timely WM EIS ROD	1. Implement WSRC Site Prioritization Strategy; productivity improvements; slow down program 2. Ability to attract and keep qualified workers; maintain funding for core TEC and OPC groups 3. Continue current plan to start up based on pre-moratorium permits 4. Conduct thorough readiness reviews, resolve findings 5. Continue ashcrete and HW/MW Vault programs 6. Justify and support planned action	1. Creativity, flexibility, willingness to accept alternatives or prolonged program 2. Impacts of RIF 3. Possible application of moratorium to CIF 4. Funding, extent of findings, willingness to support startup authorization 5. Agreement on scope/design of vaults, funding for vaults 6. Availability of support for SEIS development, justification for planned action, willingness of public to accept planned action case

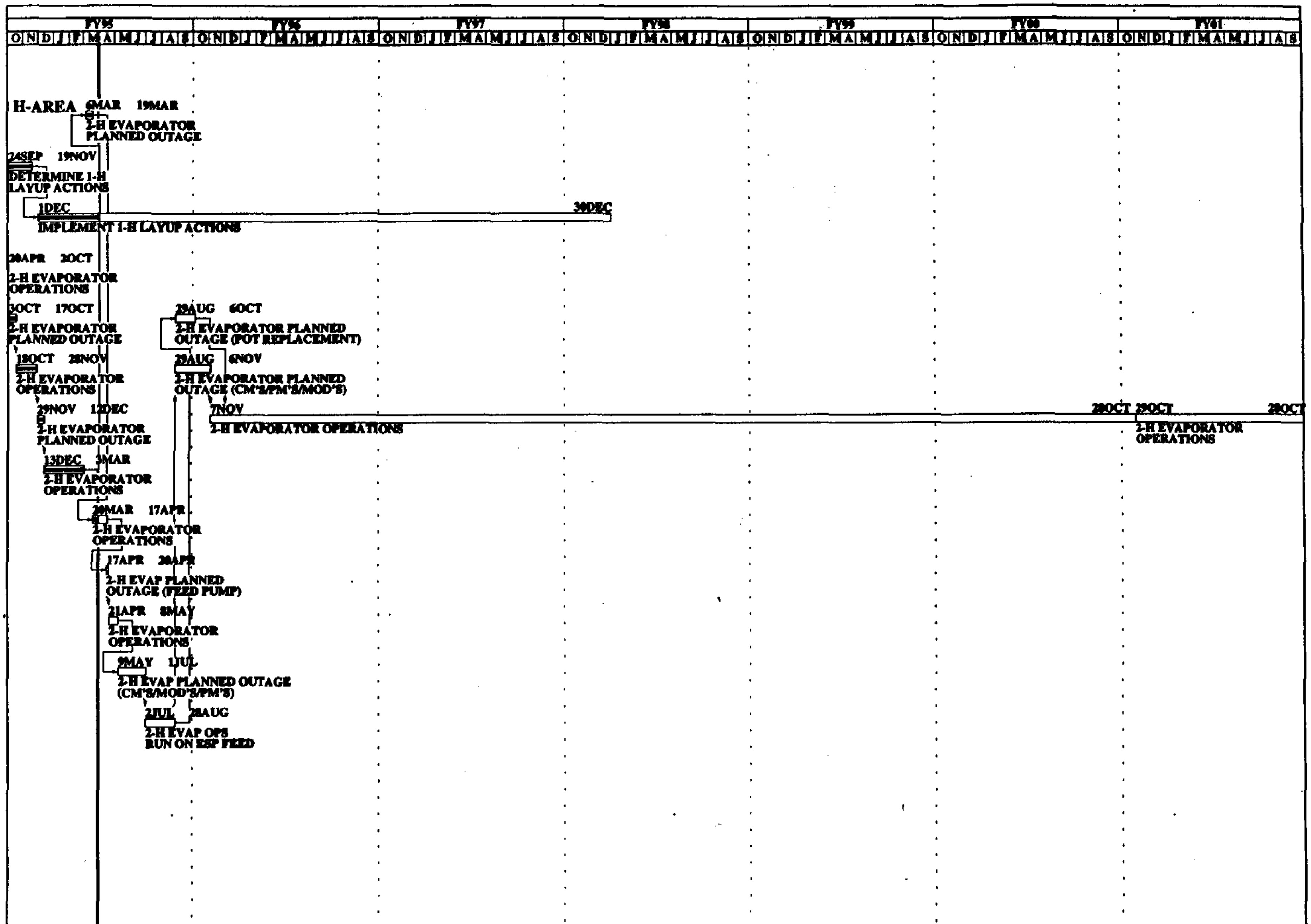
Appendix E - Process Logic Interactive Matrix

Process	Limiter	Solution	Dependent Upon


Appendix F -
HLW System
Level 1 Schedule
1995
1996
J F M A M J J A S O N D J F M A M J J A S O N D J F M
ESP
Process Verif. Test
Pump Repair
Batch #1a Washing
LM Assm't Tie-ins
NWTF
Startup and Tie-Ins
DWPF
Waste Qual Runs
Hg Runs
WSRC RSA & ORR
DOE ORR
2H Evap Pot Replacement
Startup Approval 1/1/96
Transition to Rad Ops
Sludge Ops
Sludge & Ppt Ops
Late Wash
Design & Const
Startup Testing
F/H IAL
W RSA
W ORR
DOE Readiness Validation
Ppt Ready 9/5/96
Startup Approval 5/8/96
Late Wash Ops
ITP
starts 5/15/95
Tie-ins
DOE ORR
Final startup preps
Startup Approval 7/1/95
First Ppt to Late Wash 8/31/96
Rad Ascension & Cycle #1
Cycle #2


FY95
FY96
FY97
FY98
FY99
FY00
FY01
O N D J F M A M J J A S
F-AREA
31MAY
29AUG
H -> F INTER AREA LINE RSA
17MAY
30SEP
2-F EVAPORATOR OPERATIONS
16MAY
15MAY
16MAY
16MAY
2-F EVAPORATOR ('95-400Kg)(PROCESS F-AREA 24 MH)
XFER H-AREA MATERIAL TO 2-F FOR PROCESSING
1JUN
1DEC
2-F EVAPORATOR POT REPLACEMENT
18JUL
30MAY
STARTUP/CHECKOUT H -> F INTER AREA LINE
11JAN
10JUL
STARTUP/CHECKOUT F -> H INTER AREA LINE
2DEC
23MA
2-F EVAPORATOR OPERATIONS
11JUL
9OCT
F -> H INTER AREA LINE RSA
9OCT
INTER AREA LINE READY TO SUPPORT WASTE REMOVAL
HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN
F-TANK FARM
HLW CONTROL MANAGEMENT

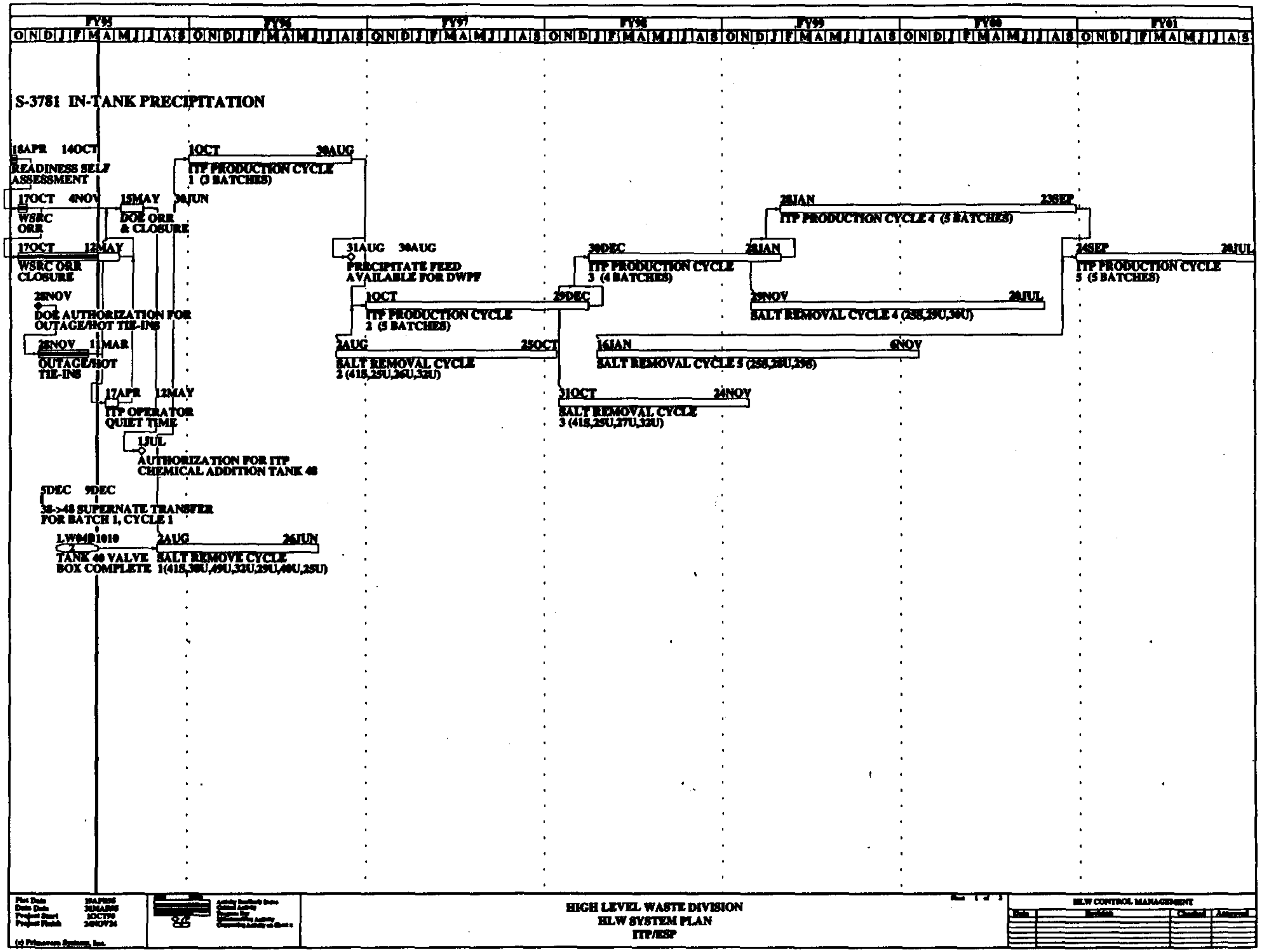
F



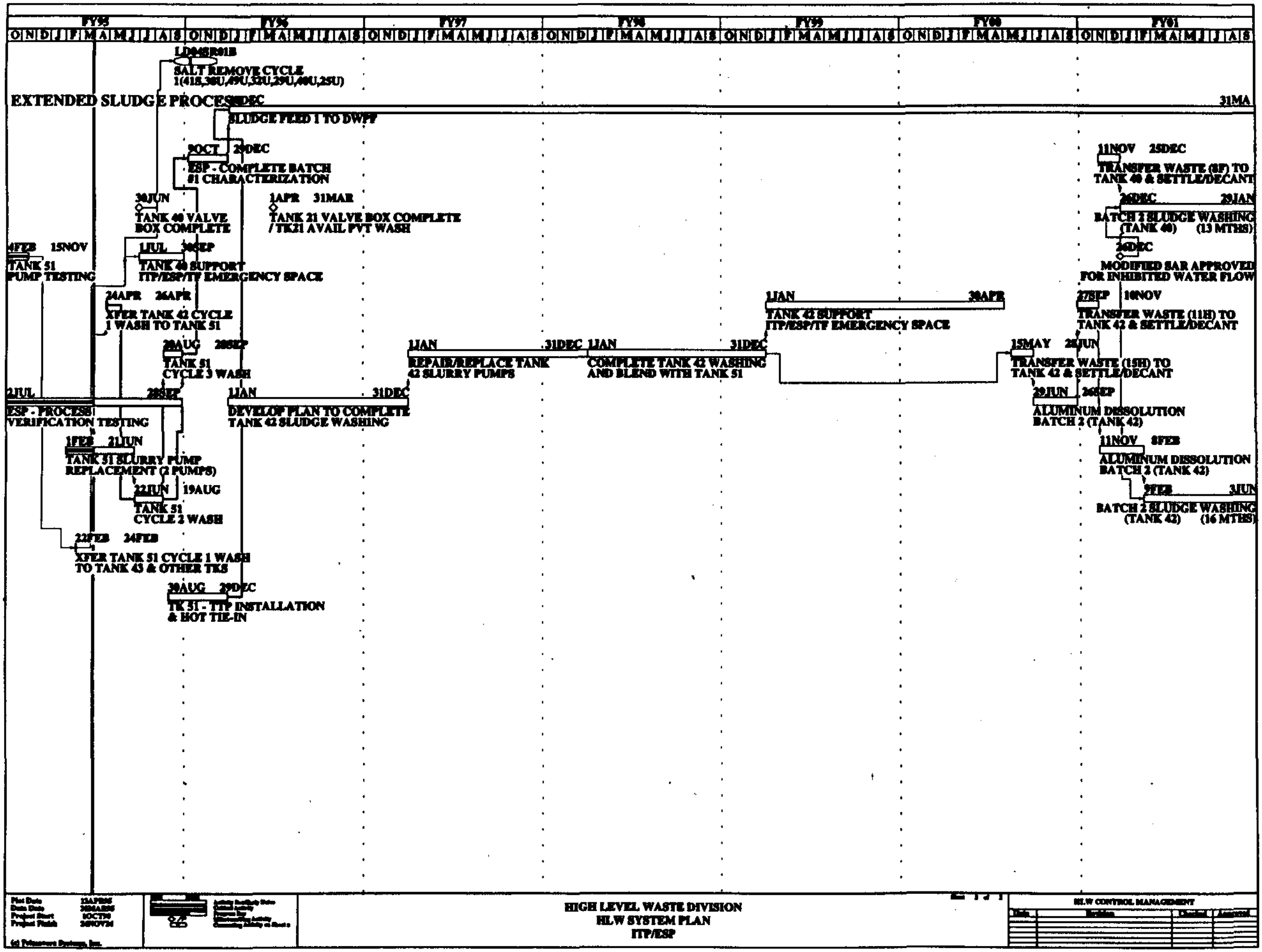
HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN
H-TANK FARM

HLW CONTROL MANAGEMENT

F


FY95
FY96
FY97
FY98
FY99
FY00
FY01
S-3781 IN-TANK PRECIPITATION
18APR 14OCT
READINESS SELF ASSESSMENT
17OCT 4NOV
WSRC ORR
15MAY 30JUN
DOE ORR & CLOSURE
17OCT 12MAY
WSRC ORR CLOSURE
28NOV
DOE AUTHORIZATION FOR OUTAGE/HOT TIE-INS
28NOV 11MAR
OUTAGE/HOT TIE-INS
17APR 12MAY
ITP OPERATOR QUIET TIME
1JUL
AUTHORIZATION FOR ITP CHEMICAL ADDITION TANK 48
5DEC 9DEC
38->48 SUPERNATE TRANSFER FOR BATCH 1, CYCLE 1
LW04B1010
TANK 48 VALVE BOX COMPLETE
2AUG 26JUN
SALT REMOVE CYCLE 1(41S,38U,49U,32U,29U,40U,25U)
1OCT 30AUG
ITP PRODUCTION CYCLE 1 (3 BATCHES)
31AUG 30AUG
PRECIPITATE FEED AVAILABLE FOR DWPF
1OCT 29DEC
ITP PRODUCTION CYCLE 2 (5 BATCHES)
2AUG 25OCT
SALT REMOVAL CYCLE 2 (41S,25U,26U,32U)
30DEC 28JAN
ITP PRODUCTION CYCLE 3 (4 BATCHES)
31OCT 24NOV
SALT REMOVAL CYCLE 3 (41S,25U,27U,32U)
16JAN 6NOV
SALT REMOVAL CYCLE 5 (25S,28U,29S)
28JAN 23SEP
ITP PRODUCTION CYCLE 4 (5 BATCHES)
29NOV 20JUL
SALT REMOVAL CYCLE 4 (25S,25U,30U)
24SEP 20JUL
ITP PRODUCTION CYCLE 5 (5 BATCHES)
HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN
ITP/ESP
HLW CONTROL MANAGEMENT
Date
Revision
Checked
Approved
(c) Primavera Systems, Inc.

F



FY95 FY96 FY97 FY98 FY99 FY00 FY01
LD04SR01B
SALT REMOVE CYCLE 1(41S,38U,49U,32U,29U,40U,25U)
EXTENDED SLUDGE PROCESS
29DEC
31MA
SLUDGE FEED 1 TO DWPF
9OCT 29DEC
ESP - COMPLETE BATCH #1 CHARACTERIZATION
30JUN
TANK 40 VALVE BOX COMPLETE
1APR 31MAR
TANK 21 VALVE BOX COMPLETE / TK21 AVAIL PVT WASH
4FEB 15NOV
TANK 51 PUMP TESTING
1JUL 30SEP
TANK 40 SUPPORT ITP/ESP/TF EMERGENCY SPACE
24APR 26APR
XFER TANK 42 CYCLE 1 WASH TO TANK 51
20AUG 28SEP
TANK 51 CYCLE 3 WASH
2JUL 28SEP
ESP - PROCESS VERIFICATION TESTING
1JAN 31DEC
DEVELOP PLAN TO COMPLETE TANK 42 SLUDGE WASHING
1FEB 21JUN
TANK 51 SLURRY PUMP REPLACEMENT (2 PUMPS)
22JUN 19AUG
TANK 51 CYCLE 2 WASH
22FEB 24FEB
XFER TANK 51 CYCLE 1 WASH TO TANK 43 & OTHER TKS
30AUG 29DEC
TK 51 - TTP INSTALLATION & HOT TIE-IN
1JAN 31DEC
REPAIR/REPLACE TANK 42 SLURRY PUMPS
1JAN 31DEC
COMPLETE TANK 42 WASHING AND BLEND WITH TANK 51
1JAN 30APR
TANK 42 SUPPORT ITP/ESP/TF EMERGENCY SPACE
15MAY 28JUN
TRANSFER WASTE (15H) TO TANK 42 & SETTLE/DECANT
29JUN 30SEP
ALUMINUM DISSOLUTION BATCH 2 (TANK 42)
11NOV 25DEC
TRANSFER WASTE (8F) TO TANK 40 & SETTLE/DECANT
26DEC 29JAN
BATCH 2 SLUDGE WASHING (TANK 40) (13 MTHS)
26DEC
MODIFIED SAR APPROVED FOR INHIBITED WATER FLOW
27SEP 10NOV
TRANSFER WASTE (11H) TO TANK 42 & SETTLE/DECANT
11NOV 8FEB
ALUMINUM DISSOLUTION BATCH 2 (TANK 42)
9FEB 3JUN
BATCH 2 SLUDGE WASHING (TANK 42) (16 MTHS)
HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN
ITP/ESP
HLW CONTROL MANAGEMENT

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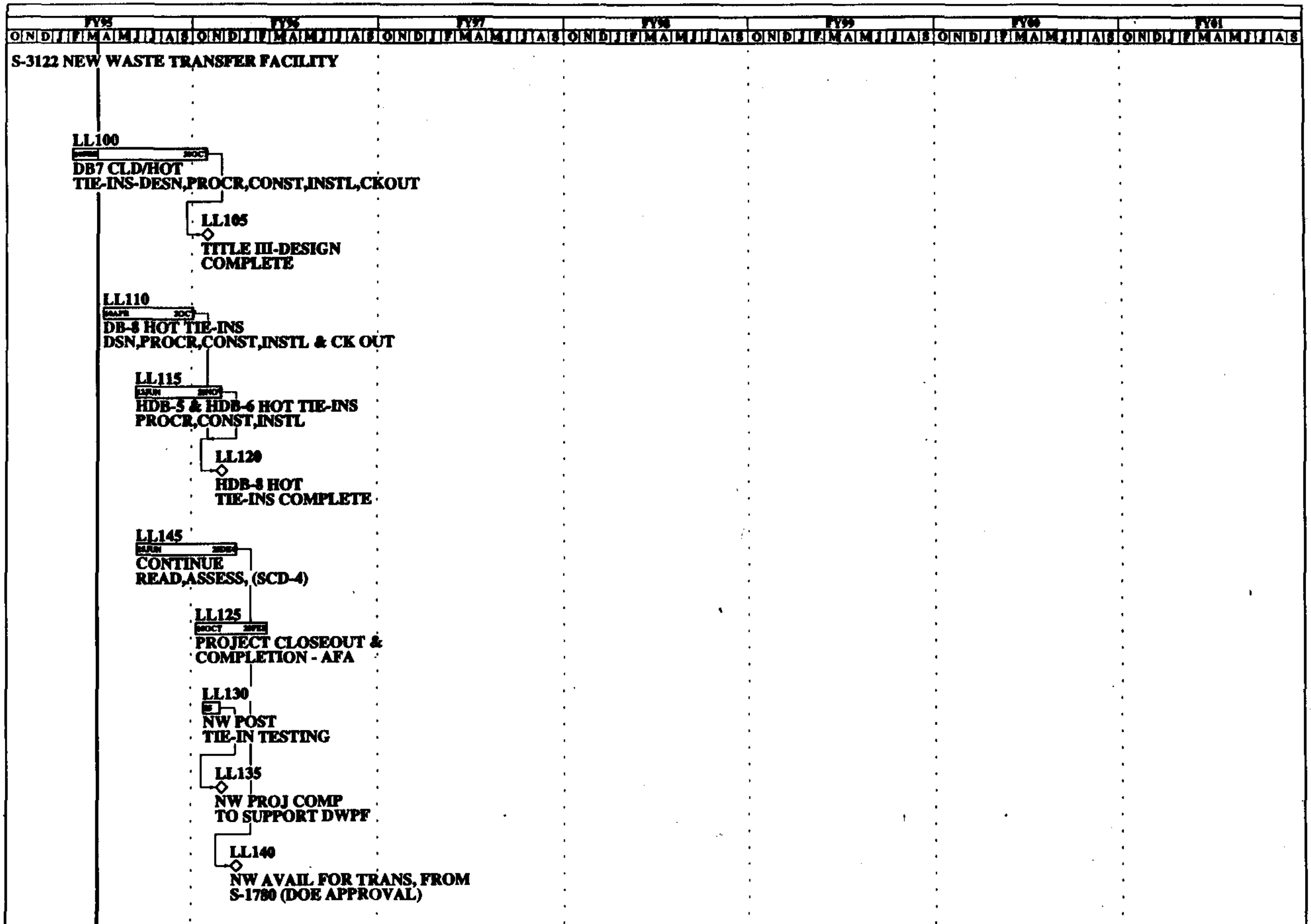
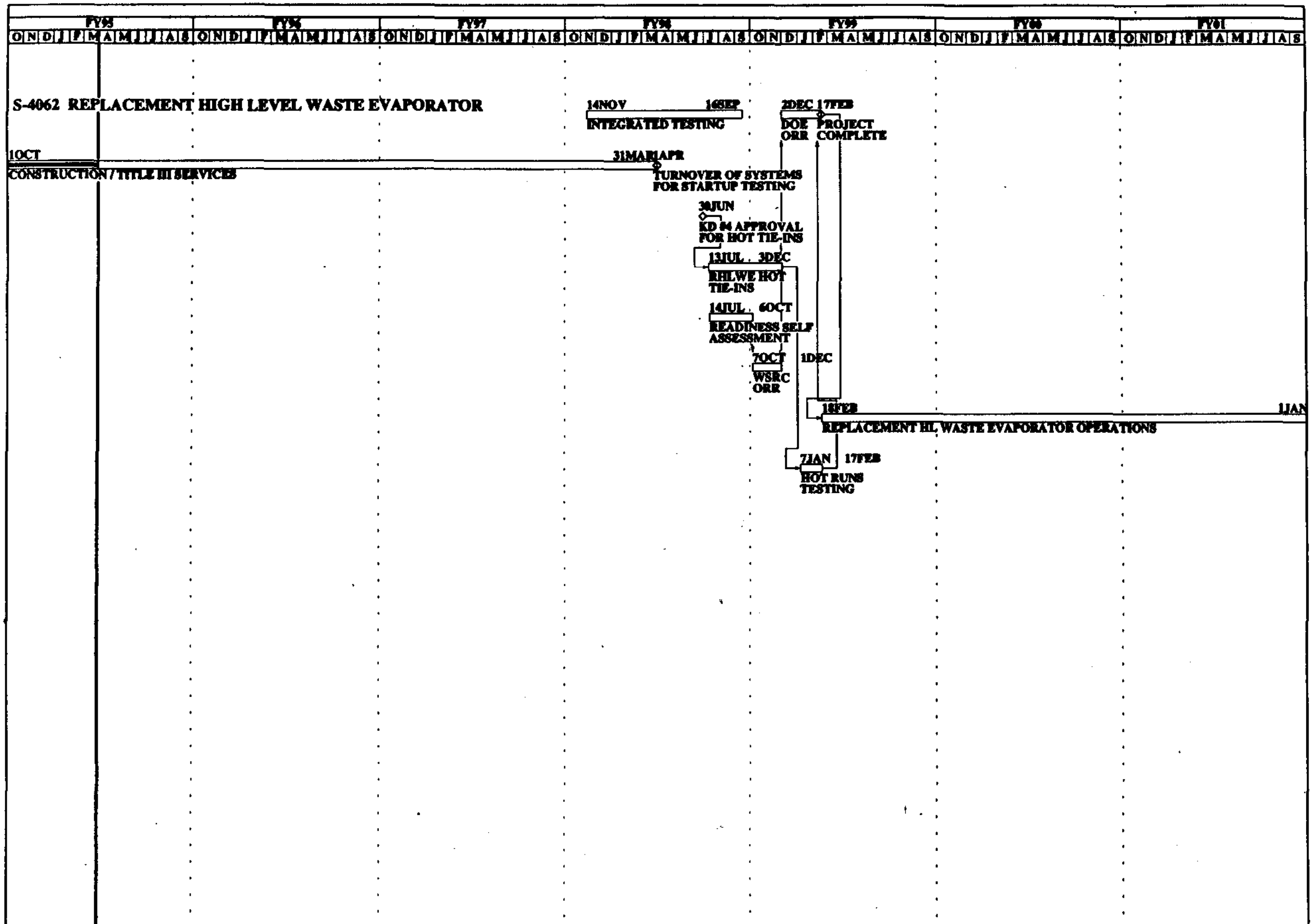


HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN
NEW WASTE TRANSFER FACILITY

HLW CONTROL MANAGEMENT

F



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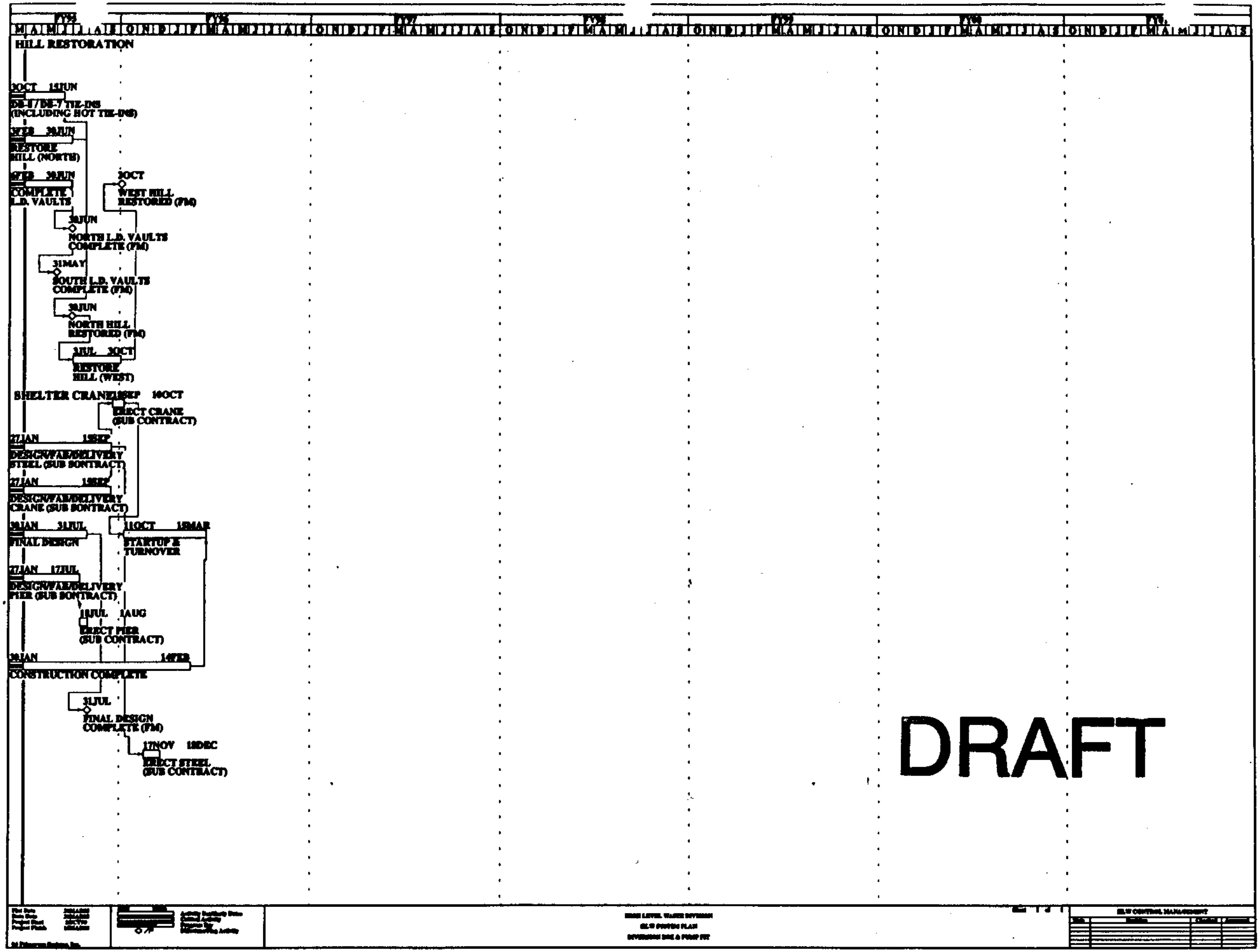
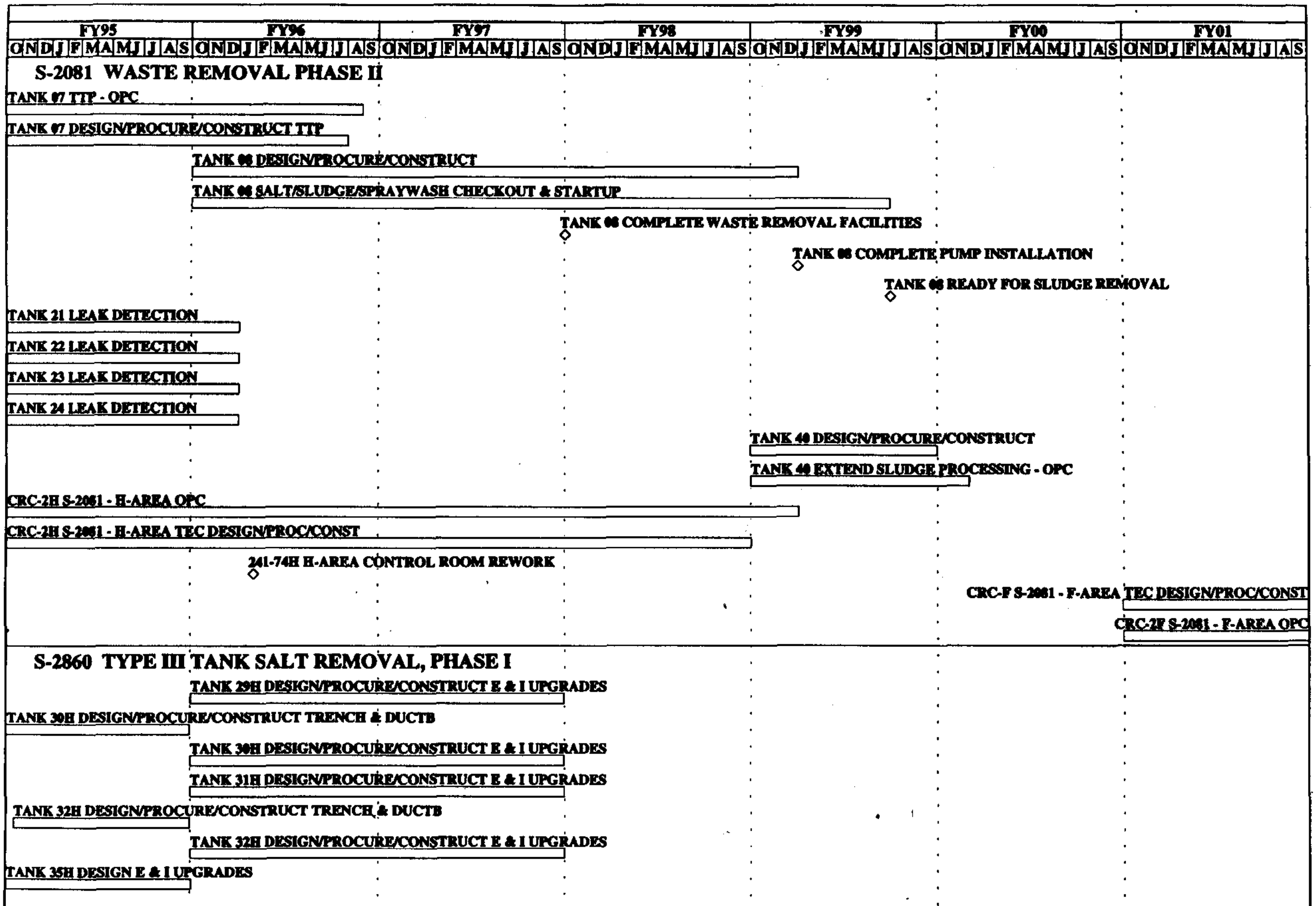
HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN
REPLACEMENT HLW EVAPORATOR

HLW CONTROL MANAGEMENT

F


HILL RESTORATION
3OCT 15JUN
DS-1/DS-7 TIE-INS (INCLUDING HOT TIE-INS)
30JUN
RESTORE HILL (NORTH)
30JUN
COMPLETE L.D. VAULTS
3OCT
WEST HILL RESTORED (FM)
30JUN
NORTH L.D. VAULTS COMPLETE (FM)
31MAY
SOUTH L.D. VAULTS COMPLETE (FM)
30JUN
NORTH HILL RESTORED (FM)
3OCT
RESTORE HILL (WEST)
SHELTER CRANE
10OCT
ERECT CRANE (SUB CONTRACT)
27JAN
DESIGN/FAB/DELIVERY STEEL (SUB SONTRACT)
27JAN
DESIGN/FAB/DELIVERY CRANE (SUB SONTRACT)
30JAN 31JUL
FINAL DESIGN
11OCT 15MAR
STARTUP & TURNOVER
27JAN 17JUL
DESIGN/FAB/DELIVERY PIER (SUB SONTRACT)
1AUG
ERECT PIER (SUB CONTRACT)
30JAN 14FEB
CONSTRUCTION COMPLETE
31JUL
FINAL DESIGN COMPLETE (FM)
17NOV 18DEC
ERECT STEEL (SUB CONTRACT)
DRAFT

F



Plot Date	13APR95
Data Date	1OCT93
Project Start	1OCT88
Project Finish	22JAN11

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Activity Bar/Early Dates
Critical Activity
Milestone/Flag Activity

Sheet 1 of 2

HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN
WASTE REMOVAL PROGRAM

HLW CONTROL MANAGEMENT

Date	Revision	Checked	Approved

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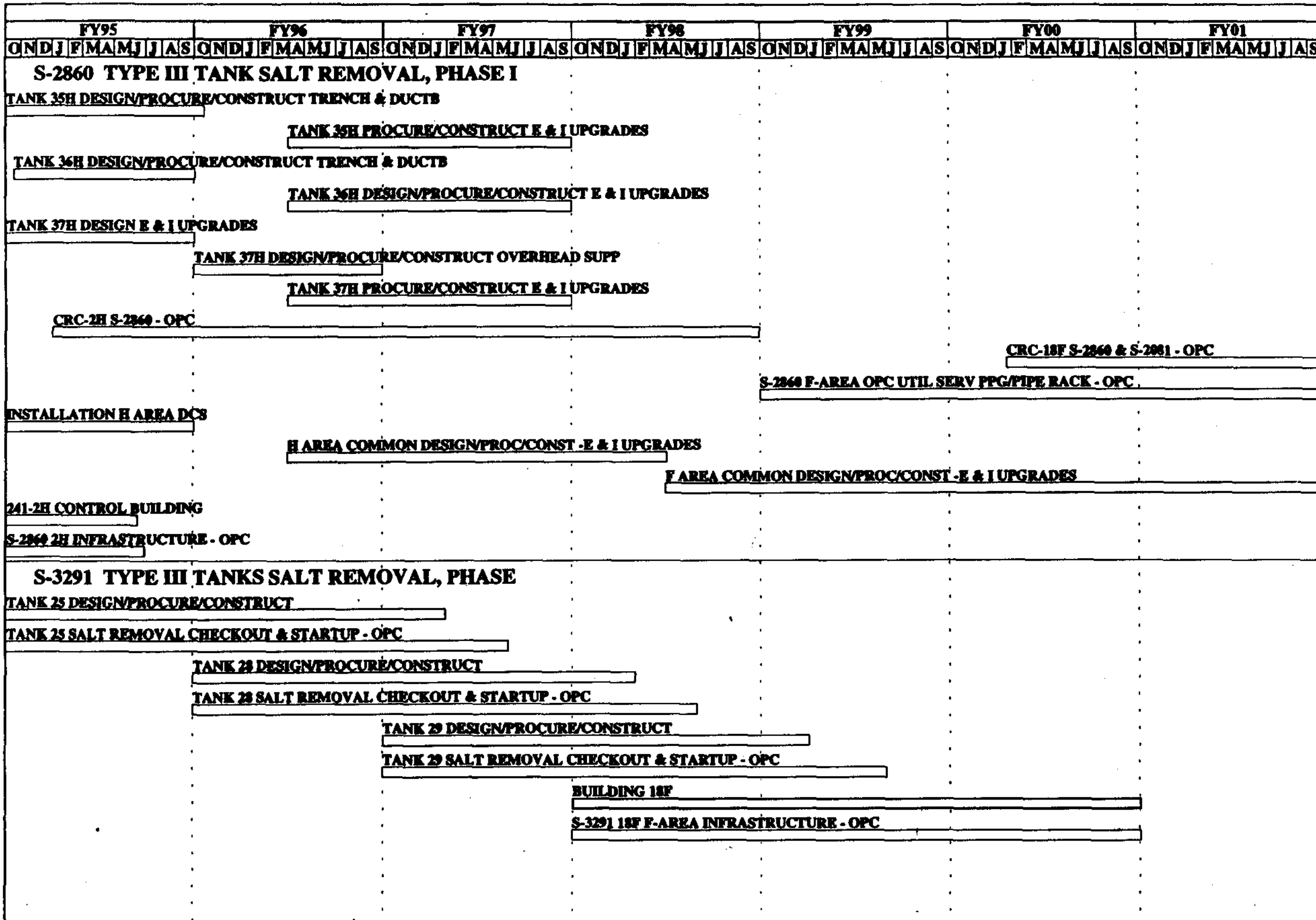

Plot Date	13APR95
Data Date	1OCT93
Project Start	1OCT88
Project Finish	21JAN11

Activity Bar/Early Dates
Critical Activity
Milestone/Flag Activity

Sheet 2 of 2

HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN
WASTE REMOVAL PROGRAM

HLW CONTROL MANAGEMENT

Date	Revision	Checked	Approved

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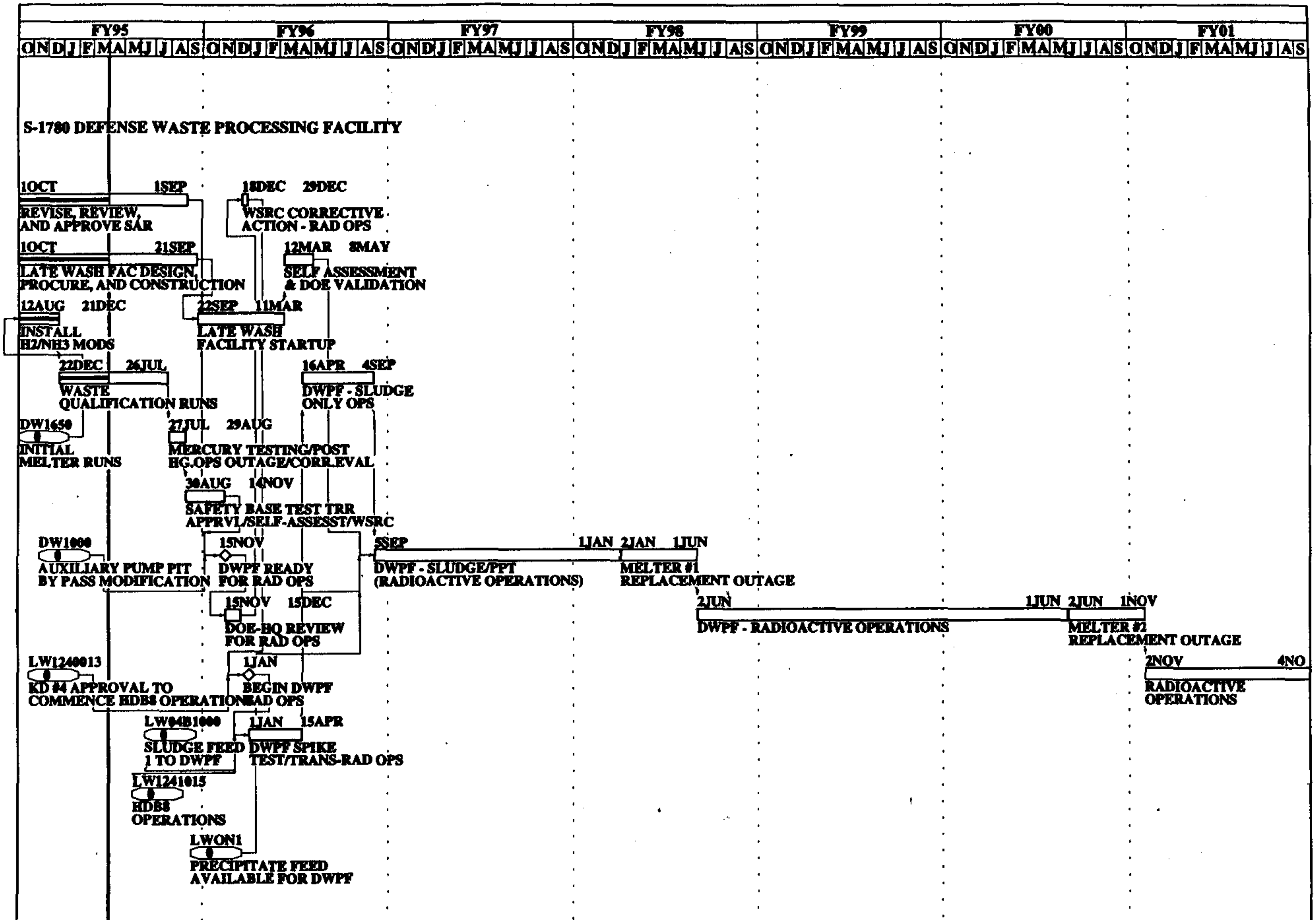


HIGH LEVEL WASTE DIVISION
HLW SYSTEM PLAN
VITRIFICATION - DWPF

HLW CONTROLS MANAGEMENT

Date	Revision	Checked	Approved

Appendix G.1 - Programmatic Uncertainties

Issue	Assumption	Contingency/Action
• The HLW Mission has a distant endpoint of FY2065 due to the large spending cuts. Changing the way SRS does business cannot react fast enough to pace with budget cuts. Waste may remain in tanks for over 100 years.	• SRS will continue to develop cost savings ideas. • SRS will incorporate cost savings as they are inpelmented.	• SRS will determine the funding required to achieve HLW System Plan, Rev. 4 given today's Site and Area Support reductions. • SRS will make maximum use of available funding.
• The HLW System Schedule has no schedule or dollar contingency for emergent program requirements or emergent work.	• The schedule is success driven; problems will be dispositioned in a way so as not delay the schedule.	• Review each facility and quantitatively assign contingency based upon a recognized method. • Jointly agree to accept schedule risk where there is no contingency.
• Funding, manpower allocation and processing uncertainties may impact the Site's ability to meet Waste Removal commitments as identified in the AOP and FYP.	• Near-term funding and allocation of personnel will support the WR program as defined in the AOP and this System Plan. • Innovation in systems integration and production planning can help overcome processing uncertainties.	• Examine current budget allocations to identify possible sources of funding for near-term waste removal expenses. • Continue development and application of systems integration tools.
• System-wide impacts of recent reductions to Waste Removal Program funding need to be fully evaluated.	• The impact of funding changes must be incorporated into current HLW system planning bases. Funding revisions will impact overall attainment without impacting process flowsheet integrity.	• Initial review of program impacts support the need to maintain as much funding as possible for the WR Program.
• The Inter-Area Transfer Line and associated controls/support systems must be upgraded before transfers can be made from F-Tank Farm to H-Tank Farm.	• The IAL upgrade will be appropriately manned and funded so that transfers can be made in support of the waste removal program.	• Complete the ongoing upgrade to support F to H-Area transfers.
• SRS's proposed FFA waste removal schedule has not been formally accepted by the regulator.	• The regulator will accept FFA commitments for waste removal activities, without commitments for interim waste processing milestones.	• Negotiate with Regulator a strategy where firm commitments are made for the budget year and forecasts thereafter. • Negotiate a schedule where there is increasing contingency each year after the current budget year. • Provide candid updates to the Regulators via quarterly meetings.

Appendix G.1 - Programmatic Uncertainties

Issue	Assumption	Contingency/Action
• Plan for relocation of Tank 41 controls to the 2H Evaporator Control Room and Tank 41 hardware-related work to return Tank 41 to salt service not complete.	• A plan will be implemented prior to feeding the second tank to ITP.	• Continue existing engineering study, determine funding source, implement. • HLW System Integration Manager will track issue through to implementation. • Evaluate extending life of Tank 38 by direct feeding concentrated supernate to ITP from Tanks 38 and 43. • Form salt in another tank.
• The Site may not be able to handle the increased analytical requirements resulting from the startup of ITP, ESP, DWPF, and Late Wash.	•Shortfalls, if any, can be identified and corrected without delaying key schedules.	• Complete site studies regarding need for new laboratories, consolidating existing labs, restart of the 772-F lab, etc.
• ITP processing rates are uncertain because the facility has never operated.	• ITP will receive startup authorization 7/1/95, start up 10/1/95, and will be able to achieve their planned production rate.	• ITP Production Planning has been refined for the first ten production cycles. Continue to refine the ITP Production Plan.
• Disposal of the CIF secondary aqueous waste stream is not fully implemented.	• The stream can be solidified in the CIF's ashcrete system.	• A Baseline Change Proposal (BCP) to solidify the aqueous wastes in the ashcrete system has been approved by DOE. Design modification s are underway. Installation is planned in Spring 1995.
• The CIF is needed in the 1999 timeframe to treat DWPF benzene. CIF startup may be delayed by the Waste Management EIS now in progress.	• Successfully managing the project and schedule will make it less vulnerable to delays or cancellation.	• There is approximately 3 years of float between the CIF's scheduled 1/96 startup and the date when the CIF is required to support the DWPF (assuming 26% initial attainment for DWPF).
• Approval of the CIF SAR could be delayed, (consequently delaying development of CIF operating procedures, Operating Safety Requirements, Process Requirements, etc.) if DOE approval of the Site Generic SAR is delayed.	• DOE approval of the Site Generic SAR will occur in a timeframe that supports CIF SAR approval.	• The CIF SAR is WSRC approved. DOE approval of the CIF SAR and the GSARs is expected in March 1995.

Appendix G.1 - Programmatic Uncertainties

Issue	Assumption	Contingency/Action
• After the Canyons shut down, there will be no 211-F facility to evaporate miscellaneous waste if DP does not provide support. This combined stream to the Tank Farm could be 940,000 gallons/year.	• The Canyons can continue to run their evaporators until the RHLWE starts up. • A process at 211-F will be implemented to volume reduce this stream before it gets to the Tank Farm.	• Canyon personnel have stated that they can operate their evaporator after the 1997-98 time frame if needed. This needs to be formally agreed upon by affected parties. • Implement a volume reduction process at 211-F.
• Valuable resources have been diverted away from the ESP Slurry Pump Program to support higher priorities; any ESP delays could impact the timely availability of Sludge Batch #1.	• The ESP Slurry Pump Program needs can be resolved in a timely manner.	• Complete sludge processing but cease slurrying activities, thereby stopping inadvertent water addition from leaking pumps. • Replace Tank 51 leaking slurry pumps.
• SRS's downsizing efforts could compromise work force quality and leave the Site with the wrong skill mix.	• Adequate training can be provided to maintain a competent work force.	• Specific critical positions can be filled via the site Critical Needs Staffing Program.
• HLW technology needs may have to compete with SRTC's commitment to technology transfer programs and work for others.	• SRTC resources can be adequately allocated to support HLW needs.	• HLW managers will continue to work closely with their SRTC counterparts to establish fair work priorities.
• As more new HLW facilities approach the start of radioactive operations, the frequency and intensity of external reviews will increase significantly.	• External reviews will be scheduled and managed to the benefit of the HLW system.	• HLW personnel will continue to build credibility with external reviewers by maintaining active and open relationships with them.
• Tank 19, like Tank 20, has had groundwater unexpected groundwater intrusion into the tank. The condition of Type IV Tanks could be suspect.	• The condition of Type IV Tanks in H-Area is sound and these tanks can be used for 30 more years. There will be no leaks in Tanks 21-24.	• Replace Tanks 21-24 with new tanks. Redeploy Type III Tanks to provide the service of Tanks 21-24 if possible.
• The F-Area encasement has collapsed in one place and is leaking in several others.	• This collapse will not propogate into a massive problem in F-Area. The H-Area encasement will not fail similar to F-Area.	• Refurbish encasements. Install new jacketed piping to replace the encasements.

Appendix G.1 - Programmatic Uncertainties

Issue	Assumption	Contingency/Action
• Funding reductions result in the extended service of aging facilities.	• Waste tanks and other facilities that were designed for a 30 year service life can be maintained to last for 90 + years.	• Increase priotiy of Tank Farm infrastructure retention type projects. • Restore funding cuts to accelerate program. • Obtain emergency appropriations to restore program. • Move waste from leaking tanks into empty tanks if possible.

Appendix G.2 - Technical Uncertainties

Issue	Assumption	Contingency/Action
• The PCCS model has been modified to correct the Predictability Constraint. Some of the future sludge batches may not be able to satisfy the modified constraint.	• Acceptable washing scenarios or revising the proposed sludge batches can be easily accomplished. If revising sludge batches is necessary, SCDHEC will approve.	• The degree of salt and sludge pre-treatment can be varied. • There are 23 sludge tanks that can be grouped into almost any batch configuration to satisfy the Predictability Constraint. • Cold chemicals can be used to trim.
• The capability to dispose of the DWPF mercury runs recycle stream is not fully implemented yet.	• Mercury recycle stream can be treated at DWPF and trucked to the F/H ETF.	• Complete preparations to handle at ETF. • Maintain NWTF schedule in support of pumping Hg Recycle to Tank Farm if needed. • Maintain trucking Hg Recycle to NWTF or Tank 47 as an option.
• Tank 41 criticality concerns may delay salt removal from Tank 41 and thus impact the 2H Evaporator operation. Only the top 50" has an approved salt removal plan.	• Rigorous sampling of Tank 41 will enable salt removal to proceed as planned. • Ongoing analyses will successfully identify a third salt tank for the 2H Evaporator system.	• Continue salt sampling program to get samples from deeper in the tank. • Feed concentrated supernate to ITP as needed to provide evaporator salt space and ITP feed, accept negative impacts. • Continue to investigate alternate tanks for salt service such as Tank 42 or 49.
• HLW tank temperature rise due to slurry pump operation not known and could reduce planned production rates.	• Temperature can be controlled in a way that does not significantly reduce production.	• Complete the ESP PVT, generate data, evaluate and make recommendations. • Continue Tank Farm Services Upgrades project planning and support as needed.
• Final feed specs for DWPF feed not finalized, some waste may not be able to be processed.	• There are adequate planning tools to enable all waste to be planned for and processed in a manner defensible to outside agencies. • CPES/PCCS modeling indicates all six batches can be processed.	• Continue to improve modeling capabilities, use Models to optimize waste removal activities, and plan all batches until the end of the waste removal campaign.
• ESP Tank 51 slurry pump seal leakage has delayed washing of the initial sludge feed to DWPF.	• Problem can be resolved without impacting subsequent processing schedules.	• Complete replacement of Tank 51 B-1 and H pumps. • Complete washing Tank 51 sludge. • Start up DWPF on Tank 51 sludge.

Appendix G.2 - Technical Uncertainties

Issue	Assumption	Contingency/Action
• Durametallic bottom seals in Tank 51 slurry pumps add too much water to maintain long term characterization of sludge batch #1.	• The Burgmann bottom seals or some other seal will be identified as a long term solution. All pumps will be refitted without effecting key System milestones.	• Replace the Tank 51 leaking pumps with new pumps with Burgmann seals; operate new pumps. • Continue ongoing pump improvement activities.
• Two of the Tank 42 slurry pumps are not pumping sludge.	• The pumps can be raised and then lowered in increments to suspend the sludge.	• Complete washing the Tank 51 sludge, then shift resources to Tank 42 and continue testing/repairs.
• The four 150 hp slurry pumps in Tank 42 may not adequately mix the tank contents under any conditions.	• The pumps can be replaced with larger pumps. • A different way of washing sludge will be developed thus eliminating the need to repair Tank 42.	• Continue ongoing studies to "re-invent" sludge washing. • Continue to gain operating experience in Tank 51.
• The aluminum in the H-Area HHW tanks may be primarily boehmite vs gibbsite and thus be difficult to dissolve with the existing ESP aluminum dissolution process.	• Sludge sample analytical results will be similar to previous prodictions. • If not, then it will be acceptable to make more glass canisters.	• Continue to study aluminum chemistry in SRS sludge. • Evaluate process changes to dissolve boemite.
• The Waste Removal program scope is limited to water washing the tank interior and annulus for each old-style tank to be retired. Additional cleaning, possibly chemical cleaning, may be required prior to turning the tank over for final closure.	• Water washing will be adequate. If further cleaning is required, then a SW/ER cost funded project will provide the facilities and operations.	• Chemical cleaning has been successfully demonstrated using dilute oxalic acid in Tank 16. This process may be applicable to other sludge tanks.
• Initial salt samples from Tank 41 indicate that chromium levels in the dissolved salt will exceed the DWPF glass limit and insoluble solids will exceed the Tank 48 process requirement.	• Insoluble solids and chromium in Tank 41 dissolved salt will be allowed to settle prior to feed to ITP.	• Use Tank 40 for a salt solution settling and accumulation tank prior to feeding it to Tank 48.

Appendix G.2 - Technical Uncertainties

Issue	Assumption	Contingency/Action
• SRS's planned resolution of safety class issues, particularly modifications to the DWPF Vitrification Building and Late Wash Auxiliary Pump Pit, may not be accepted by the DNFSB.	• The DNFSB will accept the retrofit modifications as planned thus not delaying DWPF startup.	• Continue installation of modifications. • Continue dialog with the DNFSB.
• The H-Area East Hill area is settling. Some transfer lines have settled several inches and may no longer have the proper slope.	• Settlement has not damaged the lines, and the lines do not have to excavated and resloped. • If excavation and resloping is necessary, it can be done without affecting key schedules and milestones.	• Test or inspect lines on an as-needed basis.
• F-Area pump tanks do not have agitators installed. Insoluble solids are probably collecting in the pump tanks. Pump rates may be affected or pump suction pluggage may occur.	• The condition will not worsen. • Agitators can be installed as needed without affecting key schedules and milestones.	• Agitators are available for pump tanks 2 and 3. FPP-1 used to have an agitator, but now has a second transfer pump that is normally used in a recirc mode to provide some agitation. The old agitator could be installed and a tank transfer jet could be used to transfer supernate.
• There is a concern regarding the ability to provide feed to ITP that complies with actinide source term specifications in the ITP SAR Addendum as well as other downstream facilities.	• Dissolved salt can be adequately blended with concentrated supernate until more salt tanks are ready to slurry and blend.	• Complete revision of HLW models to incorporate source term concerns. • Continue to develop production plans and integrate them with Waste Removal project schedules. • Obtain sample from Tank 48, conduct further testing of Sodium Titanate actinide adsorbtion
• Waste Removal using slurry pumps may be too expensive given today's funding constraints.	• A combination of additional funding and cost savings will generate more funding for Waste Removal. • An alternate technology for waste removal will be developed that is cheaper than pumps.	• Continue to develop all cost savings ideas. • Continue to investigate alternate waste removal technologies.

Appendix G.2 - Technical Uncertainties

Issue	Assumption	Contingency/Action
• Irradiated precipitate above 200 Megarads is suspected to cause problems in the Late Wash and DWPF process. DWPF pilot plant testing using irradiated feed is unfunded.	• Concerns are overstated, or • ITP can be operated on an alternate flowsheet to limit the precipitate's aborbed dose to less than 200 MRad.	• Continue to evaluate alternate flowsheets for ITP. • Continue bench scale work with irradiated precipitate. • Continue plans to test in the Late Wash facility using irradiated precipitate simulant feed.
• Deposition of noble metals in the DWPF melter will occur and may reduce melter life. Development of one possible solution, the stirred melter, is not adequately funded.	• Noble metals will not cause premature melter failures. • Sufficient enthusiasm can be generated to maintain stirred melter funding.	• Continue efforts to develop credible justification for alternate melter designs.
• Precipitate foaming was greater than expected during PX-7 runs and could be a problem in Late Wash.	• A surfactant can be found that reduces foaming and causes no downstream problems.	• Continue testing. • Consider outside expert consultation.
• Ultimate disposition for DWPF's elemental mercury stream has not been finalized.	• Appropriate arrangements can be made for amalgamation at DWPF, offsite resale, or amalgation at INEL.	• Store onsite in permitted facility. • Do not start up DWPF.

Appendix H - DOE Milestones

ADS	Title	Due
21-AA	DWPF Program Management	
	• Schedule for planned Quality Evaluation & Assessments (PEG-3)	4/1/95
	• AMHLW Independent Annual Management Assessment (PEG-6)	4/28/95
	• Schedule for planned Quality Evaluation & Assessments (PEG-4)	7/1/95
22-AA	DWPF Vitrification	
	• Complete TNX testing and documentation of Ammonia Scrubber performance (DWC35)	5/1/95
	• Issue interim reports for WP-14 Waste Qualification Runs (DWC04)	7/14/95
	• Complete ALARA activities for Mercury Runs (DWC15)	5/25/95
	• WSRC Ready for Mercury Runs (DWC01)	5/25/95
	• Submit Waste Certification Plan for approval (DWC16)	5/31/95
	• Complete Late Wash facility construction (ADS 8)	6/30/95
	• Issue WSRC and DOE Plans of Action for DWPF startup (PEG-8)	6/30/95
	• Submit Safety Analysis Report to DOE (DWH06)	7/5/95
	• Issue interim reports for WP-15 Waste Qualification Runs (DWC38)	8/15/95
	• Complete welder demonstrations (DWC20)	8/31/95
	• Complete radioactive operations training (DWC17)	9/4/95
	• Approve 24 System Design Description Documents (DWC33)	9/29/95
	• Approve 25 System Master Equipment Lists (DWC30)	9/29/95
	• Approve 110 Vendor Manuals (DWC32)	9/29/95
	• Ready for Waste Certification Assessment (DWC39)	9/29/95
	• Complete Phase II SCD-4 baseline assessment (DWC21)	9/29/95
	• Ready for radioactive operations (ADS 9)	12/31/95
	• Perform Radioactive Spike Test (ADS 10)	1/3/96
	• Begin Transition to Radioactive Operations (ADS 11)	2/7/96
	• Late Wash operational	6/30/96
	• Begin normal radioactive operations (Late Wash) (ADS 12)	8/31/96

Appendix H - DOE Milestones

ADS	Title	Due
	• Pour 60 canisters of glass	9/30/96
	• Pour 80 canisters of glass	9/30/97
23-AA	Z-Area Saltstone	
	• Process salt solution to maintain Tank 50 level (DWC24)	9/29/95
	• Process salt solution to maintain Tank 50 level (DWC24)	9/29/96
	• Process salt solution to maintain Tank 50 level (DWC24)	9/29/97
31-AA	HLW Program Management	
	• Issue F and F Utility Manuals	4/1/95
	• Issue WSRC approved Basis for Interim Operation	4/30/95
	• Submit Annual Tank Inspection Report	7/1/95
	• Issue WSRC approved Technical Safety Requirements	7/15/95
	• Run HLW Integrated Flowsheet Model to completion of waste removal	9/29/95
	• Complete Operator, Maintenance and Technical personnel training	9/29/95
	• Submit Annual Assessment for New or Replacement Waste Tank Components	3/16/96
	• Submit Annual Report on status of tanks being removed from service	3/16/96
	• Submit Annual Tank Inspection Report	7/1/96
	• Submit Annual Assessment for New or Replacement Waste Tank Components	3/16/97
	• Submit Annual Report on status of tanks being removed from service	3/16/97
	• Submit Annual Tank Inspection Report	7/1/97
32-AA	H-Tank Farm	
	• Develop Essential Document List	4/30/95
	• Initiate the 2H Evaporator pot replacement outage.	9/15/95
	• Resolve P&ID discrepancies for 12 systems	9/29/95

Appendix H - DOE Milestones

ADS	Title	Due
	• Recover 600,000 gallons of tank space based on evaporation and CRC operation. (Assumes availability of feed)	9/29/95
	• Complete lay-up of the 1H Evaporator system	9/30/95
	• Recover 1,000,000 gallons of tank space based on evaporation	9/30/96
	• Recover 1,000,000 gallons of tank space based on evaporation	9/30/97
	• Remove 1H Evaporator from active service	1/1/98
33-AA	F-Tank Farm	
	• Develop Essential Document List	4/30/95
	• Resolve P&ID discrepancies for 12 systems	5/15/95
	• Recover 400,000 gallons of tank space based on evaporation	9/29/95
	• Recover 1,200,000 gallons of tank space based on evaporation	9/30/96
	• Recover 1,200,000 gallons of tank space based on evaporation	9/30/97
34-AA	ITP / ESP	
	• ITP ready for DOE ORR	5/15/95
	• Issue final report of the H-Area Seismic Issues Resolution Program	5/15/95
	• Complete preparations for Tank 40 to stage salt solution	6/30/95
	• DOE authorization to initiate radioactive operations	9/30/95
	• Begin radioactive operations for ITP	10/1/95
	• Complete ESP Batch #1a washing in Tank 51	10/31/95
	• Complete ESP Process Verification Test	10/31/95
	• Initiate salt dissolution in Tank 41	11/30/95
	• Issue engineering evaluation of ESP Process Verification Test date 30	12/1/95
	• Close out ITP Cost Project	12/30/95
	• Precipitate ready to feed Late Wash	8/30/96
	• Complete 3 batches of ITP operations	9/30/96
	• Continue to operate at 4 batches per year	9/30/97

Appendix H - DOE Milestones

ADS	Title	Due
	• Prepare ESP sludge batch #1b (Tank 42)	1/30/99
35-AA	Effluent Treatment Facility	
	• Complete Organic Removal Cleaning System Project	9/29/95
	• Process all influent streams (about 20,000,000 gallons/year)	9/30/95
	• Process all influent streams (about 20,000,000 gallons/year)	9/30/96
	• Process all influent streams (about 20,000,000 gallons/year)	9/30/97
	• Complete the wastewater collection tank mixing pH project	6/30/98
38-LI	HLW New Facility Planning	
	• Request Tank Farm Services Upgrade authorization	10/1/95
	• Complete CDR for Storm Water System Upgrade project	12/31/96
	• Validate FY99 BA for Storm Water System Upgrade project	5/30/97
	• Complete CDR for Tank Farm Support Services project	10/1/98
	• Validate FY00 BA for Tank Farm Support Services project	5/30/98
	• Initiate Design FPC for Storm Water System Upgrade project	10/1/98
	• Initiate Design FPC for Tank Farm Support Services project	4/30/00
39-LI	New Waste Transfer Facility	
	• Complete NWTF construction activities excluding tie-ins	4/1/95
	• Complete Tank Operator qualification for H/F Tank Farm Operators in incumbent upgrade training program	9/29/95
	• Initiate NWTF tie-ins	9/29/95
	• Complete NWTF component and system testing	11/17/95
	• Complete operations testing	11/29/95
	• Approve KD #4 - approval to commence operations	11/29/95
	• Start of Radioactive Operations	11/30/95

Appendix H - DOE Milestones

ADS	Title	Due
	• Project complete	2/29/96
310-LI	Replacement HLW Evaporator	
	• Receive evaporator vessel	7/31/95
	• Develop and complete initial System Design Descriptions	9/29/95
	• Develop, review and approve Startup Plan	9/29/95
	• Develop, review and approve ORR Plan of Action	9/29/95
	• Complete construction activities except hot tie-ins	9/30/98
	• Project complete	3/31/99
	• Start Radioactive Operations	4/30/99
311-LI	Diversion Box & Pump Pit Containment	
	• Complete restoration of East Hill	10/3/95
	• Complete construction	2/14/96
	• Approve KD #4 - approval to commence radioactive operations	3/15/96
	• Project complete	4/30/96
314-LI	HLW Removal from Filled Waste Tanks	
	• Mechanical completion - Tank 21 Transfer Pump modifications	4/14/95
	• Complete 2H Control Room DCS Factory Acceptance Testing	5/30/95
	• Issue Tank 25 DCPS	6/30/95
	• Tank 29 riser D1-D4 turnover	6/30/95
	• Complete and turnover the 242-H Control Room building	7/31/95
	• Submit Tank 25 & 28 Structural Steel turnover package to DOE-SR	9/15/95
	• Mechanical completion - Tanks 30 & 31 tank top E&I upgrade steel	9/29/95
	• Complete Tank 21 Valve Box fabrication	9/29/95
	• Mechanical completion - Tanks 30, 31, 35 & 36 pipe trench and duct bank	9/29/95

Appendix H - DOE Milestones

ADS	Title	Due
	• Complete Tank 7F Telescoping Transfer Pump support upgrades	9/29/95
	• Tank 25 waste removal facilities - ready to operate	3/31/97
	• Mechanical completion - Tank 8 waste removal facilities	6/1/99
	• Tank 28 waste removal facilities - ready to operate	6/30/99
	• Tank 29 waste removal facilities - ready to operate	7/31/99
	• S-3291 project complete	1/3/00
	• S-3291 project closeout	1/3/00
	• S-2860 H-Area Control Room consolidation	5/31/00
	• H-Area Control Room Consolidation	7/31/00
	• Tank 8 waste removal facilities - ready to operate	2/28/01
315-LI	Tank Farm Services Upgrade	
	• Award Design & Build FPC for Service pipeline	6/1/96
	• Complete construction on cooling and electrical upgrades	9/30/00

Appendix I - Summary of Waste Receipts

	Waste Generators							
Year	F-LHW	F-HHW	H-LHW	H-HHW	RBOF	299-H	Trailers	ETF
1954	35,312	35,710	0	0	0	0	0	0
1955	790,681	984,200	244,918	650,400	0	0	0	0
1956	411,019	487,352	430,200	839,610	0	0	0	0
1957	72,450	85,730	415,471	497,270	0	0	0	0
1958	0	0	231,900	298,000	0	0	0	0
1959	501,939	485,102	47,238	941,963	0	0	0	0
1960	1,279,014	808,004	2,923	402,173	0	0	12,000	0
1961	993,765	3,217,965	9,947	475,422	0	0	3,000	0
1962	1,432,980	615,407	6,576	733,456	0	0	2,000	0
1963	1,227,702	688,965	199,462	540,521	79,000	0	45,300	0
1964	1,391,284	803,040	199,532	440,734	1,260,802	0	14,500	0
1965	485,954	727,401	438,320	942,297	590,134	0	116,050	0
1966	776,029	258,063	550,880	1,243,328	1,494,300	0	11,200	0
1967	747,113	274,016	551,282	897,197	1,632,978	0	13,300	0
1968	688,240	231,262	727,481	721,376	1,612,828	0	180,900	0
1969	930,389	260,835	752,401	864,951	1,187,000	0	360,700	0
1970	862,795	192,938	769,549	814,794	2,261,500	0	220,200	0
1971	671,327	234,343	708,166	994,926	2,295,000	0	1,400	0
1972	929,256	214,344	841,294	813,327	1,724,000	0	38,000	0
1973	1,089,842	322,290	921,378	893,976	1,768,000	0	38,600	0
1974	814,768	182,416	788,090	623,887	970,000	0	0	0
1975	527,736	72,477	350,381	542,966	1,349,000	0	3,000	0
1976	906,700	127,000	549,000	444,000	1,264,000	0	63,300	0
1977	756,500	69,000	455,000	486,000	647,000	0	28,500	0
1978	804,000	129,000	496,000	419,000	624,000	0	29,000	0
1979	798,000	187,000	575,000	511,000	716,000	0	41,000	0

Appendix I - Summary of Waste Receipts

	Waste Generators							
Year	F-LHW	F-HHW	H-LHW	H-HHW	RBOF	299-H	Trailers	ETF
1980	1,131,000	216,000	642,000	554,000	644,000	0	8,000	0
1981	1,323,000	271,000	392,000	574,000	442,000	0	5,000	0
1982	1,093,000	279,000	425,000	380,000	45,000	0	7,000	0
1983	1,684,000	297,000	508,000	427,000	853,000	0	86,000	0
1984	2,122,000	419,000	532,000	513,000	1,293,000	0	98,000	0
1985	2,146,000	580,000	441,000	601,000	991,000	34,000	25,000	0
1986	1,381,000	353,000	397,000	503,000	783,000	79,000	44,000	0
1987	1,312,000	380,000	331,000	394,000	1,157,000	157,000	35,000	0
1988	1,345,000	304,000	169,000	174,000	847,000	176,000	5,000	0
1989	557,000	128,000	203,000	95,000	1,000,000	80,000	0	304,000
1990	169,900	39,500	62,000	8,000	131,000	13,000	0	223,000
1991	209,500	18,000	106,000	20,000	391,000	8,000	14,000	190,000
1992	88,000	2,000	58,000	0	282,000	22,000	110,000	128,000
1993	66,000	12,000	72,000	21,000	265,000	3,000	0	149,000
1994	133,000	21,000	83,000	2,000	236,000	8,000	0	106,000
Total	34,685,195	15,013,360	15,683,389	21,298,574	30,835,542	580,000	1,658,950	1,100,000

Notes:
- all data obtained from HLW Engineering Monthly Data Records
- ETF receipts were ETF evaporator bottoms to Tank 50

Appendix J.1 - ITP Production Plan

Cycle/ Batch	Start	Duration	Finish	Feed Tank	Feed to ITP (kgal)	Feed Type	Notes:
c1/b1	10/1/95	70	12/10/95	48	252	heel	•precipitate heel from ITP demo
				38	130	cs	
					46	stpb	
c1/b2	12/11/95	70	2/19/96	29	100	cs	
				32	200	cs	
				40	240	us	•washwater heel from ITP demo
				49	150	heel	
					24	stpb	
c1/b3	2/20/96	70	4/30/96	25	100	cs	
				32	100	us	
				41	280	ds	
					37	stpb	
wash	5/1/96	120	8/29/96				•precipitate ready for Late Wash
down	8/30/96	31	9/30/96				•lack of funding in FY96 for chemicals
b4	10/1/96	90	12/30/96	32	125	us	
				41	500	ds	
					12	stpb	
b5	12/31/96	90	3/31/97	25	60	cs	
				26	100	cs	
					52	stpb	
b6	4/1/97	90	6/30/97	41	575	ds	
					4	stpb	
b7	7/1/97	90	9/29/97	32	100	us	

Appendix J.1 - ITP Production Plan

Cycle/ Batch	Start	Duration	Finish	Feed Tank	Feed to ITP (kgal)	Feed Type	Notes:
				41	500	ds	
					7	stpb	
b8	9/30/97	90	12/29/97	32	250	us	
				41	350	ds	
					11	stpb	
b9	12/30/97	90	3/30/98	25	125	ds	•start Tk 25 saltcake removal
				41	500	ds	
					10	stpb	
b10	3/31/98	90	6/29/98	27	100	cs	
				41	350	ds	
					28	stpb	
b11	6/30/98	90	9/28/98	25	175	ds	
				27	90	cs	
				41	200	ds	•stop Tk 41 salt removal
					29	stpb	
b12	9/29/98	120	1/27/99	25	400	ds	
				32	175	us	
					17	stpb	
b13	1/28/99	120	5/28/99	25	300	ds	
				29	100	cs	
					36	stpb	
b14	5/29/99	120	9/26/99	25	500	ds	
					14	stpb	

Appendix J.1 - ITP Production Plan

Cycle/ Batch	Start	Duration	Finish	Feed Tank	Feed to ITP (kgal)	Feed Type	Notes:
b15	9/27/99	120	1/25/00	25	400	ds	
				30	100	cs	
					18	stpb	
b16	1/26/00	120	5/25/00	25	250	ds	
				30	200	ds	
					21	stpb	
b17	5/26/00	120	9/23/00	25	425	ds	
				29	100	ds	•start Tk 29 saltcake removal
					15	stpb	
b18	9/24/00	120	1/22/01	25	440	ds	
				29	140	ds	
					24	stpb	
b19	1/23/01	180	7/22/01	25	200	ds	
				28	85	cs	
					26	stpb	
b20	7/23/01	120	11/20/01	25	410	ds	
				29	100	ds	
					14	stpb	
b21	11/21/01	120	3/21/02	25	200	ds	
				29	300	ds	
					15	stpb	
b22	3/22/02	120	7/20/02	25	75	ds	•Tank 25 empty
				29	435	ds	
					16	stpb	

Appendix J.1 - ITP Production Plan

Cycle/ Batch	Start	Duration	Finish	Feed Tank	Feed to ITP (kgal)	Feed Type	Notes:
b23	7/21/02	180	1/17/03	27	90	cs	
				29	100	ds	
					40	stpb	
b24	1/18/03	180	7/17/03	29	450	ds	
					15	stpb	
b25	7/18/03	120	11/15/03	29	300	ds	
				38	75	cs	
					21	stpb	
b26	11/16/03	120	3/15/04	29	100	ds	
				38	100	cs	
					19	stpb	
b27	3/16/04	120	7/14/04	29	100	ds	
				43	100	cs	
					29	stpb	
b28	7/15/04	180	1/11/05	27	100	cs	
				29	300	ds	
					36	stpb	
b29	1/12/05	180	7/11/05	29	250	ds	
				38	300	ds	•start Tk 38 salt dissolution
					17	stpb	
b30	7/12/05	120	11/9/05	29	300	ds	
				38	250	ds	
					17	stpb	

Appendix J.1 - ITP Production Plan

Cycle/ Batch	Start	Duration	Finish	Feed Tank	Feed to ITP (kgal)	Feed Type	Notes:
b31	11/10/05	120	3/10/06	29	100	ds	
				38	200	ds	
					14	stpb	
b32	3/11/06	120	7/9/06	29	300	ds	
				38	250	ds	
					17	stpb	
b33	7/10/06	120	11/7/06	29	225	ds	•Tk 29 empty
				38	335	ds	
					17	stpb	
b34	11/8/06	120	3/8/07	38	550	ds	
					16	stpb	
b35	3/9/07	120	7/7/07	27	90	cs	
				38	350	ds	
					31	stpb	
b36	7/8/07	120	11/5/07	31	150	ds	•start Tk 31 saltcake removal
				38	475	ds	
					26	stpb	
b37	11/6/07	120	3/5/08	31	200	ds	
				38	375	ds	
					16	stpb	
b38	3/6/08	120	7/4/08	31	200	ds	
				38	375	ds	
					16	stpb	

Appendix J.1 - ITP Production Plan

Cycle/ Batch	Start	Duration	Finish	Feed Tank	Feed to ITP (kgal)	Feed Type	Notes:
b39	7/5/08	120	11/2/08	31	300	ds	
				38	225	ds	•Tk 38 empty
					14	stpb	
b40	11/3/08	120	3/3/09	31	400	ds	
					10	stpb	

Notes:
- Cycle #1 batch times < 70 days due to CLFL issues, produce 80 kgal 10 wt % precipitate per year thereafter
- Batch durations varied to maintain precipitate production to about 80 kgal/year
- Abbreviations:
  - ww = washwater
  - ds = dissolved salt
  - stpb = sodium tetraphenylborate
  - us = unconcentrated supernate
  - cs = concentrated supernate
  - c = cycle
  - b = batch

Appendix J.2 - ITP Precipitate and Filtrate Production

ITP Batch	Start Date	Duration (days)	ITP Ppt (kgal)	Ppt Fed to LW (kgal)	Ppt Volume (kgal)	ITP Filtrate (kgal)	ETF Conc (kgal)	Total to Tk 50 (kgal)	SS Grout Produced (kgal)	Cells Filled (each)	V#1 Cells Filled (each)	V#4 Cells Filled (each)	V#2 Cells Filled (each)
c1/b1	10/1/95	70	0	0	0	383	58	441	714	0.41	2.91	1.00	
c1/b2	12/11/95	70	0	0	0	699	58	757	1,226	0.70	3.61		
c1/b3	2/20/96	70	0	0	0	642	58	700	1,133	0.65	4.26		
wash	5/1/96	120	0	0	0	0	99	99	160	0.09	4.36		
down	8/30/96	31	0	0	142	0	25	25	41	0.02	4.38		
b4	10/1/96	90	13	20	135	712	74	786	1,273	0.73	5.11		
b5	12/31/96	90	81	20	196	579	74	653	1,058	0.61	5.72		
b6	4/1/97	90	5	20	181	670	74	744	1,205	0.69	6.00	1.41	
b7	7/1/97	90	10	20	171	670	74	744	1,205	0.69		2.10	
b8	9/30/97	90	16	20	167	658	74	732	1,186	0.68		2.78	
b9	12/30/97	90	10	20	157	765	74	839	1,359	0.78		3.56	
b10	3/31/98	90	43	20	180	707	74	781	1,265	0.73		4.29	
b11	6/30/98	90	45	20	205	695	74	769	1,246	0.72		5.00	
b12	9/29/98	120	26	27	205	659	99	758	1,227	0.70		5.71	
b13	1/28/99	120	50	27	228	725	99	824	1,334	0.77		6.48	
b14	5/29/99	120	16	27	217	684	99	783	1,268	0.73		7.20	
b15	9/27/99	120	23	27	214	702	99	801	1,297	0.74		7.95	
b16	1/26/00	120	29	27	216	661	99	760	1,231	0.71		8.65	
b17	5/26/00	120	22	27	211	643	99	742	1,201	0.69		9.34	
b18	9/24/00	120	32	27	217	743	99	842	1,363	0.78		10.13	
b19	1/23/01	180	37	40	214	528	148	676	1,095	0.63		10.76	
b20	7/23/01	120	17	27	204	683	99	782	1,266	0.73		11.48	
b21	11/21/01	120	23	27	200	663	99	762	1,234	0.71		12.00	0.19
b22	3/22/02	120	24	27	198	626	99	725	1,174	0.67			0.86
b23	7/21/02	180	59	40	217	341	148	489	792	0.45			1.32
b24	1/18/03	180	18	40	195	594	148	742	1,202	0.69			2.01
b25	7/18/03	120	28	27	196	672	99	771	1,248	0.72			2.73
b26	11/16/03	120	27	27	197	374	99	473	766	0.44			3.17
b27	3/16/04	120	42	27	212	437	99	536	868	0.50			3.66
b28	7/15/04	180	50	40	222	675	148	823	1,333	0.77			4.43
b29	1/12/05	180	21	40	203	629	148	777	1,259	0.72			5.15
b30	7/12/05	120	25	27	201	647	99	746	1,208	0.69			5.85

Appendix J.2 - ITP Precipitate and Filtrate Production

ITP Batch	Start Date	Duration (days)	ITP Ppt (kgal)	Ppt Fed to LW (kgal)	Ppt Volume (kgal)	ITP Filtrate (kgal)	ETF Conc (kgal)	Total to Tk 50 (kgal)	SS Grout Produced (kgal)	Cells Filled (each)	V#1 Cells Filled (each)	V#4 Cells Filled (each)	V#2 Cells Filled (each)
b31	11/10/05	120	19	27	194	339	99	438	709	0.41			6.25
b32	3/11/06	120	22	27	189	704	99	803	1,300	0.75			7.00
b33	7/10/06	120	24	27	186	711	99	810	1,312	0.75			7.75
b34	11/8/06	120	25	27	185	676	99	775	1,255	0.72			8.47
b35	3/9/07	120	48	27	206	552	99	651	1,054	0.61			9.08
b36	7/8/07	120	35	27	215	741	99	840	1,360	0.78			9.86
b37	11/6/07	120	20	27	208	705	99	804	1,302	0.75			10.61
b38	3/6/08	120	20	27	201	705	99	804	1,302	0.75			11.35
b39	7/5/08	120	21	27	196	679	99	778	1,260	0.72			12.08
b40	11/3/08	120	15	27	184	525	99	624	1,010	0.58			12.66

Notes:
- ITP startup authorization 7/1/95, start of batch #1 is 10/1/95
- ITP Cycle #1 batch times limited to <70 days due to CLFL concerns
- ITP batch times after Cycle #1 based on producing 80 kgal of 10 wt % precipitate per year
- ITP ppt and filtrate rates based on ITP Production Plan 4/13/95 (Pate, Georgeton)
- Batch 1 sludge volume = 954 Kgal slurried sludge @ 19 wt % solids
- 804 kgal of sludge available for feed to DWPF after subtracting Tanks 42 and 51 heels.
- Per Alex Choi, 804 Kgal sludge requires 1,220 Kgal of ppt
- At 15% attainment, average ppt consumption = 0.222 kgal/day or 80 kgal/yr
- ETF feed to Tank 50 assumed 300 kgal/year
- 1.0 gallons of salt solution in Tank 50 = 1.62 gallons of Saltstone grout

Appendix J.3 - Sludge Batches and Sequencing

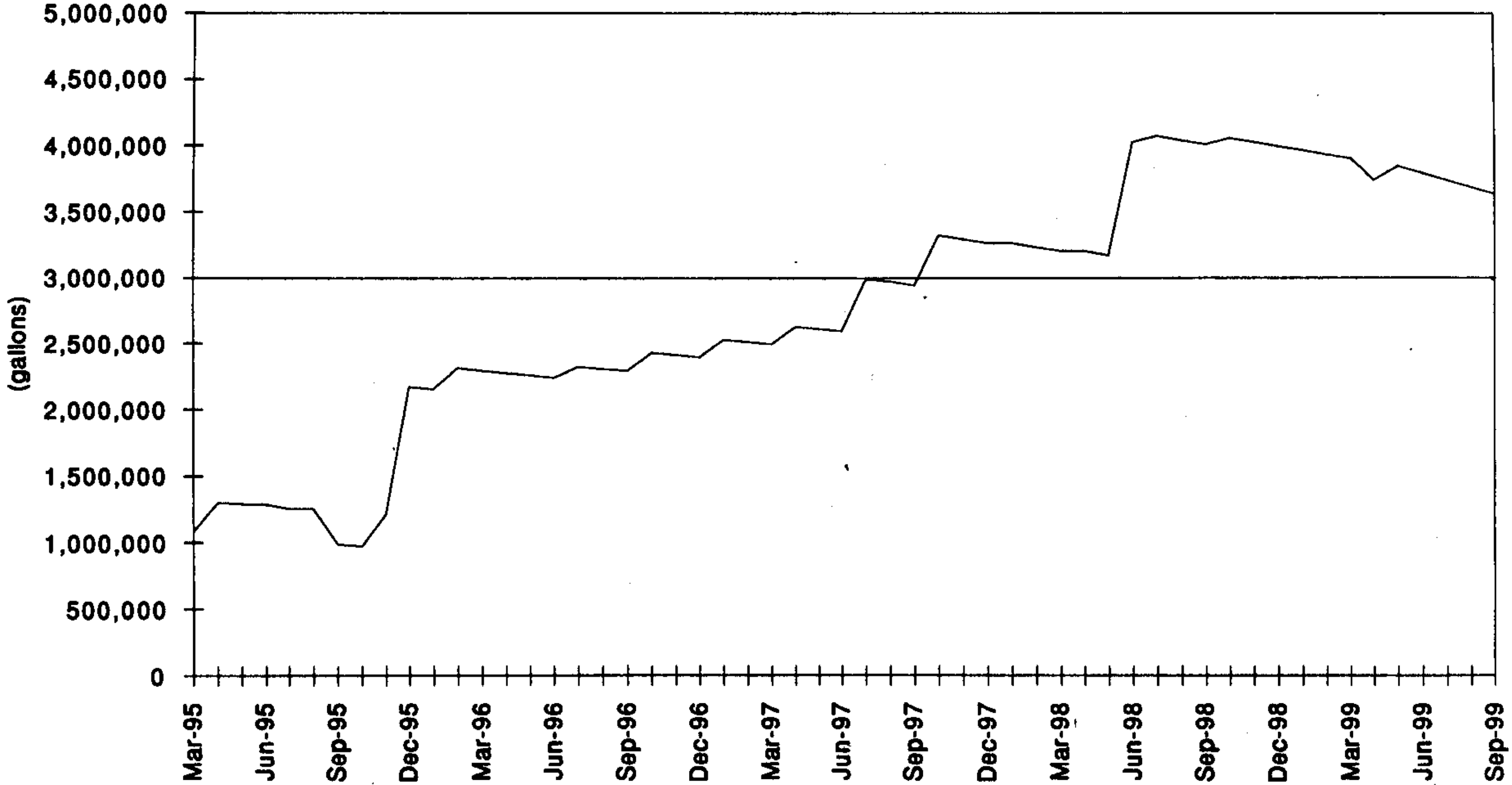
Batch	Tank	Volume (gal)	Available Volume (kgal)	Notes
1a & 1b	15	126,000	91,000	Al dissolution (actual)
	17	376,000	348,000	Volume reduction due to washing and compaction
	18	208,000	193,000	Volume reduction due to washing and compaction
	21	205,000	190,000	Volume reduction due to washing and compaction
	22	31,000	29,000	Volume reduction due to washing and compaction
			-173,000	Transferred to Tank 40
			-147,000	establish heels in Tanks 42 & 51
		946,000	531,000 *	
2		173,000	173,000	sludge already in Tank 40
	8	164,000	164,000	
	11	140,000	70,000	Al dissolution 2:1
	15	312,000	156,000	Al dissolution 2:1
			-88,000	establish heel in Tank 40
		789,000	475,000	
3	4	127,000	127,000	
	7	206,000	206,000	
	12	215,000	108,000	Al dissolution 2:1
	14	27,000	13,000	Al dissolution 2:1
	47	248,000	248,000	Sludge remaining after salt removal
		823,000	702,000	

* Sludge volumes are settled sludge as shown in the HLWE Engineering Monthly data Record. Volumes adjusted to the proper wt % solids will be quite different, i.e., Sludge Batch #1 totals 954,000 gal of which 804,000 gal is available for feed. The 804,000 gal is at 19 wt % solids and corresponds with the 531,000 gal of settled sludge shown for batch #1 in this table.

Appendix J.3 - Sludge Batches and Sequencing

Batch	Tank	Volume (gal)	Available Volume (kgal)	Notes
4	5	34,000	34,000	
	6	25,000	25,000	
	9	4,000	4,000	Sludge remaining after salt removal
	10	4,000	4,000	Sludge remaining after salt removal
	13	223,000	167,250	Al dissolution 4:3
	26	263,000	263,000	2F Evap. shut down during sludge removal
	35	52,000	26,000	Al dissolution 2:1
		605,000	523,250	
5	1	7,000	7,000	Sludge remaining after salt removal
	2	4,000	4,000	Sludge remaining after salt removal
	3	4,000	4,000	Sludge remaining after salt removal
	32	157,000	78,500	Al diss. 2:1, RHLWE down during sludge rem.
	33	42,000	42,000	
	34	45,000	45,000	
	39	93,000	46,500	Al dissolution 2:1
	43	192,000	192,000	2H Evap. shut down during sludge removal
			88,000	Tank 51 heel removed at end of batch feed
		544,000	507,000	
6	17	2,000	2,000	residual heel from 1985-6 sludge rem. campaign
	18	42,000	42,000	residual heel from 1985-6 sludge rem. campaign
	19	20,000	20,000	residual heel from 1985-6 salt rem. campaign
	21	14,000	14,000	residual heel from 1985-6 sludge rem. campaign
	22	60,000	60,000	residual heel from 1985-6 sludge rem. campaign
	23	43,000	43,000	
	24	4,000	4,000	residual heel from 1985-6 salt rem. campaign
			147,000	Tanks 42 & 40 heels removed at end of batch feed
		185,000	332,000	

Appendix J.4 - Tank Farm Material Balance Graph



Appendix J.4 - Tank Farm Material Balance

End of	Influents							Effluents					Working	
Mo/Year	F-LHW	F-HHW	H-LHW	H-HHW	DWPF	Tank WW	ESP	2H Evap	2F Evap	RHLWE	ITP	Other	Inventory	Notes
Mar-95													1,078,623	
Apr-95	13,400	500	2,100	0	0	0	0	223,544	9,869	0	0	0	1,296,036	
May-95	13,400	500	2,100	0	0	0	0	0	9,869	0	0	0	1,289,905	
Jun-95	13,400	500	2,100	0	0	0	0	0	9,869	0	0	0	1,283,774	
Jul-95	13,400	500	3,300	0	0	0	400,000	378,743	9,869	0	0	0	1,255,186	ESP Tank 51 washwater
Aug-95	13,400	500	3,300	0	0	0	0	2,343	9,869	0	0	0	1,250,198	
Sep-95	13,400	500	3,300	0	0	0	256,000	0	9,869	0	0	0	986,867	ESP Tank 51 washwater
Oct-95	30,310	7,370	3,300	0	0	0	0	0	26,753	0	0	0	972,640	Tank 38 conc sup to ITP
Nov-95	30,310	7,370	3,300	0	0	0	0	250,663	26,753	0	0	0	1,209,076	
Dec-95	30,310	7,370	3,300	0	0	0	0	2,343	26,753	0	30,000	941,000	2,168,191	Tk 42 as Emer Spare/Tk 38 to ITP 30 kgal
Jan-96	30,310	7,370	3,300	0	159,958	0	0	79,123	103,533	0	0	0	2,149,909	
Feb-96	29,910	7,370	3,300	0	159,958	0	0	79,123	103,249	0	180,000	0	2,311,742	Tk 26 to ITP 50 kgal/Tk 40 to ITP 130 kgal
Mar-96	29,910	7,370	3,300	0	159,958	0	0	79,123	103,249	0	0	0	2,293,576	
Apr-96	29,910	7,370	3,300	0	159,958	0	0	79,123	103,249	0	0	0	2,275,409	
May-96	29,910	7,370	3,300	0	159,958	0	0	79,123	103,249	0	0	0	2,257,243	
Jun-96	29,910	7,370	1,100	0	159,958	0	0	77,561	103,249	0	0	0	2,239,714	
Jul-96	28,410	7,370	1,100	0	159,958	0	0	77,561	102,184	0	100,000	0	2,322,621	Tk 32 us to ITP 100 kgal
Aug-96	28,410	7,370	1,100	0	159,958	0	0	77,561	102,184	0	0	0	2,305,527	
Sep-96	11,500	7,370	1,100	0	159,958	0	0	77,561	90,178	0	0	0	2,293,338	
Oct-96	15,450	500	1,100	0	159,958	0	0	77,561	88,104	0	145,000	0	2,426,995	Tk 32 us to ITP 100 kgal, Tk 38 cs 45 kgal
Nov-96	15,450	19,120	1,100	0	159,958	0	0	77,561	101,325	0	0	0	2,410,252	
Dec-96	15,450	19,120	1,100	0	159,958	0	0	77,561	101,325	0	0	0	2,393,510	
Jan-97	15,450	19,120	0	0	166,966	0	0	80,144	104,688	0	150,000	0	2,526,806	Tk 32 to ITP 90 kgal/Tk 38 to ITP 60 kgal
Feb-97	15,450	19,120	0	0	166,966	0	0	80,144	104,688	0	0	0	2,510,102	
Mar-97	15,450	19,120	0	0	166,966	0	0	80,144	104,688	0	0	0	2,493,398	
Apr-97	15,450	19,120	0	0	166,966	0	0	80,144	104,688	0	150,000	0	2,626,694	Tk 32 to ITP 90 kgal/Tk 38 to ITP 60 kgal/Tk 41 stop
May-97	15,450	19,120	0	0	166,966	0	0	80,144	104,688	0	0	0	2,609,990	
Jun-97	15,450	19,120	0	0	166,966	0	0	80,144	104,688	0	0	0	2,593,286	
Jul-97	15,450	19,120	0	0	166,966	0	0	80,144	104,688	0	410,000	0	2,986,582	Tk 32 to ITP 350 kgal/Tk 38 to ITP 60 kgal
Aug-97	15,450	19,120	0	0	166,966	0	0	80,144	104,688	0	0	0	2,969,878	
Sep-97	15,450	19,120	21,900	23,800	166,966	0	0	95,693	121,586	0	0	0	2,939,921	
Oct-97	15,450	19,120	21,900	23,800	166,966	0	0	95,693	121,586	0	410,000	0	3,319,964	Tk 32 to ITP 350 kgal/Tk 38 to ITP 60 kgal
Nov-97	15,450	19,120	21,900	23,800	166,966	0	0	95,693	121,586	0	0	0	3,290,007	
Dec-97	15,450	19,120	21,900	23,800	166,966	0	0	95,693	121,586	0	0	0	3,260,050	
Jan-98	15,450	19,120	21,900	23,800	173,974	0	200,000	99,057	124,950	0	30,000	200,000	3,259,813	Tk 29 to ITP 30 kgal/Tk 51 decant to Type IV Tanks
Feb-98	15,450	19,120	21,900	23,800	173,974	0	0	99,057	124,950	0	0	0	3,229,576	
Mar-98	15,450	19,120	21,900	23,800	173,974	0	0	99,057	124,950	0	0	0	3,199,339	

Appendix J.4 - Tank Farm Material Balance

End of	Influents							Effluents					Working	
Mo/Year	F-LHW	F-HHW	H-LHW	H-HHW	DWPF	Tank WW	ESP	2H Evap	2F Evap	RHLWE	ITP	Other	Inventory	Notes
Apr-98	13,950	19,120	21,900	23,800	173,974	0	0	99,057	123,885	0	30,000	0	3,199,536	Tk 29 to ITP 30 kgal
May-98	13,950	19,120	21,900	23,800	173,974	0	0	99,057	123,885	0	0	0	3,169,734	
Jun-98	13,950	19,120	21,900	23,800	173,974	0	0	99,057	123,885	0	885,000	0	4,024,932	Tk 41 return to salt service
Jul-98	13,950	19,120	21,900	23,800	173,974	0	0	99,057	123,885	0	75,000	0	4,070,129	Tk 30 to ITP 75 kgal
Aug-98	13,950	19,120	21,900	23,800	173,974	0	0	99,057	123,885	0	0	0	4,040,327	
Sep-98	13,950	19,120	21,900	23,800	173,974	0	0	99,057	123,885	0	0	0	4,010,525	
Oct-98	13,950	19,120	21,900	23,800	173,974	0	0	99,057	123,885	0	75,000	0	4,055,723	Tk 30 to ITP 75 kgal
Nov-98	13,950	19,120	21,900	23,800	173,974	0	0	99,057	123,885	0	0	0	4,025,920	
Dec-98	13,950	19,120	21,900	23,800	173,974	0	0	99,057	123,885	0	0	0	3,996,118	
Jan-99	13,950	19,120	21,900	23,800	180,982	0	0	102,420	127,249	0	0	0	3,966,036	
Feb-99	13,950	19,120	27,200	23,800	180,982	0	0	106,183	127,249	0	0	0	3,934,416	
Mar-99	13,950	19,120	27,200	23,800	180,982	0	250,000	106,183	127,249	0	0	250,000	3,902,796	Tk 42 decant to Tk 21/24
Apr-99	13,950	19,120	27,200	23,800	180,982	0	0	106,183	0	0	0	0	3,743,928	
May-99	13,950	19,120	27,200	23,800	180,982	0	300,000	106,183	0	259,783	0	300,000	3,844,843	Tk 42 decant to Tk 21/24
Jun-99	13,950	19,120	27,200	23,800	180,982	0	0	106,183	0	106,183	0	0	3,792,157	
Jul-99	13,950	19,120	27,200	23,800	180,982	0	0	106,183	0	106,183	0	0	3,739,472	
Aug-99	13,950	19,120	27,200	23,800	180,982	0	0	106,183	0	106,183	0	0	3,686,787	
Sep-99	13,950	19,120	27,200	23,800	180,982	0	0	106,183	0	106,183	0	0	3,634,101	
2000	224,540	463,340	260,400	108,800	2,255,770	0	0	1,267,654	864,804	1,267,654	0	0	3,721,363	
2001	238,320	516,480	340,400	81,600	2,001,015	0	0	0	1,596,151	2,162,658	1,271,000	0	5,573,357	Tk 25 empty - 1st fill
2002	198,880	346,320	537,600	81,600	2,001,015	0	0	0	1,436,855	2,302,670	0	0	6,147,468	
2003	30,000	360	134,400	20,400	2,001,015	0	0	0	999,065	2,016,398	0	0	6,976,756	
2004	30,000	360	30,000	0	2,001,015	0	0	0	983,561	1,942,274	1,271,000	0	9,112,216	Tk 38 empty - 1st fill
2005	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,016,189	
2006	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	8,920,162	
2007	30,000	360	30,000	0	2,001,015	140,000	0	981,787	86,074	1,023,487	0	0	8,810,135	
2008	30,000	360	30,000	0	2,001,015	190,000	1,640,000	981,787	580,894	1,885,667	1,271,000	0	9,638,108	Tk 29 empty - 1st fill
2009	30,000	360	30,000	0	2,001,015	190,000	1,640,000	981,787	580,894	1,885,667	0	0	9,195,081	
2010	30,000	360	30,000	0	2,001,015	0	820,000	981,787	259,234	1,380,327	0	0	8,935,054	
2011	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	8,839,027	
2012	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	1,271,000	0	10,014,000	Tk 31 empty - 1st fill
2013	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,917,973	
2014	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,821,946	
2015	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,725,919	
2016	30,000	360	30,000	0	2,001,015	280,000	0	981,787	149,074	1,086,487	1,271,000	0	10,872,892	Tk 41 empty - 2nd fill
2017	30,000	360	30,000	0	2,001,015	380,000	654,000	981,787	382,426	1,466,335	0	0	10,608,065	
2018	30,000	360	30,000	0	2,001,015	0	1,960,000	981,787	587,554	1,964,007	0	0	10,120,038	

Appendix J.4 - Tank Farm Material Balance

End of	Influents							Effluents					Working	
Mo/Year	F-LHW	F-HHW	H-LHW	H-HHW	DWPF	Tank WW	ESP	2H Evap	2F Evap	RHLWE	ITP	Other	Inventory	Notes
2019	30,000	360	30,000	0	2,001,015	0	1,960,000	981,787	587,554	1,964,007	0	0	9,632,011	
2020	30,000	360	30,000	0	2,001,015	0	327,000	981,787	117,250	1,127,911	0	0	9,470,584	
2021	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,374,557	
2022	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,278,530	
2023	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,182,503	
2024	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,086,476	
2025	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	8,990,449	
2026	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	1,271,000	0	10,165,422	Tk 29 empty - 2nd fill
2027	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	10,069,395	
2028	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,973,368	
2029	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,877,341	
2030	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,781,314	
2031	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,685,287	
2032	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	1,271,000	0	10,860,260	Tk 28 empty - 1st fill
2033	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	10,764,233	
2034	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	10,668,206	
2035	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	10,572,179	
2036	30,000	360	30,000	0	2,001,015	0	1,050,000	981,787	325,474	1,498,087	0	0	10,266,152	
2037	30,000	360	30,000	0	2,001,015	0	1,400,000	981,787	426,274	1,677,287	0	0	9,890,125	
2038	30,000	360	30,000	0	2,001,015	280,000	1,050,000	981,787	451,474	1,624,087	0	0	9,556,098	
2039	30,000	360	30,000	0	2,001,015	380,000	0	981,787	194,074	1,131,487	0	0	9,422,071	
2040	30,000	360	30,000	0	2,001,015	190,000	0	981,787	108,574	1,045,987	0	0	9,307,044	
2041	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	1,271,000	0	10,482,017	Tk 31 empty - 2nd fill
2042	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	10,385,990	
2043	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	1,271,000	0	11,560,963	Tk 38 empty - 2nd fill
2044	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	11,464,936	
2045	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	11,368,909	
2046	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	11,272,882	
2047	30,000	360	30,000	0	2,001,015	190,000	0	981,787	108,574	1,045,987	0	0	11,157,855	
2048	30,000	360	30,000	0	2,001,015	280,000	1,050,000	981,787	451,474	1,624,087	0	0	10,823,828	
2049	30,000	360	30,000	0	2,001,015	0	1,400,000	981,787	426,274	1,677,287	0	0	10,447,801	
2050	30,000	360	30,000	0	2,001,015	0	1,050,000	981,787	325,474	1,498,087	0	0	10,141,774	
2051	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	10,045,747	
2052	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,949,720	
2053	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,853,693	
2054	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,757,666	
2055	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	1,271,000	0	10,932,639	Tk 29 empty - 3rd fill

Appendix J.4 - Tank Farm Material Balance

End of Mo/Year	Influents F-LHW	F-HHW	H-LHW	H-HHW	DWPF	Tank WW	ESP	Effluents 2H Evap	2F Evap	RHLWE	ITP	Other	Working Inventory	Notes
2056	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	10,836,612	
2057	30,000	360	30,000	0	2,001,015	280,000	93,000	981,787	175,858	1,134,103	0	0	10,693,985	
2058	30,000	360	30,000	0	2,001,015	420,000	560,000	981,787	373,354	1,436,207	0	0	10,443,958	
2059	30,000	360	30,000	0	2,001,015	280,000	560,000	981,787	310,354	1,373,207	0	0	10,207,931	
2060	30,000	360	30,000	0	2,001,015	0	187,000	981,787	76,930	1,056,231	0	0	10,074,504	
2061	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,978,477	
2062	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	9,882,450	
2063	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	1,271,000	0	11,057,423	Tk 30 empty - 1st fill
2064	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	0	0	10,961,396	
2065	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	1,271,000	0	12,136,369	Tk 44 empty - 1st fill
2066	30,000	360	30,000	0	2,001,015	0	0	981,787	23,074	960,487	1,271,000	0	13,311,342	Tk 45 empty - 1st fill

Notes:

- F-LHW & HHW: per NMP-EFA-95-0028, dated 3/2/95
- H-LHW & HHW: per NMP-EFA-95-00??, dated 3/??/95
- Reactor Basin sludge transported to the Tank Farm is planned to be zero. The historical average is 35,200 gal/yr.
- DWPF recycle is a function of the planned attainment for the 6 batches of sludge per WSRC-TR-93-0677, Rev. 0.
- Tank washwater based on remove from service dates in Appendix C, 140 kgal for new tanks, 190 kgal for failed tanks.
- ESP washwater per memo, A. S. Choi to N. R. Davis, 5/25/94, for each batch. Washwater is assumed to be generated evenly for 30 months prior to feeding each batch to DWPF.
- 1H Evaporator is assumed to remain down indefinately.
- 2H Evaporator space gain per Section 8.6.2 of this Plan.
- 2F Evaporator per Section 8.6.3 of this Plan.
- RHLWE is assumed to start up 4/30/99, space gain per Section 8.6.4 of this Plan.
- ITP is planned to start up 10/1/95, run 3 batches in FY96, then 80,000 gallons of precipitate per year thereafter.
- The "Other" column shows transfers of dilute waste out of Type III Tanks for use as waste removal water and the changing use of Tank 42 as emergency spare.
- The "Available Space" column shows the useable storage space in Type III Tanks, this does not count the 1.3 Mgal of emergency space in F & H, ITP or ESP tanks except as noted.

Appendix J.4 - Tank Farm Salt Balance

End of Mo/Yr	Tk 38 Salt Inv. (gal)	Tk 41 Salt Inv. (gal)	Tk 25 Salt Inv. (gal)	Tk 27 Salt Inv. (gal)	Tk 28 Salt Inv. (gal)	Tk 44 salt Inv. (gal)	Tk 45 salt Inv. (gal)	Tk 46 Salt Inv. (gal)	Tk 47 salt Inv. (gal)	Tk 30 Salt Inv. (gal)	Tk 29 Salt Inv. (gal)	Tk 31 salt Inv. (gal)	Tk 36 salt Inv. (gal)	Tk 37 Salt Inv. (kgal)
Mar-95	766,000	1,231,000	full	449,000	full	full	full	107,000	full	5,000	full	full	full	full
Apr-95	791,556							110,336						
May-95	792,165							113,672						
Jun-95	792,774							117,008						
Jul-95	817,331							120,344						
Aug-95	818,288							123,680						
Sep-95	826,925							127,016						
Oct-95	827,882							136,059						
Nov-95	828,839							145,102						
Dec-95	829,796	1,141,000						154,146						
Jan-96	833,952							166,388						
Feb-96	838,108	1,098,000						178,534						
Mar-96	842,264							190,681						
Apr-96	846,421							202,827						
May-96	850,577							214,973						
Jun-96	854,095							227,120						
Jul-96	857,613	996,000						238,906						
Aug-96	861,131							250,692						
Sep-96	864,649							258,420						
Oct-96	868,168	896,000						265,448						
Nov-96	871,686							276,944						
Dec-96	875,204							288,440						
Jan-97	878,543	811,000						300,076						
Feb-97	881,883							311,712						
Mar-97	885,222							323,348						
Apr-97	888,561	726,000						334,984						
May-97	891,901							346,620						
Jun-97	895,240							358,256						
Jul-97	898,579	641,000						369,892						
Aug-97	901,918							381,528						
Sep-97	911,609							398,877						
Oct-97	921,299	556,000						416,226						
Nov-97	930,989							433,573						
Dec-97	940,680							450,921						
Jan-98	950,510	471,000						468,409						
Feb-98	960,341							485,898						
Mar-98	970,171							503,386						

Appendix J.4 - Tank Farm Salt Balance

End of Mo/Yr	Tk 38 Salt Inv. (gal)	Tk 41 Salt Inv. (gal)	Tk 25 Salt Inv. (gal)	Tk 27 Salt Inv. (gal)	Tk 28 Salt Inv. (gal)	Tk 44 salt Inv. (gal)	Tk 45 salt Inv. (gal)	Tk 46 Salt Inv. (gal)	Tk 47 salt Inv. (gal)	Tk 30 Salt Inv. (gal)	Tk 29 Salt Inv. (gal)	Tk 31 salt Inv. (gal)	Tk 36 salt Inv. (gal)	Tk 37 Salt Inv. (kgal)
Apr-98	980,002	324,000						520,514						
May-98	989,832							537,642						
Jun-98	999,663							554,771						
Jul-98	1,009,493	324,000						571,899						
Aug-98		333,830						589,027						
Sep-98		343,661						606,155						
Oct-98		353,491						623,284						
Nov-98		363,322						640,412						
Dec-98		373,152						657,540						
Jan-99		383,123						674,809						
Feb-99		394,631						692,077						
Mar-99		406,138						709,346						
Apr-99		417,646						726,614						
May-99		429,154						743,883						
Jun-99		440,661						761,151						
Jul-99		452,169						778,419						
Aug-99		463,677						795,688						
Sep-99		475,184						812,956		5,000				
2000		595,816		449,000				1,049,275		170,747				
2001		734,552		649,736						349,503				
2002		930,476	Tk 25 empty	800,168						585,448				
2003		1,009,472		812,350						704,465				
2004		2H down		819,637						793,205				
2005		2H down		826,923						881,946				
2006		2H down		834,210						921,966	Tk 29 empty			
2007		2H down		847,535						968,986	0			
2008	T38 empty	2H down	0	982,402							259,440			
2009	48,720		133,562								518,881			
2010	97,441		199,889								663,861			
2011	146,161		207,175								703,881			
2012	194,881		214,462								743,902	Tk 31 empty		
2013	243,602		221,748								783,922			
2014	292,322		229,034								823,942			
2015	341,042		236,321								863,962			
2016	389,762		255,686								917,983			
2017	438,483		326,452								1,060,715	0		
2018	487,203		474,859									290,900		

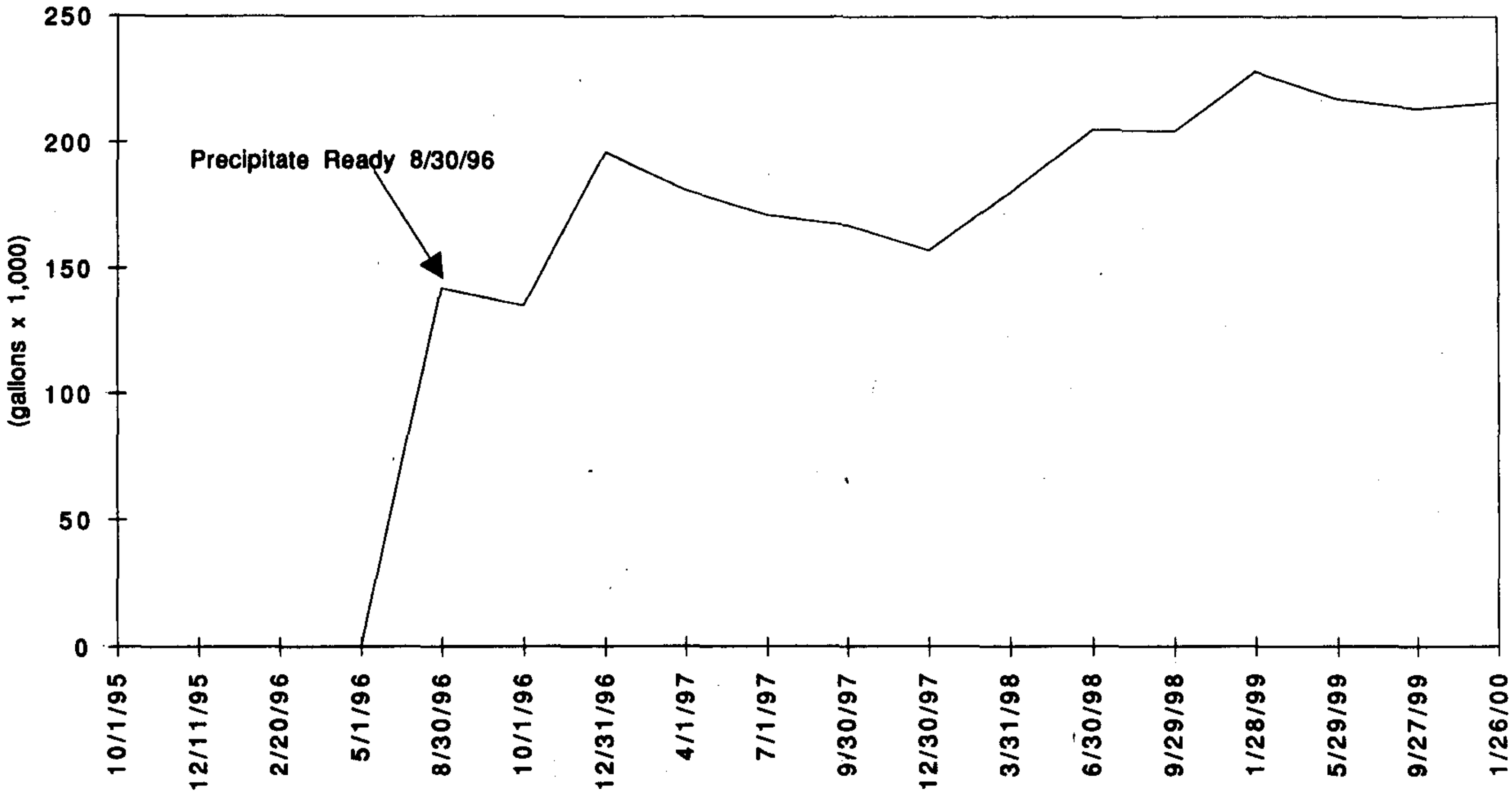
Appendix J.4 - Tank Farm Salt Balance

End of Mo/Yr	Tk 38 Salt Inv. (gal)	Tk 41 Salt Inv. (gal)	Tk 25 Salt Inv. (gal)	Tk 27 Salt Inv. (gal)	Tk 28 Salt Inv. (gal)	Tk 44 salt Inv. (gal)	Tk 45 salt Inv. (gal)	Tk 46 Salt Inv. (gal)	Tk 47 salt Inv. (gal)	Tk 30 Salt Inv. (gal)	Tk 29 Salt Inv. (gal)	Tk 31 salt Inv. (gal)	Tk 36 salt Inv. (gal)	Tk 37 Salt Inv. (kgal)
2019	535,923		623,265									581,801		
2020	584,644		654,095									663,677		
2021	633,364		661,382									703,697		
2022	682,084		668,668									743,718		
2023	730,805		675,955									783,738		
2024	779,525		683,241									823,758		
2025	828,245		690,527									863,778		
2026	876,965	0	697,814								Tk 29 empty	903,799		
2027		48,720	705,100									943,819		
2028		97,441	712,387									983,839		
2029		146,161	719,673								0	1,023,860		
2030		194,881	726,959								40,020			
2031		243,602	734,246								80,041			
2032		292,322	741,532		Tk 28 empty						120,061			
2033		341,042	748,819								160,081			
2034		389,762	756,105								200,102			
2035		438,483	763,391								240,122			
2036		487,203	846,278								414,542			
2037		535,923	954,364								633,762			
2038		584,644	1,049,329		0						822,183			
2039		633,364			23,679						881,203			
2040		682,084			39,161						930,723			
2041		730,805			46,447						970,744	Tk 31 empty		
2042		779,525			53,734						1,010,764	0		
2043	T38 empty	828,245			61,020							40,020		
2044		876,965			68,307							80,041		
2045		925,686			75,593							120,061		
2046		974,406			82,879							160,081		
2047	0	1,023,126			98,362							209,602		
2048	48,720				193,327							398,022		
2049	97,441				301,413							617,242		
2050	146,161				384,300							791,662		
2051	194,881				391,586							831,683		
2052	243,602				398,872							871,703		
2053	292,322				406,159							911,723		
2054	341,042				413,445							951,744		
2055	389,762				420,732						Tk 29 empty	991,764		

Appendix J.4 - Tank Farm Salt Balance

End of Mo/Yr	Tk 38 Salt Inv. (gal)	Tk 41 Salt Inv. (gal)	Tk 25 Salt Inv. (gal)	Tk 27 Salt Inv. (gal)	Tk 28 Salt Inv. (gal)	Tk 44 salt Inv. (gal)	Tk 45 salt Inv. (gal)	Tk 46 Salt Inv. (gal)	Tk 47 salt Inv. (gal)	Tk 30 Salt Inv. (gal)	Tk 29 Salt Inv. (gal)	Tk 31 salt Inv. (gal)	Tk 36 salt Inv. (gal)	Tk 37 Salt Inv. (kgal)
2056	438,483				428,018						0	1,031,784		
2057	487,203				454,079						65,924			
2058	535,923				519,803						198,625			
2059	584,644				579,488						324,325			
2060	633,364				600,238						388,281			
2061	682,084				607,524						428,302			
2062	730,805				614,811						468,322			
2063	779,525				622,097					Tk 30 empty	508,342			
2064	828,245				629,384						548,362			
2065	876,965				636,670	Tk 44 empty					588,383			
2066	925,686				643,956		Tk 45 empty				628,403			

Appendix J.5 - ITP Precipitate Inventory



Appendix J.6 - Glass Waste Storage Building Fill Rate

End of Yr	Sludge Batch	Percent Attnmt	No. Cans Produced	Total Cans In GWSB #1	Total Cans In GWSB #2	Total Cans In GWSB #3	Notes
1996	1	16	60	60			• Start production 1/1/96
1997	1	16	87	147			
1998	1	16	87	234			
1999	1	16	87	321			
2000	1	16	87	408			
2001	1	16	87	495			
2002	1	16	87	582			
2003	1	16	87	669			
2004	1	16	87	756			
2005	1	16	87	843			
2006	1	16	87	930			
2007	1	16	87	1,017			
2008	1	16	87	1,104			
2009	1	16	87	1,191			
2010	1,2	16,15	81	1,272			
2011	2	15	81	1,353			
2012	2	15	81	1,434			
2013	2	15	81	1,515			
2014	2	15	81	1,596			
2015	2	15	81	1,677			
2016	2	15	81	1,758			
2017	2	15	81	1,839			
2018	2	15	81	1,920			
2019	2,3	15	81	2,001			
2020	3	15	81	2,016	76		Start filling GWSB #2,
2021	3	15	81		157		modules 1 and 2.
2022	3	15	81		238		
2023	3	15	81		319		
2024	3	15	81		400		
2025	3	15	81		481		
2026	3	15	81		562		
2027	3	15	81		643		

Appendix J.6 - Glass Waste Storage Building Fill Rate

End of Yr	Sludge Batch	Percent Attnmt	No. Cans Produced	Total Cans In GWSB #1	Total Cans In GWSB #2	Total Cans In GWSB #3	Notes
2028	3	15	81		724		
2029	3	15	81		805		
2030	3	15	81		886		
2031	3	15	81		967		
2032	3	15	81		1,048		
2033	3	15	81		1,129		
2034	3	15	81		1,210		
2035	3	15	81		1,291		
2036	3	15	81		1,372		
2037	3	15	81		1,453		
2038	3,4	15	81		1,534		
2039	4	15	81		1,615		
2040	4	15	81		1,696		
2041	4	15	81		1,777		
2042	4	15	81		1,858		
2043	4	15	81		1,939		
2044	4	15	81		2,020		
2045	4	15	81		2,101		
2046	4	15	81		2,182		
2047	4	15	81		2,263		
2048	4	15	81		2,286	58	Start filling GWSB #2,
2049	4	15	81			139	module 3.
2050	4,5	15	81			220	
2051	5	15	81			301	
2052	5	15	81			382	
2053	5	15	81			463	
2054	5	15	81			544	
2055	5	15	81			625	
2056	5	15	81			706	
2057	5	15	81			787	
2058	5	15	81			868	
2059	5	15	81			949	

Appendix J.6 - Glass Waste Storage Building Fill Rate

End of Yr	Sludge Batch	Percent Attnmt	No. Cans Produced	Total Cans In GWSB #1	Total Cans In GWSB #2	Total Cans In GWSB #3	Notes
2060	5,6	15	81			1,030	
2061	6	15	81			1,111	
2062	6	15	81			1,192	
2063	6	15	81			1,273	
2064	6	15	81			1,354	
2065	6	15	61			1,415	
					Total Cans Produced:	**5,717**	

Assumptions:
- GWSB #1 holds 2,286 canisters, less 250 unusable positions, less 20 Transition Test cans, leaves working capacity = 2,016 cans.
- GWSB #2, if needed, will be built in modules: first two modules will have combined capacity of 2,286 canisters.
- A third module, if needed, will be added later to store balance of forecasted canisters.
- Each GWSB fills to capacity.

Appendix K - High Level Waste Management Manpower

ADS #	Title	FY95	FY96	FY97	FY98	FY99	FY00	FY01
21-AA	DWPF Program Management	34	37	36	36	35	34	33
22-AA	Vitrification	1,030	845	808	782	720	716	676
23-AA	Saltstone Z-Area	54	51	51	50	50	51	49
24-GP	General Plant Projects	0	0	1	1	1	1	1
25-LI	New Facility Planning	2	0	0	1	1	0	0
26-LI	Defense Waste Processing Facility	0	14	0	0	0	0	0
	Total Defense Waste	1,120	947	896	870	807	802	759
31-AA	HLW Program Management	157	129	129	130	128	125	124
32-AA	H-Tank Farm	371	390	384	373	373	373	375
33-AA	F-Tank Farm	277	280	273	261	261	262	262
34-AA	ITP/ESP	323	303	300	302	288	287	284
35-AA	Effluent Treatment Facility	116	108	106	107	103	102	102
37-GP	HLW General Plant Projects	0	1	1	1	1	1	1
38-LI	HLW New Facility Planning	1	1	1	3	5	5	6
39-LI	New Waste Transfer Facility	78	19	0	0	0	0	0
310-LI	RHLWE	27	25	26	37	42	0	0
311-LI	DB & Pump Pit Containment	1	1	0	0	0	0	0
314-LI	Waste Removal	67	55	53	28	28	28	28
315-LI	Tank Farm Services Upgrade	0	1	2	5	6	5	0
	Total High Level Waste	1,418	1,313	1,275	1,247	1,235	1,188	1,182
	Total HLW Management Division	**2,538**	**2,260**	**2,171**	**2,117**	**2,042**	**1,990**	**1,941**

Notes:
- Only HLW employees are shown. No support groups are shown.

Appendix L - HLW Priorities

1. Essential Base Program

   1a. Health & safety of workers & public
   1b. Stewardship of current waste inventories
   1c. Improvement programs critical to 1a and 1b
   1d. Maintenance of facilities to ensure 1a and 1b

2. "In Progress" projects/programs to handle waste safely

   2a. In-Tank Precipitation and Tank 41 salt removal
   2b. Saltstone operation and vault capping
   2c. L-ETF Operation
   2d. M-Area Sludge Stabilization
   2e. Diversion Box & Pump Pit Containment

3. High Level Waste System to support DWPF sludge startup

   3a. DWPF Vitrification startup
   3b. ESP Batch#1 processing
   3c. Waste Removal as required to maintain evaporator operation to handle recycle (F to H-Area IAL, F-Area Waste Removal infrastructure, Tanks 25 and 28 salt removal)
   3d. New Waste Transfer Facility startup

4. HLW System to support DWPF sludge & precipitate operations

   4a. Late Wash Project
   4b. Late Wash Filter Demonstration Unit

Appendix L - HLW Priorities

5. Continuity of operations at low attainment

   5a. Provide precipitate feed (H-Area Waste Removal infrastructure, Tanks 38 and 29 salt removal)
   5b. Sludge Batch #2 (Tanks 8, 11, 15)
   5c. Space Gain to support Sludge Batch #2 washing (RHLWE or SMECT water reduction or both)
   5d. H-Area Control Room and support for RHLWE
   5e. Continued operation of RHLWE (Tank 31 salt removal)

6. Productivity Improvement Programs

   - H-Area Control Room Consolidation
   - Saltstone Vault #4 permanent roof
   - Slurry pump improvements
   - Ion Exchange as replacement for ITP

7. Increase System Attainment

   - ITP process enhancements
   - Accelerate repetitive projects (Saltstone Vaults, Waste Removal)
   - Additional raw materials to support higher attainment

8. Reduce Program Risk

   - ITP Just in Time
   - Benzene Abatement
   - Precipitate Hydrolysis Experimental Facility
   - Alternative Technologies
   - Project Contingency

Appendix M - Funding

ADS #	Title	AOP FY95	Pres. FY96	FY97 Five Year Plan FY97	FY98	FY99	FY00	FY01
21-AA	DWPF Program Management	27,934	20,825	20,120	19,755	19,803	19,869	20115
22-AA	Vitrification	150,400	145,021	142,030	130,298	133,269	122,664	124515
23-AA	Saltstone Z-Area	9,932	12,740	12,171	11,635	14,054	16,286	12566
24-GP	General Plant Projects	500	1,000	2,060	2,122	2,185	2,251	2319
25-LI	DWPF New Facility Planning	824	0	0	2,000	2,000	0	0
26-LI	DWPF (Line Item)	45,058	0	0	0	0	0	
31-AA	HLW Program Management	48,752	41,040	42,305	40,921	41,669	41,789	42823
32-AA	H-Tank Farm	62,417	61,314	60,954	64,849	66,596	70,461	67359
33-AA	F-Tank Farm	43,888	45,308	43,229	45,117	46,328	47,701	49101
34-AA	ITP/ESP	59,881	66,184	60,670	61,561	59,583	60,847	59209
35-AA	Effluent Treatment Facility	19,044	18,238	18,186	18,076	18,614	19,172	19735
37-GP	HLW General Plant Projects	1,500	1,540	2,616	2,695	2,776	2,859	2945
38-LI	HLW New Facility Planning	459	1,400	504	1,559	7,127	9,567	13569
39-LI	New Waste Transfer Facility	9,098	2,652	0	0	0	0	0
310-LI	RHLWE	15,062	16,510	17,493	9,818	4,596	0	0
311-LI	DB & Pump Pit Containment	495	246	0	0	0	0	0
314-LI	Waste Removal	33,130	28,525	27,830	7,241	9,999	10,293	10606
315-LI	Tank Farm Services Upgrade (H-Area)	0	3,848	3,979	6,291	5,989	4,701	0
36-AA	L-Effluent Treatment Facility	9,787	17,101	11,984	3,128	3,207	3,161	3135
	Total SRS High Level Waste	**538,161**	**483,492**	**466,131**	**427,066**	**437,795**	**431,621**	**427,997**

Notes:
•14-AA and 36-AA have both been combined into 36-AA.
•FY96 is the FY96 President's Budget

Appendix N - HLW Projects

FY	Project #	ADS	Project Title	TEC (K)	Driver	Scope
79	S-2081	314-LI Capital 93-D-187	Waste Removal and Extended Sludge Processing	$307,050	• Waste Removal FFA	This FY79 project provides a sludge processing facility and equipment needed facilities to remove high level radioactive waste from 23 underground waste tanks. Facilities include slurry pumps and transfer jets or pumps for each tank, control room expansions, motor control centers and services to all tanks.
82	S-1780	26-LI Capital 81-T-105	Defense Waste Processing Facility	$1,276,469	• STP • Waste Removal FFA	This FY82 line item provides a process building to receive washed sludge and salt precipitate from the Tank Farms and incorporate this waste into a stable glass waste form suitable for final disposition in a future federal repository. Facilities include the main processing building, a sand filter building, control rooms, an effluent treatment area, an interim glass waste storage building, support services and administrative offices.
84	S-3781	34-AA Op Ex (includes S-1588)	In-Tank Precipitation	$131,390	• Waste Removal FFA	This FY84 project provides a process to pretreat salt waste for disposition as either saltstone or glass. Facilities include a filter building, a cold chemical area, a control room, slurry and transfer pumps, and support services. Also now includes the scope of project S-1588.

Appendix N - HLW Projects

FY	Project #	ADS	Project Title	TEC (K)	Driver	Scope
85	S-3122	39-LI Capital 85-D-159 (includes S2835)	New Waste Transfer Facility	$54,871	• STP • Waste Removal FFA	This FY85 project replaces an existing obsolete diversion box/pump pit waste transfer facility with one of current design. NWTF is needed to support DWPf operations and h to F-Area transfers. The facility consists of four pump pits with tanks and pumps, one large diversion box, and an enclosure building with remotely operated bridge crane and control room.
87	S-2821	311-LI Capital 87-D-181	Diversion Box and Pump Pit Containment	$24,100	• Rad exposure reduction, improve system attainment	This FY87 project provides an enclosure building over H-Area Diversion Box no. 7 (HDB-7). Facilities include a remotely operated bridge crane, a ventilation system, and a mobile control room.
87	S-2787	45-LI Capital 83-D-148	Consolidated Incineration Facility	$87,295	• STP • Waste Removal FFA	This FY87 project provides a facility to incinerate hazardous, low-level radioactive, and mixed waste and particularly the DWPF benzene. Facilities include a large rotary kiln incinerator, offgas treatment, feed storage and ash handling systems and a control room.
87	S-3291	314-LI Capital 93-D-187	Type III Tanks Salt Removal, Phase I	$47,800	• Waste Removal FFA	This FY87 project provides facilities to remove waste from three tanks (25, 28, and 29), support services and process control equipment, and an expansion to control room building 241-18F to support the waste removal operation.

Appendix N - HLW Projects

FY	Project #	ADS	Project Title	TEC (K)	Driver	Scope
88	S-1588	34-AA Op Ex	ITP Safety and Environmental Enhancements	$36,830	• Waste Removal FFA	This FY88 project provides a fire water suppression system, a liquid nitrogen storage and unloading system, two benzene strippers, a laboratory, and other miscellaneous equipment in support of the ITP project.
89	S-2860	314-LI Capital 93-D-187	Type III Tanks Salt Removal, Phase II	$106,500	• Waste Removal FFA	This FY89 project provides facilities to remove waste from two tanks (31 & 47) and a new control room (241-2H) that will support waste removal from 17 other waste tanks as well as the RHLWE.
89	S-4062	310-LI Capital 89-D-174	Replacement High Level Waste Evaporator	$118,200	• STP • Waste Removal FFA • Improve HLW System attainment	This FY89 project provides a cost-effective waste evaporator to replace the aging 1H Evaporator and to support the increased waste load from the DWPF. Facilities include a process cell, a large evaporator with all supporting tanks, pumps and piping, and an enclosure building with remotely controlled crane.
93	S-4391	22-AA Op Ex	Late Wash Filter Demonstration Unit	$1,730	• STP • Waste Removal FFA	This FY93 project provides a temporary facility to demonstrate and optimize the Late Wash filtration process.
93	S-5575	38-LI Op Ex	Ion Exchange Skid	$1,125	• Improve HLW System attainment	This FY93 project provides a facility to demonstrate the IX process using SRS, Hanford and Oak Ridge simulated waste. Work currently stopped. No plan to continue at this time.

Appendix N - HLW Projects

FY	Project #	ADS	Project Title	TEC (K)	Driver	Scope
93	S-3025	314-LI Capital 93-D-187	Waste Removal Facilities, Phase III	$112,500	• Waste Removal FFA	This FY93 project provides facilities to remove waste from six tanks (26, 30, 35-38). Facilities include slurry pumps, transfer jets/pumps, support services and process control equipment.
94	S-5556	22-AA Op Ex	IDMS Ammonia Scrubber	$500	• STP • Waste Removal FFA	This FY94 project provides modifications to the IDMS demonstration facility to make it compatible with recent DWPF equipment modifications.
96	S-3898	23-AA Op Ex	Saltstone Vault#2	$17,525	• Waste Removal FFA	This project will provide a reinforced concrete 12 cell storage vault for saltstone grout in support of the ongoing ITP operation. Vault#2 need date 8/97.
96	S-4558	315-LI Capital 96-SR-161	Tank Farm Services Upgrade (primarily H-Area)	$21,070	• Improve HLW System attainment • Maintain Tank Farm infrastructure	This project provides services to replace aging facilities including a) F-Area electrical, b) F and H-Area Tank Farm 25, 150 and 325 psi steam, domestic and cooling water, and breathing and instrument air lines, c) steam and waste transfer equipment for Tanks 35-37, and d) increased cooling to support ITP/ESP.
98	S-2048	25-LI 98-WM-1	Failed Equipment Storage Vaults#3-6	$4,700	• STP • Waste Removal FFA	This proposed project provides four additional storage vaults to store failed melters or other equipment that contains high level contamination.
99	S-4881	38-LI Capital	Tank Farm Storm Water System Upgrade	$12,000	• Maintain Tank Farm safety envelope	This proposed project will relieve potential flooding in the Tanks 9-12 area of the H-Area Tank Farm.

Appendix N - HLW Projects

FY	Project #	ADS	Project Title	TEC (K)	Driver	Scope
00	W-3008	38-LI Capital 98-SR-387	Tank Farm Services Upgrade (primarily F-Area)	$30,000	• Maintain Tank Farm infrastructure • Improve HLW System attainment	This proposed project replaces aging service piping in the F and H-Area Tank Farms not covered by project S-4558 including, 25, 150 and 325 psi steam, domestic and cooling water, and breathing and instrument air lines.
TBD	TBD	23-AA Op Ex	Saltstone Vault#3	$20,800	• STP • Waste Removal FFA	This project will provide a reinforced concrete 12 cell storage vault for saltstone grout in support of the ongoing ITP operation. Vault#3 need date 8/99.
TBD	S-4878	38-LI Capital	ITP Benzene Abatement	$14,000	• Clean Air Act of 1990	The CAA of 1990 mandated that states promulgate laws within 10 years to reduce benzene emissions by 95%. This law, when passed, will apply to ITP which must then comply within 3 years. This proposed project provides a catalytic incinerator at 3 point sources within ITP. Not funded in FY96 FYP Target Case.
TBD	S-2093	25-LI Capital	DWPF Salt Cell Benzene Abatement	$15,000	• Clean Air Act of 1990	The CAA of 1990 mandated that states promulgate laws within 10 years to reduce benzene emissions by 95%. This law, when passed, will apply to DWPF which must then comply within 3 years. This proposed project provides a catalytic incinerator at 1 point source within DWPF. Not funded in FY96 FYP Target Case.

Appendix N - HLW Projects

FY	Project #	ADS	Project Title	TEC (K)	Driver	Scope
TBD	TBD	25-LI Capital	Recycle Stream Volume Reduction	TBD	• Improve HLW System attainment	This proposed project will provide facilities and equipment to reduce the volume of the DWPF recycle stream. Not funded in FY96 FYP Target Case.
TBD	TBD	25-LI Capital 99-SR-184	703-S Administration Building	$7,000	• QA document control requirements	This proposed project provides an office building to replace numerous temporary facilities for 300 people and will enable DWPF Records Management to meet QA requirements.
TBD	TBD	23-AA Op Ex	Saltstone Vault#5	$20,800	• Waste Removal FFA	This proposed project will provide a reinforced concrete 12 cell storage vault for saltstone grout in support of the ongoing ITP operation. Vault#5 need date 8/01.

Appendix O - Acronyms

ADS	Activity Data Sheet
AOP	Annual Operating Plan
APP	Auxiliary Pump Pit
CAA	Clean Air Act
CAB	Citizen's Advisory Board
CCR	Cold Chemical Runs
CDR	Conceptual Design Report
CIF	Consolidated Incinerator Facility
Ci/gal	Curies per Gallon
CPES	Chemical Process Evaluation System
CRC	Cesium Removal Column
DB&PP	Diversion Box & Pump Pit
D&D	Decontaminate & Decommission
DNFSB	Defense Nuclear Facility Safety Board
DOE	Department of Energy
DP	Defense Programs
DW	Defense Waste
DWPF	Defense Waste Processing Facility
EA	Environmental Assessment
EAC	Estimate at Completion
EIS	Environmental Impact Statement
EM	Environmental Management
EPA	Environmental Protection Agency
ERDA	Energy Research and Development Administration
ER/WM	Environmental Restoration/Waste Management
ESAAB	Energy Systems Advisory Acquisition Board
ESP	Extended Sludge Processing
ETF	Effluent Treatment Facility
FDB	F-Area Diversion Box
FDC	Functional Design Criteria

FEIS	Final Environmental Impact Statement
FESV	Failed Equipment Storage Vault
FFA	Federal Facility Agreement
FFCA	Federal Facility Compliance Agreement
FPR	Functional Performance Requirements
FRR	Foreign Research Reactors
FTE	Full Time Equivalent
FY	Fiscal Year
FYP	Five Year Plan
ITP	In-Tank Precipitation
GP	General Purpose
GPM	Gallons per minute
GWSB	Glass Waste Storage Building
H & V	Heating & Ventilation
HAD	Hazards Assessment Document
HDA	Hydrogen Deflagration Analysis
HDB	H-Area Diversion Box
HHW	High Heat Waste
HLW	High Level Waste
HLWM	High Level Waste Management
HQ	Headquarters - usually as a suffix to DOE
IAL	Inter-Area Line
IFM	Integrated Flowsheet Model
INMM	Integrated Nuclear Material Management
ITP	In-Tank Precipitation
JCO	Justification for Continued Operation
LCO	Limiting Condition of Operation
LDR	Land Disposal Restriction
LHW	Low Heat Waste
LI	Line Item

Appendix O - Acronyms

LPPP	Low Point Pump Pit
LW	Late Wash
N/A	Not Applicable
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NFP	New Facility Planning
NPDES	National Pollution Discharge Elimination System
NWTF	New Waste Transfer Facility
OPC	Other Project Costs
ORR	Operational Readiness Review
OSR	Operational Safety Requirement
OTD	Office of Technology Development
PCCS	Product Composition Control System
PID	Process Interface Document
PMP	Project Management Plan
PRA	Probabilistic Risk Assessment
PVT	Process Verification Test
QA	Quality Assurance
RBOF	Receiving Basin for Offsite Fuels
RCRA	Resource Conservation and Recovery Act
RHLWE	Replacement High Level Waste Evaporator
ROD	Record of Decision
RSA	Readiness Self-Assessment
RW	Radioactive Waste, as in DOE Office of RW
RWPC	Rolling Weather Protection Cover
SAD	Safety Assessment Document
SAR	Safety Analysis Report
SCD	Startup Criteria Document
SCDHEC	South Carolina Department of Health and Environmental Control
SEIS	Supplemental Environmental Impact Statement
SIMP	System Integration Management Plan
SMECT	Slurry Mix Evaporator Condensate Tank
SR	Savannah River - usually as a suffix to DOE
S/RID	Standards/Requirements Identification Document
SRS	Savannah River Site
SRTC	Savannah River Technology Center
ST	Sodium Titanate
STP	Site Treatment Plan
STPB	Sodium Tetraphenylborate
SW	Solid Waste
TBD	To Be Determined
TEC	Total Estimated Cost
TOST	Technical Oversite Steering Team
TPC	Total Project Cost
TSD	Treatment, Storage and Disposal
USQD	Unresolved Safety Question Determination
WM	Waste Management
WRP	Waste Removal Program
WSRC	Westinghouse Savannah River Company

High Level Waste Management Division

HLW System Plan Revision 5 Addendum (U)

Pro Forma Funding and

System Attainment Analysis

Westinghouse Savannah River Company
Aiken, South Carolina

April 19, 1995

HLW System Plan Revision 5
Addendum (U)
Pro Forma Funding and System Attainment Analysis

Table of Contents

Executive Summary

This revision of the pro forma funding and system attainment addendum to the HLW System Plan has incorporated the new funding guidance provided in the FY97 FYP Target Level. Based on the new funding guidance, the FY97 FYP Target Level program will produce an average 81 canisters per year, which is approximately 20% of the design capacity for the processing plants. Since there is the equivalent of 5,700 canisters of liquid waste currently stored in underground tanks at SRS, a production rate of 81 canisters per year will complete the Waste Removal Program in FY2065. This does not meet the FFA regulatory commitments and results in an extremely expensive life cycle cost for the program.

To avoid the severe programmatic impacts and the life cycle cost penalties described above, two alternative cases have been detailed: a Minimum Life Cycle Cost Case and the Baseline Case (described in Rev 4 of the HLW System Plan).

This pro forma funding addendum highlights the total program life cycle cost, the canister production fill rate and the program completion date for each of the cases.

Regulatory Commitments

Completion of the Waste Removal Program for the older-style waste tanks is part of the Federal Facilities Agreement commitment with the South Carolina DHEC. As part of the FFA, in November 1993, SRS submitted the FFA Waste Removal Plan and Schedule which showed completion of waste removal in FY2028. This commitment date is still in effect. Therefore, from the state's perspective, the FY97 Five Year Plan and the resulting Rev 5 of the HLW System Plan shows a 37 year delay in completion of the waste removal program.

Historical Funding Reductions

High Level Waste has experienced significant funding reductions since the FY1995 FYP was developed. The comparable funding table shown below displays the funding by year and in cumulative for the five year period from FY96 to FY00. These reductions range from a 23 to 42% reduction of funding in the individual funding years.

Comparative Funding Table (Millions of Dollars)

	FY96	FY97	FY98	FY99	FY00	Cumulative FY96- FY00	Funding Reduction
95 FYP	603	624	688	722	744	3,381	-
96 FYP	537	550	570	585	596	2,838	543
97 FYP Target*	466	454	424	435	428	2,207	1,174
% Reduction	23%	27%	38%	40%	42%	35%	

* Funding does not include LETF ADS 36-AA.

Productivity Improvements

To reduce the programmatic impacts of the outyear funding reductions, an aggressive Productivity Improvement program has been in place at SRS since FY94. The following 23 % productivity improvement commitment has been incorporated into each of the funding levels in the FY97 FYP.

FY94 5 % Reduction accomplished
FY95 5 % Reduction incorporated into FY95 AOP
FY96 10 % Reduction incorporated into FY97 FYP
FY97 3 % Reduction incorporated into FY97 FYP

FY97 FYP Target Case

Based on the projected 40% funding reductions in the outyears, and even with productivity improvements incorporated into our plans, significant programmatic impacts to the HLW Waste Removal program will occur in the FY97 FYP Target Case. Based on the outyear funding levels, the projected waste removal program will process an average of 81 canisters per year, which is approximately 20% of the design capacity for the processing plants. Since there is an equivalent of 5,700 canisters of liquid high-level waste currently stored in underground tanks at SRS, this production rate will delay completion of the waste removal program until FY2065. This will result in waste storage tanks being in service up to 107 years with an accompanying significant increase in the risk of tank failure and environmental releases. This program will not meet the FFA regulatory commitment to complete waste removal by FY2028. The life cycle cost of this program, in FY95 constant year dollars, is $26.5 billion versus $11.3 billion for the Baseline Waste Removal Program described in Rev 4 of the HLW System Plan, an increase of $15 billion life cycle costs.

Baseline Program

To avoid the severe programmatic impacts and the life cycle cost penalties described above, an estimate has been developed to fund the Baseline Program described in Rev 4 of the HLW System Plan. This program provides a rational HLW program with an average production rate of 231 canisters per year which is approximately 60% of the design capacity for the processing plants. This case will complete the waste removal program in 2021 which meets the FFA regulatory commitments. The funding required to complete this program is shown below. The additional funding required above the current FY97 FYP Target Case for FY98 to FY00 is approximately $ 57 million per year. The implementation of this program will result in a $15 billion life cycle cost savings over the FY97 FYP Target Program.

Funding Requirements (Millions of Dollars)

	Rev 4 Baseline Program	FY97 FYP Program	Additional Funding Requirements
FY96	466	466	0
FY97	462	454	8
FY98	479	424	55
FY99	491	435	56
FY00	487	428	59
TOTAL	2,385	2,207	178

Since it is clear that the program described above is the responsible program for High Level Waste at the site, all possible attempts should be made to maintain the Baseline Program. In this Revision of the System Plan, SRS has already incorporated $1.1 Billion in cost reductions (since the Rev 4 estimate in October 1994) to the Life Cycle cost of the Baseline Program. SRS is committed to continue developing more innovative techniques that could further reduce the funding requirements for this program. However, even with this aggressive cost reduction program, additional funding will be required for the waste removal program in the outyears.

Minimum Life Cycle Cost

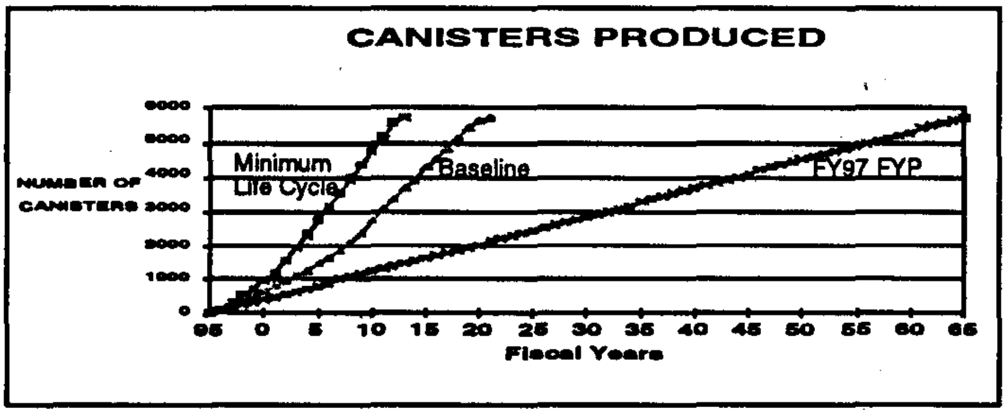
To minimize life cycle cost, the HLW waste removal program should be completed as early as is practical. Such a Minimum Life Cycle Cost Program has been developed. This program processes an average of 340 canisters per year, which is approximately 85% of the design capacity for the processing plants. It completes the waste removal program in 2013, which far exceeds the FFAregulatory commitments. The funding requirements to complete this program are shown below. The additional funding required above the current FY97 FYP outyear Target Case for FY97 to FY00 ranges from $53 to 142 million per year. The implementation of this program will result in a $18 billion (FY95 Constant Year Dollars) life cycle cost savings over the FY97 FYP Program.

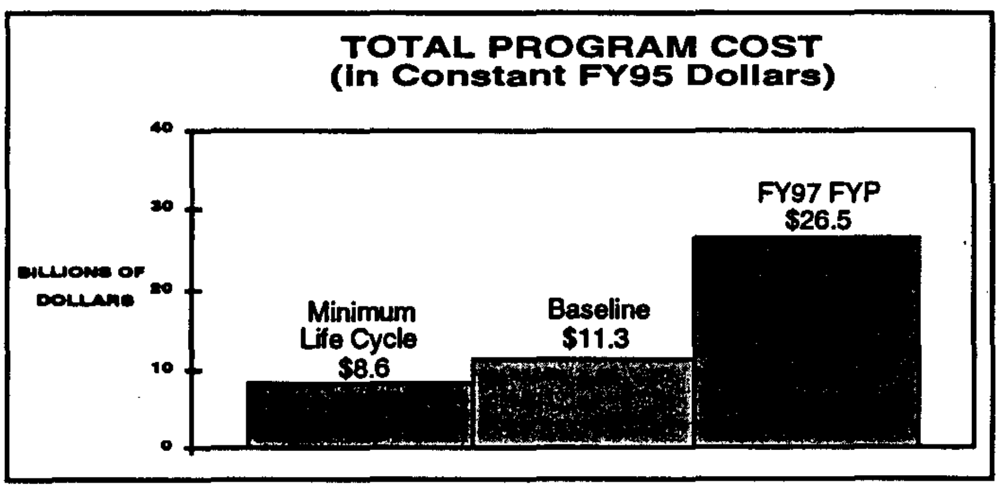
Funding Requirements (Millions of Dollars)

	Minimum Life Cycle Cost	FY97 FYP Program	Additional Funding Requirements
FY96	466	466	0
FY97	507	454	53
FY98	516	424	92
FY99	546	435	111
FY00	570	428	142
TOTAL	2,605	2,207	398

Figure 1 below illustrates the Cumulative Canisters filled over the length of the program and the Total Program Cost in both FY 95 Constant Year Dollars for each of the Cases.

FIGURE 1: CASE COMPARISONS





Summary

The High Level Waste Program that can be supported with the FY97 Five Year Plan outyear Target Level funding results in:

- Program completion in FY2065
- High Level Waste storage tanks being in service up to 107 years
- Significantly increased risk of tank failure and environmental releases
- Failure to meet the existing FFA regulatory commitments
- $18 Billion life cycle cost penalty (vs Minimum Life Cycle Cost Case)

Due to these severe programmatic impacts and life cycle cost penalties, all possible attempts should be made to maintain the Baseline Program described in Revision 4 of the HLW System Plan. This program results in:

- Program completion in FY2021
- Success in meeting the existing FFA regulatory commitments
- $3 Billion life cycle cost penalty (vs Minimum Life Cycle Cost Case)

Even with planned aggressive cost reduction programs, additional funding will be required for the waste removal program in the outyears.

Program Planning Basis

All of the cases were developed using the same program planning basis. The basis required that significant Productivity Improvement commitments be incorporated prior to allocating funding. Then funds were allocated based on the priorities listed in Appendix L. This method of allocation maximizes the attainment rate for the overall High Level Waste System. No funding was provided for emergent work activities.

Productivity Improvements

To reduce the programmatic impacts of the outyear funding reductions, an aggressive Productivity Improvement program has been in place at SRS since FY94. The following 23 % productivity improvement commitment has been incorporated into each of the funding levels in the FY97 FYP.

FY94	5 %	Reduction accomplished
FY95	5 %	Reduction incorporated into FY95 AOP
FY96	10 %	Reduction incorporated into FY97 FYP
FY97	3 %	Reduction incorporated into FY97 FYP

Escalation
A 3% escalation rate was used in all funding calculations.

No Funding for Emergent Work
The model did not provide any contingency funding for emergent work activities. This planning basis was used to coincide with DOE budget guidance, however, the emergent work activities will occur. This model assumes that additional savings will be recognized to cover these emergent needs or that scope will be deferred as necessary when emergent activities are identified.

Summary of Results

Case A: FY97 FYP Target Case
Based on the outyear funding levels in the FY97 FYP Target Case, the projected waste removal program will process an average of 81 canisters per year, which is approximately 20% of the design capacity for the processing plants. Since there is an equivalent of 5,700 canisters of liquid high-level waste currently stored in underground tanks at SRS, this production rate will delay completion of the waste removal program until FY2065. This will result in
waste storage tanks being in service up to 107 years with an accompanying significant increase in the risk of tank failure and environmental releases. This program will not meet the FFA regulatory commitment to complete waste removal by FY2028 and results in an extremely expensive life cycle cost for the program. This case was described in Rev 4 of the HLW System Plan Addendum as Case 5.

Case B: Baseline Case
Case B is the Baseline Case described in detail in Rev 4 of the HLW System Plan. This program provides a rational HLW program with an average production rate of 231 canisters per year which is approximately 60% of the design capacity for the processing plants. This case will complete the waste removal program in 2021 which meets the FFA regulatory commitments. This case was described in Rev 4 of the HLW System Plan Addendum as Case 3.

Case C: Minimum Life Cycle Cost Case
Case C is the Minimum Life Cycle Cost Case. This program processes an average of 340 canisters per year, which is approximately 85% of the design capacity for the processing plants. It completes the waste removal program in 2013, which far exceeds the FFA. This case was described in Rev 4 of the HLW System Plan Addendum as Case 1.

The cost estimates for each of the cases have been re-estimated since Rev 4 of the HLW System Plan was issued. In each of the cases, substantial additional cost reductions have been incorporated based on the FY95 Reduction in Force which will substantially reduce overhead cost for the site and additional cost reductions initiatives that have been developed since Rev 4 was issued. Since each of these cases were initially developed in Rev 4 of the system plan the summary table shown on the next page includes both the current Rev 5 estimate as well as the Rev 4 estimate.

Summary of Cases

	Case A: FY97 FYP Target Case	Case B: Baseline Case	Case C: Minimum Life Cycle Cost Case
	Rev 5 (Rev 4)	Rev 5 (Rev 4)	Rev 5 (Rev 4)
Total Program Cost (billions)			
In Funding Year Dollars	85.2 (99.8)	16.8 (17.3)	11.1 (11.2)
In Constant Year Dollars (FY95)	26.6 (30.4)	11.3 (11.8)	8.6 (8.7)
Production			
Program Completion Date	2065	2021	2013
Average Canisters Filled/Year	81	231	340
Tank Age at Program End (years)			
Oldest Tank Age in Service	107	64	58
Average Tank Age	89	56	51
Unit Cost per Canister (millions)			
In Funding Year Dollars	14.9 (17.7)	2.9 (3.0)	1.9 (2.0)
In Constant Year Dollars (FY95)	4.7 (5.4)	2.0 (2.1)	1.5 (1.5)
Regulatory Impacts			
Regulatory Commitments	Not Met	Met "Just in Time"	Met or Exceeded

The funding requirements for the initial years of the program associated with each of the Cases are shown below. Note that relatively small funding increases from FY97 - FY00 have a dramatic impact on the final completion date and the resulting life cycle costs.

First 6-Years of Funding (Millions of Dollars)

	Case A: FY97 FYP Target Case Rev 5 (Rev 4)	**Case B: Baseline Case Rev 5 (Rev 4)**	**Case C: Minimum Life Cycle Cost Case Rev 5 (Rev 4)**
FY96	466 (470)	466 (470)	466 (530)
FY97	454 (477)	462 (509)	507 (536)
FY98	424 (486)	479 524)	516 (550)
FY99	435 (509)	491 (540)	546 (574)
FY00	428 (507)	487 (556)	570 (602)
TOTAL	2, 207 (2,449)	2,385 (2,599)	2,605 (2,792)

Case Analysis

Case A: FY97 FYP Target

Based on the significant funding reductions incorporated in the FY97 FYP Target, the new Target Case for Rev 5 of the HLWSP is the Case 5: The Maximum Life Cycle Cost case in Rev 4 of the HLWSP. Significant additional productivity improvements have been incorporated into this case to maintain the scope in Rev 4 of the HLWSP. This case was initially developed to provide a case which would illustrate the lowest sustainable production rate for DWPF. This case pushes program completion out to 2065 and results in an inappropriate expenditure of funds. This case was initially provided as a bounding case only.

The funding reductions in this case are very disruptive to the program and greatly increase the overall Life Cycle Cost. The reduced funding profile requires the whole High Level Waste System to function in a very inefficient and wasteful manner. This case stretches the age of the existing Tank Farm facilities to over 100 years. This case would appear to result in an unacceptable increase in the safety risk of the program. Greatly increased funding would be required for maintenance improvements and infrastructure replacements. In this case, some tanks and support systems in the Tank Farms will be over 107 years old before High Level Waste can be removed. Many of these tanks do not meet RCRA secondary containment requirements, therefore if failures occur prior to Waste Removal completion High Level Waste could potentially be released to the environment. This case will not meet Regulatory Commitments in the Federal Facility Agreement.

Case A results in:

	Rev 4	Rev 5
Total Program Cost (billions)		
In Funding Year Dollars	99.8	85.2
In Constant Year Dollars (FY95)	30.4	26.6
Production		
Program Completion Date	2065	2065
Average Canisters Filled/Year	81	81
Tank Age at Program End (years)**		
Oldest Tank Age in Service	107	107
Average Tank Age	89	89
Unit Cost per Canister (millions)		
In Funding Year Dollars	17.7	14.9
In Constant Year Dollars (FY95)	5.4	4.7
Regulatory Impacts		
Regulatory Commitments	Not Met	Not Met

* All Total Program Costs (Life Cycle) are based on cost beginning with FY95. Prior Year sunk cost has not been included in the analysis.

** The Average /Oldest Tank Age is based on age of the Type I, II and IV Waste Tanks (which do not meet RCRA requirements) prior to the final Waste Removal actions being completed.

This case requires extensive maintenance/infrastructure improvements to be made because the program completion is not accomplished until 2065. This late completion date substantially extends age of the Tank Farm and DWPF facilities. Due to the significant concern about leaking waste tanks, four additional Type III tanks have been constructed to provide emergency replacement tanks for the program. A listing of the required new projects to support this program is shown below. These projects include both upgrade and repetitive projects required for the program such as melters.

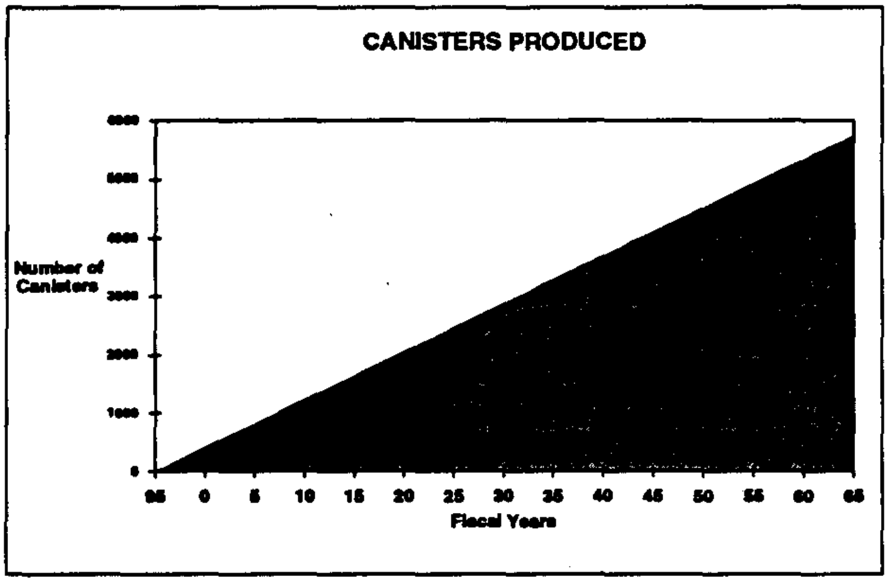
Project Title	FY Start	Cost in Millions of FY95 Dollars
Tank Farms		
Tank Farm Services Project	96	19
Sample/Monitor System Upgrade	97	10
Storm Water Safeguards	00	12
Tank Farm Support Services	01	30
Tank Farm Infrastructure Upgrades I	06	70
Ion Exchange replacement for ITP	16	150
Tank Farm Infrastructure Upgrades II	18	100
4 New Type III Waste Tanks	20	320
DWPF		
8 Saltstone Vaults	First one in 96	144
28 Melters & Boxes	First one in 97	571
7 Failed Equipment Storage Vaults (4 cells)	98	30
Infrastructure Upgrade	07	25
Glass Waste Storage Building II	19	75
DWPF Infrastructure Upgrade I	25	75
DWPF Infrastructure Upgrade II	35	100
Glass Waste Storage Building III	45	75
TOTAL		1,806

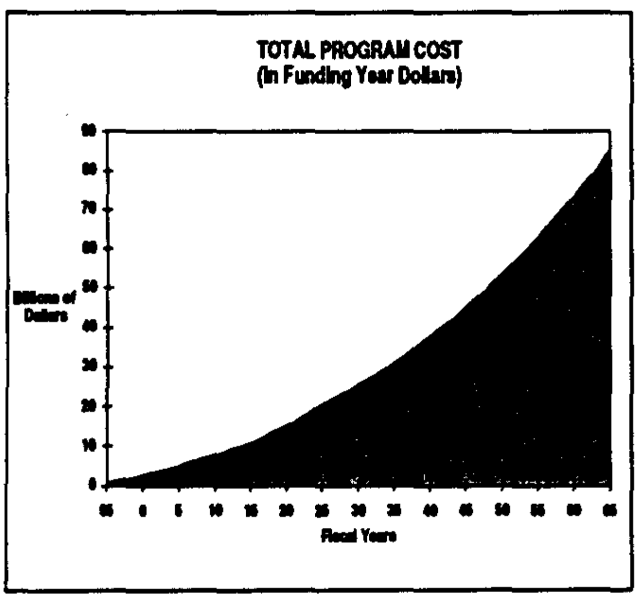
Figure 2 illustrates the Cumulative Canisters filled over the length of the program and the Total Program Cost in both Constant Year (FY95) and Funding Year Dollars for this Case. Table 1 provides a summary of the Production Plan for the case.

The funding profile that was initially estimated in Rev 4 as well as the new estimate for Rev 5 is shown below. Substantial additional overhead cost reduction goals have been incorporated into the Rev 5 estimate.

Funding	Rev 4 $ Millions	Rev 5 $ Millions	Additional Cost Reductions
Fiscal Year 1996	470	466	4
Fiscal Year 1997	477	454	23
Fiscal Year 1998	486	424	62
Fiscal Year 1999	509	435	74
Fiscal Year 2000	507	428	79
	2,449	2,207	242

FIGURE 2: CASE A - FY97 FYP TARGET CASE





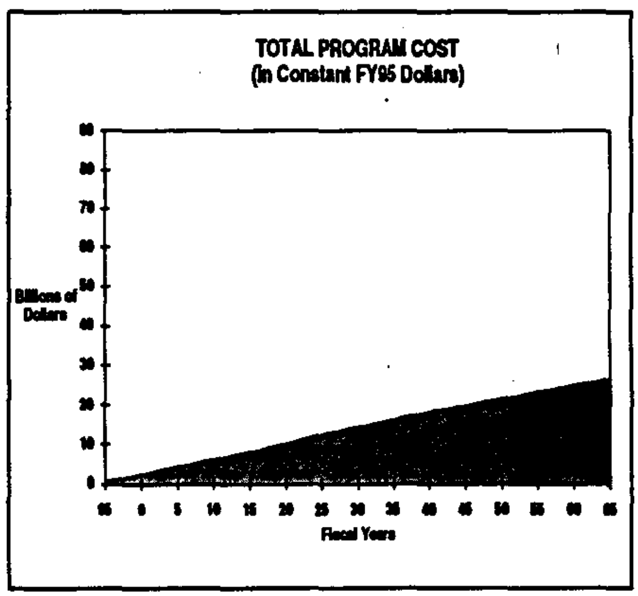


Table 1:
Case A - FY97 FYP Target Case

Batch	Start	Canisters	FY	Canisters	Cumulative Canisters	Sludge Tanks Removed from Service
1	1/1/96	1236				
			96	60	60	
			97	87	147	
			98	87	234	
			99	87	321	
			0	87	408	
			1	87	495	
			2	87	582	
			3	87	669	
			4	87	756	
			5	87	843	
			6	87	930	
			7	87	1017	
			8	87	1104	
			9	87	1191	
2	4/1/10	782	10	87	1278	8,11,15
			11	81	1359	
			12	81	1440	
			13	81	1521	
			14	81	1602	
			15	81	1683	
			16	81	1764	
			17	81	1845	
			18	81	1926	
			19	81	2007	
3	12/1/19	1513	20	81	2088	4,7,12,14,47
			21	81	2169	
			22	81	2250	
			23	81	2331	
			24	81	2412	
			25	81	2493	
			26	81	2574	
			27	81	2655	
			28	81	2736	
			29	81	2817	
			30	81	2898	
			31	81	2979	
			32	81	3060	
			33	81	3141	

Table 1:
Case A - FY97 FYP Target Case

Batch	Start	Canisters	FY	Canisters	Cumulative Canisters	Sludge Tanks
			34	81	3222	
			35	81	3303	
			36	81	3384	
			37	81	3465	
4	8/1/38	971	38	81	3546	5,6,9,10,13,26,35
			39	81	3627	
			40	81	3708	
			41	81	3789	
			42	81	3870	
			43	81	3951	
			44	81	4032	
			45	81	4113	
			46	81	4194	
			47	81	4275	
			48	81	4356	
			49	81	4437	
5	8/1/50	774	50	81	4518	1,2,3,32,33,34,39,43
			51	81	4599	
			52	81	4680	
			53	81	4761	
			54	81	4842	
			55	81	4923	
			56	81	5004	
			57	81	5085	
			58	81	5166	
			59	81	5247	
6	3/1/60	441	60	81	5328	
			61	81	5409	17,18,19,21,22,23,24
			62	81	5490	
			63	81	5571	
			64	81	5652	
			65	65	5717	

Case B: Baseline Case

Case A is the Baseline Case described in detail in Rev 4 of the HLW System Plan. It provides a rational HLW program with a average production rate of 231 canister per year which is approximately 60% of the design capacity for the processing plants. This case results in the completion of the Waste Removal Program in 2021 which meets the FFA regulatory commitments. While this case does not provide a minimum life cycle cost for the program, it is sensitive to the age of the existing Tank Farm facilities at program completion, thereby reducing the funding required for maintenance improvements and infrastructure replacements.

Since it is clear that the program described above is the responsible program for High Level Waste at the site, all possible attempts should be made to maintain the Baseline Program. In this Revision of the System Plan, SRS has already incorporated $1.1 Billion in cost reductions (since the Rev 4 estimate in October 1994) to the Life Cycle cost of the Baseline Program. SRS is committed to continue developing more innovative techniques that could further reduce the funding requirements for this program. However, even with this aggressive cost reduction program, additional funding will be required for the waste removal program in the outyears.

Case B results in:

Total Program Cost (billions)*	**Rev 4**	**Rev 5**
In Funding Year Dollars	17.3	15.7
In Constant Year Dollars (FY95)	11.8	10.7
Production		
Program Completion Date	2021	2021
Average Canisters Filled/Year	231	231
Tank Age at Program End (years) **		
Oldest Tank Age in Service	64	64
Average Tank Age	56	56
Unit Cost per Canister (millions)		
In Funding Year Dollars	3.0	2.7
In Constant Year Dollars (FY95)	2.1	1.9
Regulatory Impacts		
Regulatory Commitments	Met "Just in Time"	Met "Just in Time"

* All Total Program Costs (Life Cycle) are based on cost beginning with FY95. Prior Year sunk cost has not been included in the analysis.

** The Average /Oldest Tank Age is based on age of the Type I, II and IV Waste Tanks (which do not meet RCRA requirements) prior to the final Waste Removal actions being completed.

This case requires the following maintenance/infrastructure improvements due to the age of the existing Tank Farm facilities and because the program completion is not accomplished until 2021. A listing of the required new projects to support this program is shown below. These projects include both upgrade and repetitive projects required for the program such as melters.

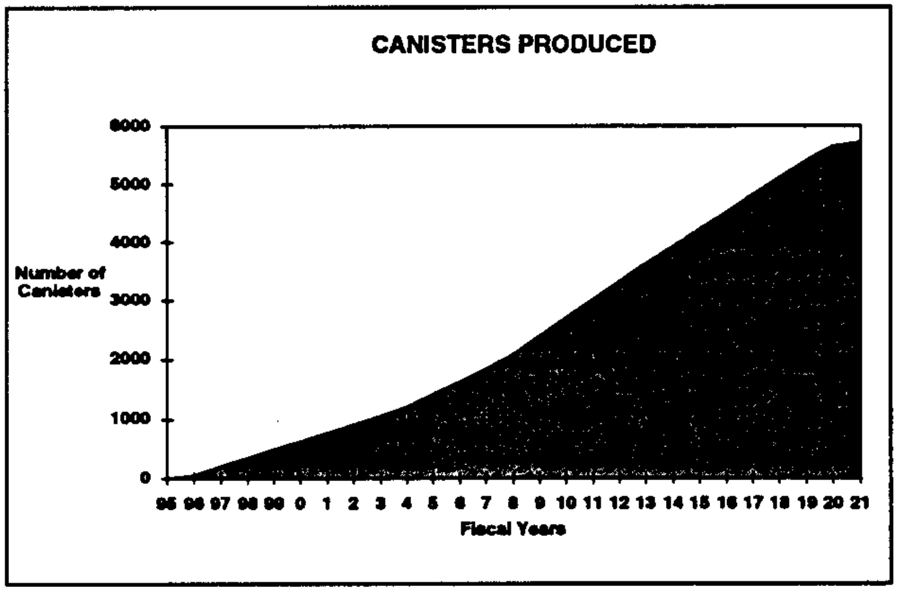
Project Title	FY Start	Project TEC in Millions of FY95 Dollars
Tank Farms		
Tank Farm Services Project	96	19
Sample/Monitor System Upgrade	97	10
Storm Water Safeguards	00	12
Tank Farm Support Services	01	30
Tank Farm Infrastructure Upgrades	06	70
DWPF		
8 Saltstone Vaults	First one in 96	144
10 Melters & Boxes	First one in 97	204
2.5 Failed Equipment Storage Vaults (4 cells)	98	11
DWPF Laboratory Upgrade for Attainment Improvement	02	15
Glass Waste Storage Building II	02	75
DWPF Infrastructure Upgrade I	07	25
Glass Waste Storage Building III	11	75
TOTAL		690

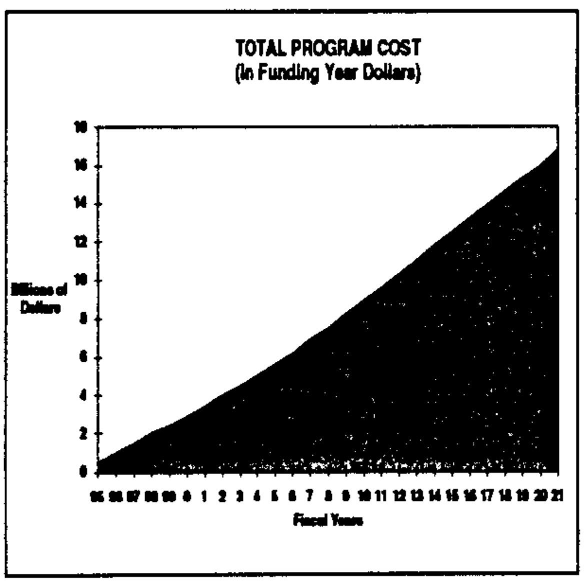
Figure 3 illustrates the Cumulative Canisters filled over the length of the program and the Total Program Cost in both Constant Year (FY95) and Funding Year Dollars for this Case. Table 2 provides a summary of the Production Plan for this case.

The funding profile that was initially estimated in Rev 4 as well as the new estimate for Rev 5 is shown below. Substantial additional overhead cost reduction goals have been incorporated into the Rev 5 estimate.

Funding	Rev 4 $ Millions	Rev 5 $ Millions	Additional Cost Reductions
Fiscal Year 1996	470	466	4
Fiscal Year 1997	509	462	47
Fiscal Year 1998	524	479	45
Fiscal Year 1999	540	491	49
Fiscal Year 2000	556	487	69
TOTAL	2,599	2,385	214

FIGURE 3: CASE B - BASELINE CASE





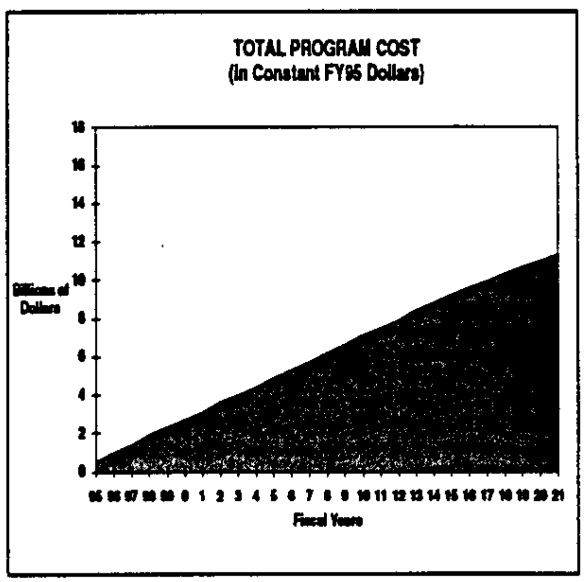


Table 2:
Case B - Baseline Case

Batch	Start	Canisters	FY	Canisters	Cumulative Canisters	Sludge Tanks Removed from Service
1	3/1/96	1236				
			96	60	60	
			97	143	203	
			98	143	345	
			99	143	488	
			0	143	630	
			1	143	773	
			2	143	915	
			3	143	1058	
			4	143	1200	
2	11/4/04	782	5	207	1408	8,11,15
			6	213	1621	
			7	213	1834	
3	7/1/08	1513	8	238	2072	4,7,12,14,47
			9	313	2385	
			10	313	2698	
			11	313	3012	
			12	313	3325	
4	5/11/13	971	13	304	3629	5,6,9,10,13,26,35
			14	292	3921	
			15	292	4212	
5	9/14/17	774	16	292	4504	1,2,3,32,33,34,39,43
			17	300	4804	
			18	300	5104	
6	4/17/19	441	19	285	5389	17,18,19,21,22,23,24
			20	264	5653	
			21	64	5717	

Case C: Minimum Life Cycle Cost

The Minimum Life Cycle Cost Case (previously Case 1 in Rev 4 of the HLW System Plan) was developed to approximate the best overall schedule and cost to achieve the earliest program completion. This Case was developed with no Fiscal Year funding limitations except for FY96. The Funding levels in FY97 and the outyears were determined based on providing the funding required to maximize the attainment of the High Level Waste System which in turn minimizes the Life Cycle cost and provides an earlier end date for the program. This case minimizes the age of the existing Tank Farm facilities at program completion, thereby minimizing the funding required for interim tank farm maintenance improvements and infrastructure replacements.

Case C results in:

Total Program Cost (billions)*	**Rev 4**	**Rev 5**
In Funding Year Dollars	11.2	11.1
In Constant Year Dollars (FY95)	8.7	8.6
Production		
Program Completion Date	2013	2013
Average Canisters Filled/Year	340	340
Tank Age at Program End (years) **		
Oldest Tank Age in Service	58	58
Average Tank Age	51	51
Unit Cost per Canister (millions)		
In Funding Year Dollars	2.0	1.9
In Constant Year Dollars (FY95)	1.5	1.5
Regulatory Impacts		
Regulatory Commitments	Met or Exceeded	Met or Exceeded

* All Total Program Costs (Life Cycle) are based on cost beginning with FY95. Prior Year sunk cost has not been included in the analysis.

** The Average /Oldest Tank Age is based on age of the Type I, II and IV Waste Tanks (which do not meet RCRA requirements) prior to the final Waste Removal actions being completed.

This case allows minimum maintenance/infrastructure improvements to be made because the program completion is accomplished in 2013. A listing of the required new projects to support this program is shown below. These projects include both upgrade and repetitive projects required for the program such as melters.

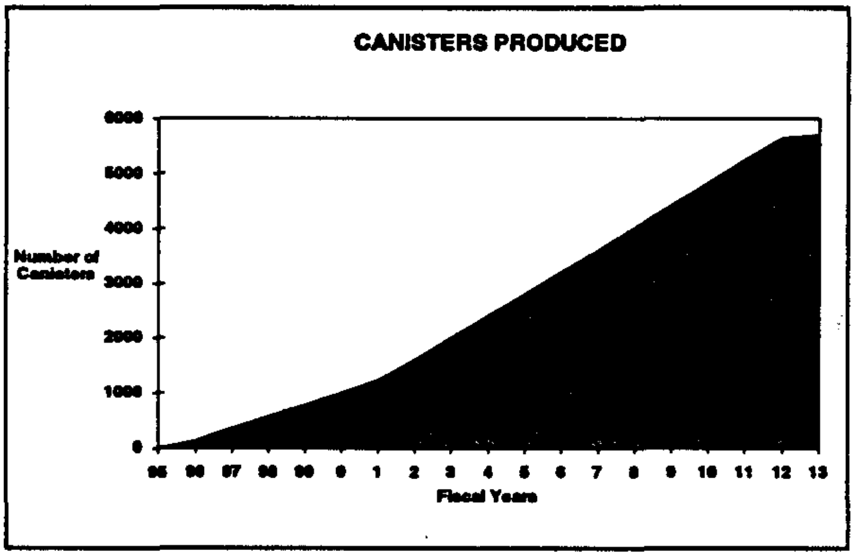
Project Title	FY Start	Project TEC in Millions of FY95 Dollars
Tank Farms		
Tank Farm Services Project	1996	19
Sample/Monitor System Upgrade	1997	10
Storm Water Safeguards	2000	12
Tank Farm Support Services	2001	30
Tank Farm Infrastructure Upgrades	2005	50
DWPF		
8 Saltstone Vaults	First one in 96	144
6 Melters & Boxes	First one in 97	123
2 Failed Equipment Storage Vaults (4 cells)	1998	8
DWPF Laboratory Upgrade for Attainment Improvement	1999	15
Glass Waste Storage Building II	1999	75
Glass Waste Storage Building III	2005	75
TOTAL		561

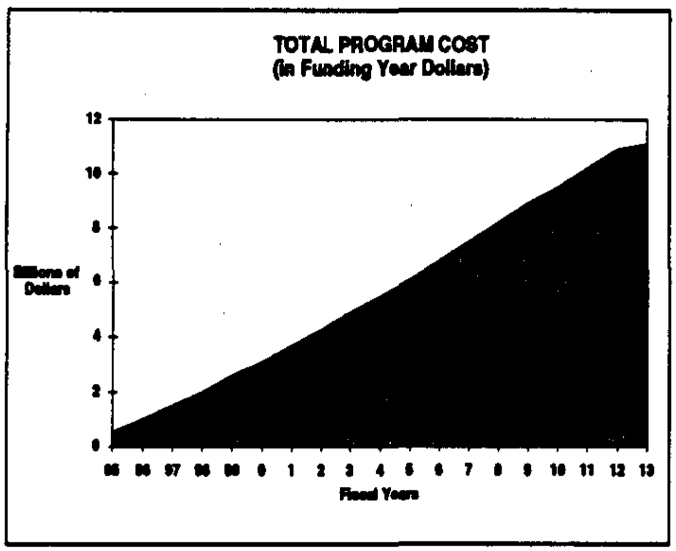
Figure 4 illustrates the Cumulative Canisters filled over the length of the program and the Total Program Cost in both Constant Year (FY95) and Funding Year Dollars for this Case. Table 3 provides a summary of the Production Plan for the case.

The funding profile to support this program is shown below.

Funding	Rev 4 $ Millions	Rev 5 $ Millions	Additional Cost Reductions
Fiscal Year 1996	525	466	59
Fiscal Year 1997	536	507	29
Fiscal Year 1998	552	516	36
Fiscal Year 1999	577	546	31
Fiscal Year 2000	602	570	32
TOTAL	2,792	2,605	187

FIGURE 4: CASE C
MINIMUM LIFE CYCLE COST CASE





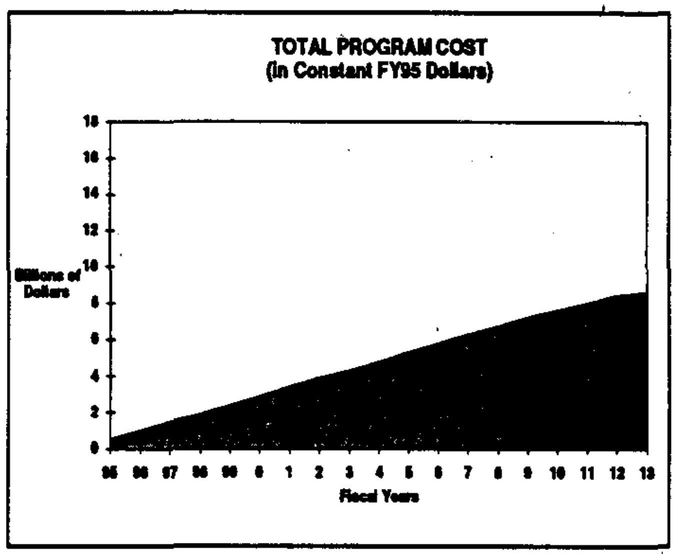
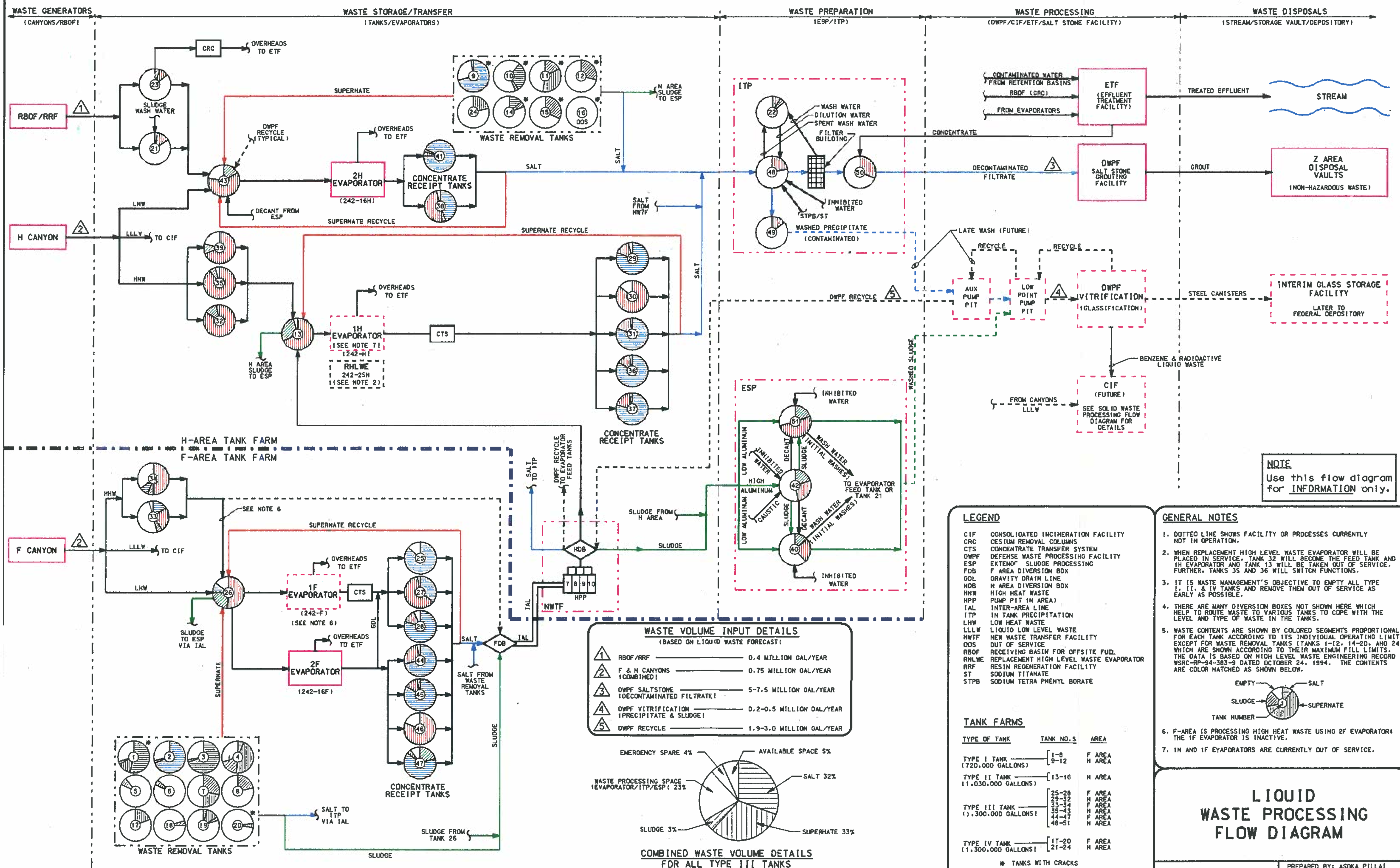


Table 3
Case C - Minimum Life Cycle Cost Production Plan

Batch	Start	Canisters	FY	Canisters	Cumulative Canisters	Sludge Tanks Removed from Service
1	3/1/96	1236				
			96	60	60	
			97	215	275	
			98	215	490	
			99	215	705	
			0	215	920	
			1	215	1135	
2	12/1/01	782	2	373	1509	8,11,15
3	11/7/03	1513	3	405	1913	4,7,12,14,47
			4	405	2318	
			5	405	2723	
			6	405	3128	
4	8/3/07	971	7	405	3533	5,6,9,10,13,26,35
			8	405	3938	
			9	405	4343	
5	12/27/09	774	10	405	4748	1,2,3,32,33,34,39,43
			11	405	5153	
6	11/26/11	441	12	405	5558	17,18,19,21,22,23,24
			13	158	5717	



WASTE VOLUME INPUT DETAILS

(BASED ON LIQUID WASTE FORECAST)

1	RBOF/RRF	0.4 MILLION GAL/YEAR
2	F & H CANYONS (COMBINED)	0.75 MILLION GAL/YEAR
3	DWPF SALTSTONE (DECONTAMINATED FILTRATE)	5-7.5 MILLION GAL/YEAR
4	DWPF VITRIFICATION (PRECIPITATE & SLUDGE)	0.2-0.5 MILLION GAL/YEAR
5	DWPF RECYCLE	1.9-3.0 MILLION GAL/YEAR

COMBINED WASTE VOLUME DETAILS FOR ALL TYPE III TANKS

LEGEND

CIF	CONSOLIDATED INCINERATION FACILITY
CRC	CESIUM REMOVAL COLUMNS
CTS	CONCENTRATE TRANSFER SYSTEM
DWPF	DEFENSE WASTE PROCESSING FACILITY
ESP	EXTENDED SLUDGE PROCESSING
FDB	F AREA DIVERSION BOX
GDL	GRAVITY DRAIN LINE
HDB	H AREA DIVERSION BOX
HHW	HIGH HEAT WASTE
HPP	PUMP PIT (H AREA)
IAL	INTER-AREA LINE
ITP	IN TANK PRECIPITATION
LHW	LOW HEAT WASTE
LLLW	LIQUID LOW LEVEL WASTE
NWTF	NEW WASTE TRANSFER FACILITY
OOS	OUT OF SERVICE
RBOF	RECEIVING BASIN FOR OFFSITE FUEL
RHLWE	REPLACEMENT HIGH LEVEL WASTE EVAPORATOR
RRF	RESIN REGENERATION FACILITY
ST	SODIUM TITANATE
STPB	SODIUM TETRA PHENYL BORATE

TANK FARMS

TYPE OF TANK	TANK NO.S	AREA
TYPE I TANK (720,000 GALLONS)	1-8	F AREA
	9-12	H AREA
TYPE II TANK (1,030,000 GALLONS)	13-16	H AREA
TYPE III TANK (1,300,000 GALLONS)	25-28	F AREA
	29-32	H AREA
	33-34	F AREA
	35-43	H AREA
	44-47	F AREA
	48-51	H AREA
TYPE IV TANK (1,300,000 GALLONS)	17-20	F AREA
	21-24	H AREA

* TANKS WITH CRACKS

GENERAL NOTES

1. DOTTED LINE SHOWS FACILITY OR PROCESSES CURRENTLY NOT IN OPERATION.
2. WHEN REPLACEMENT HIGH LEVEL WASTE EVAPORATOR WILL BE PLACED IN SERVICE, TANK 32 WILL BECOME THE FEED TANK AND 1H EVAPORATOR AND TANK 13 WILL BE TAKEN OUT OF SERVICE. FURTHER, TANKS 35 AND 36 WILL SWITCH FUNCTIONS.
3. IT IS WASTE MANAGEMENT'S OBJECTIVE TO EMPTY ALL TYPE I, II, & IV TANKS AND REMOVE THEM OUT OF SERVICE AS EARLY AS POSSIBLE.
4. THERE ARE MANY DIVERSION BOXES NOT SHOWN HERE WHICH HELP TO ROUTE WASTE TO VARIOUS TANKS TO COPE WITH THE LEVEL AND TYPE OF WASTE IN THE TANKS.
5. WASTE CONTENTS ARE SHOWN BY COLORED SEGMENTS PROPORTIONAL FOR EACH TANK ACCORDING TO ITS INDIVIDUAL OPERATING LIMIT, EXCEPT FOR WASTE REMOVAL TANKS (TANKS 1-12, 14-20, AND 24) WHICH ARE SHOWN ACCORDING TO THEIR MAXIMUM FILL LIMITS. THE DATA IS BASED ON HIGH LEVEL WASTE ENGINEERING RECORD WSRC-RP-94-383-9 DATED OCTOBER 24, 1994. THE CONTENTS ARE COLOR HATCHED AS SHOWN BELOW.

6. F-AREA IS PROCESSING HIGH HEAT WASTE USING 2F EVAPORATOR; THE 1F EVAPORATOR IS INACTIVE.
7. 1H AND 1F EVAPORATORS ARE CURRENTLY OUT OF SERVICE.

LIQUID WASTE PROCESSING FLOW DIAGRAM

DATE: DECEMBER 10, 1994

PREPARED BY: ASOKA PILLAI

DRAWN BY: KAREN A. BARLEY