

Department of Energy

Washington, DC 20585

MAR 2 2004

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004-2901

Dear Mr. Chairman:

This letter transmits the Programmatic Risk Assessment for the Savannah River Site (SRS) Salt Processing Program (Commitment 2.12 of the Department of Energy's Implementation Plan in response to Recommendation 2001-1), provides information on the Low Curie Salt (LCS) Program (Commitment 2.11), and gives notice that Commitment 2.9 (Process the first batch of LCS in Saltstone) was not met as scheduled.

In accordance with Commitment 2.12, please find enclosed the Programmatic Risk Assessment for the SRS Salt Processing Program (Enclosure 1). The assessment covers the risks and proposed mitigation actions for the key facilities and activities required to execute all three phases of the SRS Salt Processing Program: LCS processing, low curie-high actinide processing, and high curie-high actinide processing. The Department plans to maintain this assessment and update it as needed. It will be used as a management tool to ensure that risks are identified, managed, and mitigated to support our Accelerated Cleanup Program goals.

One of the identified risks in the Programmatic Risk Assessment is how ongoing litigation may delay certain aspects of the Salt Processing Program. On July 3, 2003, parts of DOE Order 435.1 dealing with the authority for determining waste incidental to reprocessing were declared invalid by the U.S. District Court for the District of Idaho. This ruling currently is on appeal to the U.S. Court of Appeals for the Ninth Circuit. Accordingly, the Programmatic Risk Assessment did not undertake a probability or consequence analysis of the litigation's outcome on the Salt Processing Program and rated this risk as "Uncertain." Once this litigation is resolved, the Department will provide you with an update on salt waste processing and disposal plans.

An evaluation of the LCS Program as outlined in Commitment 2.11 has found that while the LCS Program plans and schedules have not been fully achieved, several key technical milestones have been met. The most significant of these are:

- The draining of higher curie interstitial liquid from high level waste saltcake in Tank 41 and dissolution of a portion of the remaining saltcake.
- Modification of the Saltstone facility to process salt solutions with a cesium activity of 0.1 curies per gallon in anticipation of LCS feed.



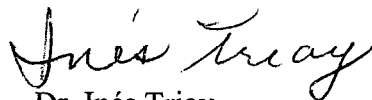
- Restoration of Building 512-S and the cold chemical demonstration of filter performance. Plant activities remain ahead of schedule to demonstrate actinide removal process viability by the June 2004 commitment date.

Several issues have prevented the LCS Program from meeting all of its objectives.

- Technical problems were encountered with returning Tank 50 to service due to the discovery of excessive solids and tetraphenylborate on the bottom of the tank. As highlighted in the July 14, 2003, letter, these issues have been resolved; however, resolution delayed program progress.
- The Saltstone Facility permit modifications required for processing LCS feed, and disposal of the resulting grouted waste, were submitted to the State of South Carolina in September 2002. The South Carolina Department of Health and Environmental Control notified the Department that it would take no official action on the permit applications pending resolution of the ongoing litigation concerning waste incidental to reprocessing. Without this permit, the current plan to process LCS at Saltstone (Commitment 2.9) cannot proceed.
- While permit issues may prevent waste processing at this time, the Department and its contractors continue working to demonstrate the technical feasibility of the LCS processing option. Samples of the dissolved Tank 41 saltcake have been taken and the analytical results have been provided to your staff. These sample results show higher than anticipated activity levels and may result in the need for additional actions to achieve the total volume to be disposed of as LCS.

Should you or your staff have any questions concerning these issues, please contact Jeffrey Allison at (803) 952-6337 or me at (202) 586-0738.

Sincerely,



Dr. Inés Triay
Deputy Chief Operating Officer
Office of Environmental Management

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**Y-RAR-G-00015
REVISION 1.1**

**Key Words:
Salt Processing
Risk Assessment**

**Retention:
Permanent**

**RISK ASSESSMENT REPORT:
SALT PROCESSING PROGRAM**

JANUARY 2004

Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29808

**Prepared for the U.S. Department of Energy Under
Contract Number DE-AC09-96SR18500**



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Printed in the United States of America

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LIST OF ACRONYMS

AB	Authorization Basis
AMHLW	Assistant Manager for High Level Waste
ARP	Actinide Removal Process
CBU	Closure Business Unit
CSSX	Caustic Side Solvent Extraction
CST	Crystalline Silicotitanate
DSS	Decontaminated Salt Solution
DF	Decontamination Factor
DNFSB	Defense Nuclear Facilities Safety Board
DOE-HQ	Department of Energy, Headquarters
DOE-SR	Department of Energy, Savannah River
DOJ	Department of Justice
DWPF	Defense Waste Processing Facility
EIS	Environmental Impact Statement
EM-42	Office of Project Completion, Savannah River Office
EPC	Engineer, Procure, Construct
FFA	Federal Facility Agreement
HLW	High Level Waste
HS	Handling Strategy
LCS	Low Curie Salt
LWD	Liquid Waste Disposition
MST	Monosodium Titanate
OD	Operating Division
PD	Programs Division
PNNL	Pacific Northwest National Laboratory
PMP	Performance Management Plan
R&D	Research and Development
ROD	Record of Decision
RAR	Risk assessment Report
RHS	Risk Handling Strategy
RMP	Risk Management Plan
SME	Subject Matter Expert
SPD	Salt Processing Division
SPF	Saltstone Processing Facility
SPP	Salt Processing Program
SRS	Savannah River Site
SS	Saltstone
SWPF	Salt Waste Processing Facility
TBD	To Be Determined
TFA	Tank Focus Area
TPB	Tetraphenylborate
WAC	Waste Acceptance Criteria
WIR	Waste Incidental to Reprocessing
WSRC	Westinghouse Savannah River Company

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REVISION HISTORY

Rev.	Date	Description
0	6/2003	Initial Issue
1	11/2003	Incorporate DOE comments as per correspondence, Hansen to DeVine, dated 11/04/2003
1.1	01/2004	Incorporate editorial comments from DOE

EXECUTIVE SUMMARY

This report documents the results of a programmatic risk assessment conducted on the Savannah River Site's Salt Waste Treatment and Disposal Program. It provides the U.S. Department of Energy and Westinghouse Savannah River Company a management tool to identify and manage risks associated with the safe and economical treatment and disposal of salt waste at SRS. This report will be submitted in response to Corrective Action 2.12 of DOE's implementation plan for the Defense Nuclear Facility Safety Board Recommendation 2001-1.

Salt waste makes up 34 million gallons of the 37 million gallons total in the high level waste system at the Savannah River Site. Under the Site's Accelerated Cleanup Plan, a three-pronged strategy to treat and dispose of salt waste has been proposed and is being implemented. Analyses have shown that salt waste treatment and disposal are on the critical path to the completion of cleanup activities for the SRS high level waste system. Success in the Salt Processing Program is vital to the overall success of the Site's accelerated cleanup plan.

Salt waste can be segregated into three general categories – low curie salt, low curie with higher actinide salt, and high curie with high actinide salt. Processes to treat each of these categories of waste have been identified and make up the three-pronged strategy. The low curie salt treatment process will treat and dispose of the approximately two-thirds of the salt waste that is low in cesium. One-half of the low curie volume (one-third of the total waste volume), which is low in cesium and low in actinides, will be processed at Saltstone after verification that the waste meets the facility waste acceptance criteria. The remaining volume of low curie salt (one-third of the total waste volume), low in cesium but high in actinides, will be pre-treated using the Actinide Removal Process prior to final disposition at Saltstone. The planned Salt Waste Processing Facility will treat the remaining one third of the salt waste by removing both cesium and actinides prior to disposal.

A team made up of experienced, senior-level personnel from within DOE-SR and WSRC was chartered to develop the programmatic risk assessment. A subteam prepared the risk assessment plan and the core team, with input from subject matter experts, conducted the risk assessment during a focused two-week period. The Risk Assessment looked at the following assessable units of the salt waste treatment and disposal program.

- Feed Management
- Actinide Removal Process
- Salt Waste Processing Facility
- Low Curie Salt Processing
- Saltstone
- Saltstone Alternative Technology
- Defense Waste Processing Facility
- Support Functions

Previously completed risk assessments were reviewed for applicability. The focus was placed on identifying risks that were programmatic in nature or in consequence.

The core team identified 28 risks that were applicable to the salt program. The team assigned a probability of occurrence, a severity of consequence, and a level of risk for each of 28 risk events identified, based on the criteria developed in the planning for the risk analysis. Seven (7) of the risks were rated as **High**, six (6) were rated as **Moderate**, 14 were rated as **Low**, and one (1) was rated **Uncertain**. The High risks identified were as follows, in order of probability, and within order of probability, by magnitude of consequence, where it was possible to estimate a consequence. The Uncertain risk is also listed below.

Risk Number	Risk Title	Probability	Worst Consequence
SWPF-00-055	High Curie Salt Treatment Capacity and Schedule Exceeded	Very Likely	>\$6.1B
SWPF-00-046	High Feed Cesium and Actinide Concentrations to SWPF	Very Likely	>\$640M
SPP-00-048	MST Loading Impacts Ti Loading in DWPF Glass	Very Likely	\$500M
SPP-00-043	Material and Chemical Balances Not Accommodated for the DWPF Interfaces	Very Likely	\$500M
LCS-00-002	Cesium or Actinides Exceed LCS Limits	Likely	\$810M
SPP-00-039	Equipment Failure Halts SPP Processing	Likely	\$540M
SPP-00-021	Funding Competition Impacts SPP	Very Likely	\$6.1B
SPP-00-006	Regulators, Stakeholder Concerns - WIR	Uncertain	Unknown

After the application of proposed handling strategies, two risks would remain ranked as High: Equipment Failure Halts SPP Processing; and Funding Competition Impacts SPP. One risk would remain ranked as uncertain: Regulators, stakeholder concern – WIR (Waste Incidental to Reprocessing). Of the remaining risks, eleven (11) would be reduced to or accepted as Low; three (3) would be mitigated to, reduced to, or accepted as Moderate; and eleven (11) risks would be avoided. Potential for second order impacts remains, which may increase the total impact of multiple risks.

Reductions in risk level depend on successful implementation of the recommended risk handling strategies. The strategies identified in this assessment are not fully funded at this time. This assessment did not attempt to quantify program contingencies to cover all cost and schedule impacts of identified risks. Rather, the descriptions of the risks identified and risk handling strategies are presented to WSRC Management and the DOE for consideration in making decisions which affect the risks and vulnerabilities in order to promote maximum success for the implementation of accelerated cleanup activities.

On July 3, 2003, parts of DOE Order 435.1 dealing with the authority for determining waste incidental to reprocessing were declared invalid by the U.S. District Court for the District of Idaho in the case of Natural Resources Defense Council v. DOE, Case No. 01-413-S-BLW. The District Court's ruling is currently on appeal to the U.S. Court of Appeals for the Ninth Circuit. Accordingly, it is not appropriate to address these types of probabilities or consequences, nor to undertake a probability or consequence analysis of the litigation's outcome in this document at this time.

WSRC has initiated action on many of the risk handling strategies identified, and recommends that the future overall risk mitigation strategy be focused in the following areas:

- 1 Risk-handling strategies for risks identified as High should be immediately implemented to minimize program impact.
- 2 To ensure that the capacity of the HLW system can meet the performance expectations of the PMP, SPP should perform an attainment study to determine the quantitative maximum potential process capability of the integrated HLW system, including the existing and proposed process facilities. This should include an analysis of the secondary impacts from the interaction between coupled facilities (e.g., statistical analysis of the ARP schedule risks). Results of this study need to be available prior to the start of final design for the SWPF in order to enable the design team to accurately size the processing capacity of the facility, including buffer storage capacity.
- 3 In order to reduce the probability that an interruption could occur in operation of any individual facility or the system resulting from inadequate blending strategies, or use of feed batches which require multiple process cycles, or acceptance of a non-compliant feed batch, SPP should initiate further refinement of the HLW system planning tools to include a comprehensive material balance flowsheet integrating all HLW facilities and modeling the performance of the processing facilities. This material balance flowsheet would be at the level of detail necessary to identify potentially non-compliant waste streams with sufficient lead time to preclude system interruptions.
- 4 In order to minimize the risk associated with the limited experience using CSSX technology for high level waste processing on a production basis, DOE should continue to provide funding for ongoing technology development activities which reduce risk. Priority should be placed on those activities that have the greatest potential of reducing high risks and multiple risks of a lower ranking.
- 5 Responsibility for coordination of risk analyses performed on projects or operational initiatives required to meet the expectations of the PMP should be assigned to a single manager responsible to the Salt Processing Program Manager. All risk analyses performed on projects or operational initiatives required to meet the expectations of the PMP should be reviewed and evaluated by that manager to ensure that:

- emergent risks in any individual project or initiative that could impact any other project or the overall Program would be identified
- risk-handling strategies are being implemented by the responsible project owner or facility manager
- the status of risks affecting the program are monitored and communicated to senior program management in timely manner

Risk status will be monitored and reported to the Manager, SPP, and the Director, SPD, on a periodic basis. This analysis will be reviewed and updated periodically to capture the latest developments that may impact accelerated cleanup.

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1.0 SALT PROCESSING PROGRAM INFORMATION

1.1 PROGRAM BACKGROUND

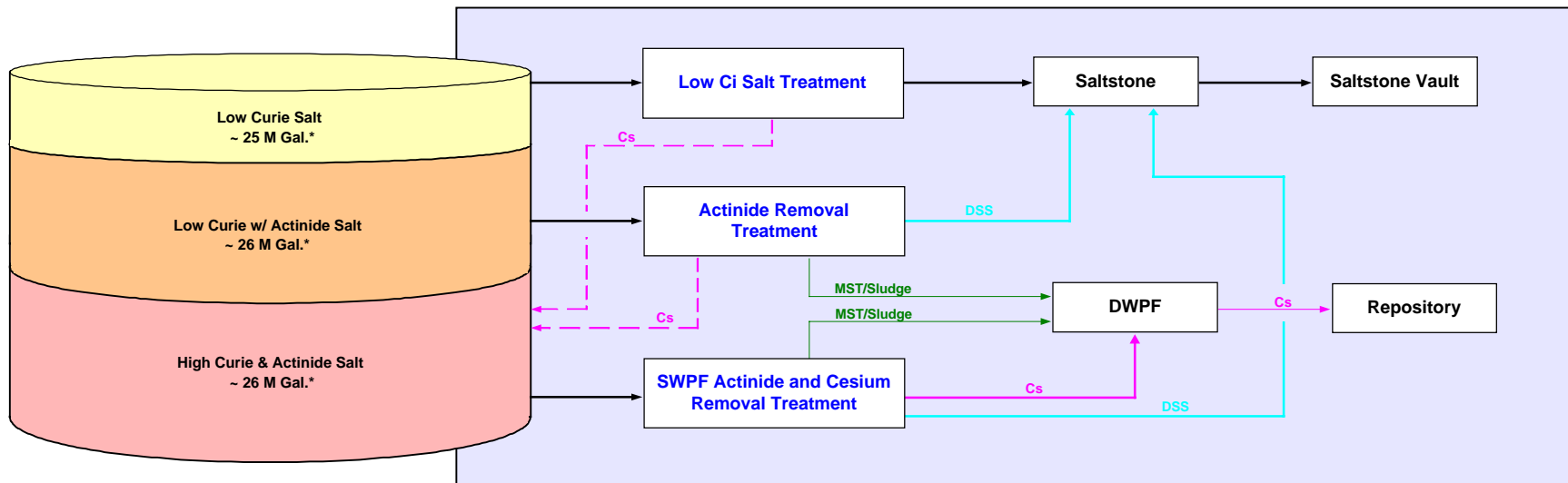
Since the early 1950s, the Savannah River Site has produced approximately 100 million gallons of high level waste. Through evaporation and treatment approximately 37 million gallons of high level waste containing approximately 426 million curies of radioactivity remain today. Of this quantity, salt makes up approximately 34 million gallons and contains 207 million curies of radioactivity. Sludge, which will be vitrified and shipped to Yucca Mountain for disposal, makes up the remaining inventory. The salt inventory includes solidified salt, called saltcake, and liquid salt solution, called supernate.

SRS developed a three-pronged, tailored approach to treat and dispose of the salt waste. (Figure 1) The salt inventory can be segregated by radionuclide content into three general categories: 1) salt which is low in cesium and low in actinides, 2) salt which is low in cesium but contains higher levels of actinides, and 3) salt which contains high levels of cesium and high levels of actinides. Each of these categories of material have a process by which the salt can be treated and made acceptable for disposal as low level waste in SRS's Saltstone Facility.

Approximately one third of the current inventory of salt is low in cesium and low in actinides. This material (referred to as low curie salt) is treated by the removal of the cesium-bearing interstitial liquid, followed by dissolution of the hard saltcake and transfer to the Saltstone Facility for disposal. An additional one third of the salt is low in cesium but contains actinides. This material can be treated by removing interstitial liquid (as with low curie salt) followed by dissolution and transfer to a staging tank. It can then be treated with monosodium titanate and filtered to remove the actinides. The remaining one third of the salt inventory contains significantly higher levels of cesium and actinides. The Salt Processing Environmental Impact Statement and Record of Decision were issued in late 2001 to document DOE's proposed path forward for treating and disposing of this salt waste. The technology to be used for treating this waste is the caustic side solvent extraction process. The Salt Waste Processing Facility is currently in the design phase and will incorporate this technology to treat the remaining salt waste and send the decontaminated salt solution to the Saltstone Facility for disposal. This strategy tailors the treatment of each of the salt waste fractions to the risk and hazards involved

This approach focuses on implementing expedited treatment methods that ensure the fastest risk reduction, while meeting the performance requirements and protecting human health and the environment. The implementation of this strategy will help meet the present SRS Environmental Management Program Performance Management Plan (WSRC-RP-2002-00245, Rev. 3) commitment to process all HLW (salt and sludge) by 2019. (Reference 1.)

Tailored Salt Treatment Approach



*Salt wastes must be segregated to enable multiple treatment paths

May 2003

Figure 1. Tailored Salt Treatment Approach

Note: Volumes represented based on adjustment to 6.4 M sodium.

The low curie salt program was initiated in 2002 and was projected to result in the treatment and disposal of the initial batch of low curie salt waste by late 2003. The actinide removal process is currently being implemented via an existing site facility (512-S, the former Late Wash Facility) that is being restored and modified. It will be operational in early 2004 to provide an initial actinide removal capability. In 2005, another existing facility, 241-96H (Filter Stripper Building) will be tied into 512-S to provide significantly more actinide removal process throughput. The Salt Waste Processing Facility (SWPF), which will treat the remaining one third of the salt waste inventory, is currently in the design phase with two engineering, procurement, and construction contractors competing for the design/build contract. The capacity for this facility was determined in mid-2003 and the down-select to a single contractor occurred in early 2004. Construction is scheduled to begin in 2005 and initial operation is planned for the 2009-2010 timeframe.

This Risk Assessment Report assesses programmatic risks associated with the SPP as implemented to support the Performance Management Plan (PMP) commitments. (Reference 2.) By implementing the PMP strategy, the overall HLW system lifecycle may be expedited by eight years (from 2027 to 2019).

1.2 PROGRAM AREAS AND FUNCTIONS

The SPP, for the purpose of this Risk Assessment Report, is divided into the following program and upper-level functions. These were the areas defined as Assessable Elements for the SPP risk assessment. These assessable elements separate the High Level Waste system into smaller manageable elements that facilitate the identification of risks by areas of unique process function or support (e.g., feed management or other support functions). These closely align with processes or support functions for which risk analysis had been completed previously at the project level.

Feed Management

- Characterize Waste
- Determine Path
- Prepare Feed
- Transfer Feed

Actinide Removal Process

- Receive Salt Solution
- Store Salt Solution
- Transfer Dissolved Salt Solution to Feed Tank (Tank 48 or 49)
- Process Salt Solution
- Separate Actinides
- Transfer Filtrate to Tank 50, then to Saltstone
- Store Filtrate
- Transfer MST/Sludge as Feed to DWPF
- Provide Infrastructure
- Monitor Process
- Control Process
- Increase Throughput of Facility/Process

SWPF

- Receive Feed
- Process Salt Solution
- Separate Actinides
- Remove Cesium
- Transfer Decontaminated Salt Stream as Feed to Saltstone
- Transfer MST/Sludge Stream as Feed to DWPF
- Transfer Acidified Cesium Stream as Feed to DWPF
- Provide Infrastructure
- Monitor Process
- Control Process
- Increase Throughput

Low Curie Salt Processing

- Remove Interstitial Liquid from Salt Tanks
- Dissolve Salt Solution
- Transfer Salt Solution to Tank 50
- Transfer Salt Solution as Feed to Saltstone Processing Facility
- Monitor Process
- Control Process

Saltstone

- Receive Low Curie Salt Solution as Feed for processing into Saltstone
- Store Low Curie Salt Solution
- Process Low Curie Salt Solution into Saltstone
- Construct New Vaults
- Manage Existing Vaults
- Provide Infrastructure
- Monitor Process
- Control Process

Saltstone Alternative Technology

- Develop Alternative - Introduction of new technologies that will improve group processing capability (i.e., higher curie content, process improvements, reliability, throughput)
- Implement Alternative

DWPF

- Receive MST/Sludge Slurry as Feed
- Receive Acidified Cesium Stream as Feed
- Process MST/Sludge Slurry and Cesium into Glass
- Store Vitrified Cesium Waste

Support Functions

- Develop AB Documentation

2.0 RISK ASSESSMENT

2.1 INTRODUCTION

DOE's revised Implementation Plan in response to the Defense Nuclear Facilities Safety Board's Recommendation 2001-1, High-Level Waste Management at the Savannah River Site was issued May 10, 2002 (2002-004978) (Reference 3). This Risk Assessment Report will be submitted to satisfy Implementation Plan Commitment 2.12, which states, "Prepare a programmatic risk assessment with mitigation strategies for the salt processing program."

2.2 RISK ASSESSMENT PROCESS

The initial planning for this assessment is documented in the Risk Management Plan for the Salt Processing Program (Y-RMP-H-00009) (Reference 4). This plan was reviewed and implemented by the risk assessment team, with minor modifications, as described by the following activities:

- 1 Identification of risks, via team expert elicitation and examination of previously identified risks, combined with a team review of other risks associated with the SPP.
- 2 Calibration of risk probability, into categories of Non-Credible, Very Unlikely, Unlikely, Likely, and Very Likely, based upon the timing of/impact on the SPP.
- 3 Calibration of the risk consequences associated with cost overrun and schedule delay into categories of Negligible, Marginal, Significant, Critical, and Crisis, based upon the severity of impact on the SPP.
- 4 Assignment of probability and consequence levels to the identified risks, per Tables 1 and 2.
- 5 Determination of the Risk Level of each risk, based upon the combination of the risk probability and consequence, as identified by the matrix shown in Table 3.
- 6 Selection of a handling strategy for each risk, consistent with the handling strategy guidance provided in WSRC-IM-98-00033: Systems Engineering Methodology Guidance Manual, Appendix B: Risk (and Opportunity) Analysis and Management.
- 7 Determination of the potential impact of implementing the handling strategy, with respect to additional cost to the program to do so, as well as additional project time which may be required. The handling strategy would need to meet applicable legal requirements including NEPA. A manager will be assigned and accept responsibility for each handling strategy.
- 8 Identification of residual risk level, based upon implementation of the selected handling strategy, including the revised cost and schedule impact, as applicable.
- 9 Documentation of the above on Risk Assessment Forms. The complete Risk Assessment Forms are found in Appendix A.

The risk assessment was conducted consistent with the WSRC risk assessment methodology defined in WSRC E7, Procedure 2.16, *Technical Risk Analysis* (Reference 5). This procedure was specifically developed for the analysis of technical risk associated with the engineering and design process for plant modifications and projects. The process was modified to accommodate the analysis of risk from the perspective of a program which spans multiple, functionally related projects, facilities, and proposed initiatives. Participants in the risk assessment were given a one-day training session on the risk assessment process and its application to the Salt Processing Program. An initial calibration for activities 2 and 3 above was included as part of the training process.

Process steps performed during the risk assessment included activities 1 through 9, above.

For activity 7, in some instances, the Team did not quantify implementation cost or schedule requirements to conduct handling strategies. Accurate quantification was not considered feasible by the team given the absence of sufficient detail for the cost or schedule of certain assessable elements (e. g., Saltstone alternative technology, actinide removal capacity improvements to 6 gpm, etc.). Actions identified were being addressed where possible within currently scheduled operations activities and funding.

For activity 8, although residual cost and schedule impacts were documented in some instances, residual cost impacts were not analyzed to determine the risk or cost contingency. Many risk handling strategies identified for various risks are funded and addressed by ongoing projects, high level waste operational initiatives, or FY03 technology development activities as referenced in the Risk Summary Table, Appendix B, and individual Risk and Opportunity Assessment Forms, Appendix A.

Two other risk assessment outputs specified by Reference 5 were not quantified. Specifically, due to lack of sufficient detail for major program elements, the Team chose not to determine the risk-based cost contingency required to minimize the possibility that program risk will result in excess cost to the program. Nor did the Team attempt to quantify a schedule contingency. Quantification of SPP contingency at this early stage of PMP implementation is not considered meaningful. The PMP reflects an aggressive and visionary plan for accelerated disposition of salt waste. By its nature, such a plan is expected to entail significant risk. As projects and initiatives required for implementation of the SPP mature, technical and programmatic risk analyses conducted at the project level should enable better and more meaningful cost and contingency estimates.

2.3 TEAM MEMBERS

The Risk Assessment Team is composed of individuals from both DOE and WSRC selected to participate based upon their diverse knowledge and expertise. Core Team members for this risk assessment were:

WSRC Core Team Members

Tom Lex-WSRC/CBU/LWD
Bill Tucker-WSRC/CBU/SPP
Ginger Dickert-WSRC/CBU/LWD
Mark Mahoney-WSRC/CBU

DOE Members

Terrel Spears –DOE-SR/AMHLW/SPD
Carl Everatt–DOE-SR/AMHLW/OD
Doug Hintze–DOE-SR/AMHLW/PD
Kurt Fisher-DOE-HQ/HLWOD

Bob Hinds-WSRC/CBU/SPP - **WSRC Lead**

Biographical information of the Team Members is found in Appendix C. Other subject matter experts were made available to provide detailed operational, project, and program information. Representatives of the two EPC Contractors currently engaged in developing conceptual designs for the SWPF were present, as were observers from a risk consulting firm who were evaluating and monitoring the risk assessment methodology and implementation for the DOE. The list of attendance for each day is found in Appendix C.

2.4 RISK IDENTIFICATION AND ANALYSIS

This risk assessment was conducted in workshops held on February 20, and on March 3, 4, 5, 6, 7, 10, and 11 of 2003. The program was divided into assessable elements, shown in Section 1.2 of this report. During the risk assessment process, the Risk assessment Team evaluated each of the assessable elements, and reviewed previously identified risks documented in References 6, 7, 8, 9, 10, and 11 based on current status and programmatic relevance. Subject matter experts for each of the assessable elements and/or individual risks met with the team and assisted in identification of additional risks. Project level risks were included only if the risk or if a combination of risks rose to the program level; duplicate risks were deleted.

For the purpose of this assessment, programmatic risks represent those existing or potential conditions (including the political, regulatory, and program management decisions which establish those conditions) that could interfere with the achievement of the accelerated closure of the High Level Waste system as described in the Savannah River Site Environmental Performance Management Plan. It is assumed that the project and operations management of the facilities will meet current requirements for the safe execution of their responsibilities with respect to environmental and health risks. Facility-specific health and environmental safety risks are addressed in each referenced project and facility-specific risk analyses, vulnerability analyses, and safety analyses. Facility and project risks that are technical in nature are assumed to be managed by the individual owner, except where a risk has been identified which has a system-wide impact. System-wide impacts will require the development of a common risk handling strategy that includes funding, setting priorities, and controls outside of the project or facility owner's span of control for resolution.

The team then assigned a probability of occurrence and a severity of consequence grade for each of the risks identified. These estimates of probability and consequence grades were based upon a combination of management experience and technical judgment using the criteria in Table 1 and Table 2. Details of each risk appear on Risk Identification and Assessment Forms in Appendix A.

Table 3 provides the Probability-Consequence Matrix used to grade risks as **High**, **Moderate**, or **Low** based on risk probability and consequence. The team used Table 3 to determine the Risk Level of each risk identified during the analysis process, based upon the probability and consequence information obtained from Table 1 and Table 2.

2.5 COST DETERMINATION

Refer to Table 4 for the PMP Budget Authority in Escalated Dollars as reproduced from the PMP Supplement. The escalated dollar value is a provision in the cost estimate to reflect increases in the cost of equipment, material, labor, etc., due to continuing price changes over time. Escalation is used to estimate the future cost of a project or to bring historical costs to the present. For additional information, refer to DOE Order 5700.2, Cost Estimating, Analysis, and Standardization.

Using historical information and the information provided in the PMP Supplement (Reference 2), the cost of SPP program delay was determined to be \$270M per year (in FY03 dollars) for the purposes of this risk evaluation. This number was derived based on continued operation of the SPP, DWPF, and one Tank Farm. The Team assumed that in the latter years of the SPP, only H-Tank Farm would continue in operation. Because of close coupling between various SPP operations, only the ARP was found to have schedule float. Therefore, additional ARP operations could continue for a maximum of 2 years, without resulting in an overall delay of the SPP program. Additional expenses associated with individual risks are identified on the Risk Identification and Assessment Forms found in Appendix A. For most SRS risk assessments, schedule delays are evaluated separately. For this risk assessment, since schedule delays largely drove costs associated with each risk, the cost of schedule delay is included along with other costs shown as a total estimated cost on the Risk Identification and Assessment Forms. Additional expenses associated with individual risks are also identified on the Risk Identification and Assessment Forms.

The operational costs for the various facilities associated with the SPP were derived from the funding schedule in the PMP Supplement (Reference 2). The dollar values allocated for operations in the latter years of the SPP are used for estimation purposes. These costs are as follows:

Facility	Impact (\$ Millions)	Basis
ARP Operation	25	Cost of extended operation per year
SWPF Operation	75	Cost of extended operation per year
SS Operation	20	Cost of extended operation per year
H Tank Farm East	50	Cost of extended operation per year
DWPF Fixed Operational Cost	100	Cost of extended operation per year
DWPF Variable	1	Per additional can (includes production and disposal)

2.6 RISK HANDLING STRATEGY IDENTIFICATION

Having graded the risks, the team established handling strategies for each risk, based on guidance provided in Reference 12. After each risk was validated and assigned a risk level,

using their subject matter expertise and knowledge of current Salt Processing Program work scope and plans, the team identified existing or proposed projects, operational activities, and technology development tasks as risk handling strategies which could be effective in reducing, mitigating, or avoiding the various risks. Ongoing activities identified as risk-handling strategies (e.g., current FY03 technology development activities referenced in Appendix B, Risk Summary Table) can be verified by various current program performance monitoring reports.

Table 1. Guidelines for Assigning Risk Probabilities

Probability of Occurrence (P_R)		Criteria
Descriptive	Numerical	
Non-Credible	N/A	<ul style="list-style-type: none"> • Determined to have a probability of occurrence of $\bullet 10^{-6}$ (or other non-credible probability defined for the activity)
Very Unlikely	> 0 but < 0.15	<ul style="list-style-type: none"> • Will not occur anytime within multiple SPP life cycles; or • Development is at least at the stage of a system prototype demonstration in an operational environment up to an actual system in service proven through successful mission operations; or • Estimated recurrence interval > 50 years; or • Estimated recurrence frequency < 1 (i.e., event not expected to recur); or • $0 < \text{Probability of single event occurrence} < 0.15$.
Unlikely	≥ 0.15 but < 0.45	<ul style="list-style-type: none"> • Will not occur in the SPP life cycle; or • Development is between the stages of component and/or breadboard validation in a laboratory environment and system/subsystem model or prototype demonstration in a relevant environment; or • $25 \text{ years} < \text{Estimated recurrence interval} \leq 50 \text{ years}$; or • $1 \leq \text{Estimated recurrence frequency} < 2$ (i.e., event expected to recur, but not more than once); or • $0.15 \bullet \text{Probability of single event occurrence} < 0.45$.
Likely	≥ 0.45 but < 0.75	<ul style="list-style-type: none"> • May occur sometime during the life cycle of the SPP; or • Development is between the stage of technology concept and/or application formulation and the stage of analytical and experimental critical function and/or characteristic proof of concept; or • $10 \text{ years} < \text{Estimated recurrence interval} \leq 25 \text{ years}$; or • $2 \leq \text{Estimated recurrence frequency} < 5$ (i.e., event expected to recur from 2 to 4 times); or • $0.45 \bullet \text{Probability of single event occurrence} < 0.75$.
Very Likely	≥ 0.75 but < 1	<ul style="list-style-type: none"> • Very likely to occur sometime during the life cycle of the SPP; or • Only basic principles (or less) are observed and reported; or • Estimated recurrence interval ≤ 10 years; or • Estimated recurrence frequency ≥ 5 (i.e., event expected to recur more than five times); or • $0.75 \leq \text{Probability of single event occurrence} < 1$.

Table 2. Guidelines for Assigning Risk Consequences

Consequence of Occurrence	Criteria
Negligible	<ul style="list-style-type: none"> • Minimal or no consequences. • Negligible impact on program; slight potential for PMP schedule change; compensated by available schedule float. • Cost estimates exceed budget by \leq \$68M (the approximate equivalent cost of extending the overall HLW system lifecycle by $\frac{1}{4}$ of 1 year) • Slip in schedule of \leq 3 months.
Marginal	<ul style="list-style-type: none"> • Moderate threats to program mission; may require minor facility redesign or repair. • Cost estimates exceed budget by $>$ \$68M to $<$ \$270M. • Slip in PMP schedule of $>$3 months to $<$ 1 year.
Significant	<ul style="list-style-type: none"> • Significant threat to program mission; requires some facility redesign or repair. • Cost estimates exceed budget by more than \geq \$270M to $<$ \$540M. • Significant slip in PMP schedule of \geq 1 year to $<$ 2 years.
Critical	<ul style="list-style-type: none"> • Serious threat to program mission; possibly completing only portions of the mission or requiring major facility redesign or rebuilding. • Cost estimates exceed budget by \geq \$540M. • Excessive PMP schedule slip of \geq 2 years.
Crisis	<ul style="list-style-type: none"> • Catastrophic impact to PMP mission completion. • Requires instant response with low chance of success.
<p>Special attention must be given to First-of-a-Kind Risks because they are often associated with project failure. First-of-a-Kind risks should receive a Critical or Crisis consequence estimate unless there is a compelling argument for a lesser consequence value determination.</p> <p>First-of-a-kind risks are those associated with projects or modifications that are unique in their design, purpose, and/or application of technology. Typically, no other similar project or application of the technology in full-scale operation is available from which to obtain historical information with respect to risk.</p> <p>Any one or more of the criteria in the five levels of consequence may apply to a single risk. The consequence level for the risk being evaluated must be based upon the highest level for which a criterion applies.</p>	

Table 3. Risk Matrix - Probabilities vs. Consequences

		RISK LEVEL				
		Low	Moderate	High	High	High
P R O B A B I L I T Y	Very Likely	Low	Moderate	High	High	High
	Likely	Low	Moderate	Moderate	High	High
	Unlikely	Low	Low	Moderate	Moderate	High
	Very Unlikely	Low	Low	Low	Low	High
	Non-Credible	Low	Low	Low	Low	Low
		Negligible	Marginal	Significant	Critical	Crisis
		CONSEQUENCES				

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Table 4. Funding (from HLW-2002-00161)

**PMP Budget Authority in
Escalated Dollars**

Project Title	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13
HL-01 H Tank Farm West	89,611	94,076	96,503	97,215	100,892	104,537	109,695	112,657	115,698	118,822	122,030
HL-04 H Tank Farm East & Sludge Operations	64,203	65,382	69,689	68,530	71,180	73,746	77,085	79,166	81,303	83,499	85,753
HL-01 Total	153,813	159,458	166,191	165,746	172,072	178,282	186,780	191,823	197,002	202,321	207,784
Move Support to Melter Outage											
HL-02 F Tank Farm	68,167	69,394	70,995	72,908	75,142	78,326	73,657	69,085	64,698	66,444	61,594
Move Support to Melter Outage											
HL-03 Waste Removal & Tank Closures											
WR Ops w/ Demo Projects	3,971	9,773	12,265	12,770	13,227	13,721	14,091	14,472	14,862	15,264	15,676
Am/Cm	1,745	-	-	-	-	-	-	-	-	-	-
LI: Salt Tanks Tk 31	1,445	35,421	36,201	59,107	22,724	16,711	17,502	43,772	35,778	14,075	6,446
Low Curie	5,914	4,171	3,692	4,327	4,397	4,474	5,074	5,211	5,352	5,496	5,644
Actinide	5,282	19,088	18,947	20,283	20,645	21,005	21,572	22,155	22,753	23,367	23,998
Salt Alternatives (512-S, Tk 48, etc)	7,439	288	-	-	(0)	(0)	(0)	(0)	(0)	(0)	(0)
LI: Water Wash & Isolation Tks 18, 19	5,893	2,772	-	-	22,130	11,964	15,392	-	31,802	45,055	19,006
WR: Tank Closure Tks 18, 19	5,288	13,051	4,357	8,396	9,202	26,758	20,861	32,121	790	68,953	89,283
HL-03 Total	36,977	84,564	75,461	104,883	92,325	94,633	94,492	117,730	111,336	172,209	160,053
HL-12 LI: Waste Removal											
LI: WR from Sludge Tanks Tk 11	13,805	42,725	58,234	34,421	29,842	27,827	34,892	35,512	30,269	28,083	18,582
LI: Infrastructure Upgrades	9,338	15,458	12,139	14,577	5,605	18,671	32,344	33,217	35,979	26,393	28,552
LI: Acid Front End	-	-	-	-	-	-	23,754	27,255	27,728	-	-
LI: Acid Evap & Space Management Tk 18, 37	-	-	-	-	-	0	-	-	-	-	-
LI: Piping, Evaps & Infrastructure	-	-	-	-	-	-	-	-	-	-	-
HL-12 Total	23,143	58,183	70,373	48,998	35,447	46,498	90,990	95,985	93,976	54,476	47,133
									205,313		
HL-11 LI: Tk Fm Services Upgrade II	571	-	-	-	-	-	-	-	-	-	-
HL-05 Vitrification	127,918	124,487	132,768	137,360	136,924	145,613	152,360	157,690	156,036	163,778	171,262
Melter Outage											
HL-06 Glass Waste Storage	5,451	48,122	39,608	1,399	5,249	19,057	19,580	6,653	1,908	1,960	2,265
HL-13 Salt Disposition											
Salt EPC Support	2,000	3,600	2,100	2,100	2,201	18,200	61,822	63,486	64,976	66,730	68,532
LI: Salt Alternative	28,000	58,400	107,900	107,900	107,799	91,800	-	-	-	-	-
HL-13 Total	30,000	62,000	110,000	110,000	110,000	110,000	61,822	63,486	64,976	66,730	68,532
FA-24 Facility Decontamination/Decommissioning	-	-	-	-	-	-	-	-	-	-	-
HLW TOTAL	446,040	606,209	665,397	641,294	627,159	672,409	679,681	702,451	689,933	727,919	718,623
HLW w/o Salt Total	416,040	544,209	555,397	531,294	517,159	562,409	617,859	638,965	624,957	661,189	650,091
6,340	417,349	544,212	555,404	531,266	517,172	562,272					
	6,911										
	(1,309)	(3)	(7)	28	(13)	137					
Solid Waste Facilities											
ETF	16,735	18,708	20,677	22,431	23,404	23,575	18,687	19,568	19,710	22,195	27,090
SS	13,101	23,437	24,462	26,382	25,030	28,853	36,079	34,249	34,718	45,332	49,123
SW TOTAL	29,835	42,146	45,139	48,813	48,433	52,428	54,766	53,818	54,428	67,528	76,213
Life Cycle Cost	475,876	648,354	710,536	690,107	675,592	724,837	734,447	756,268	744,361	795,447	794,836

On July 3, 2003, parts of DOE Order 435.1 dealing with the authority for determining waste incidental to reprocessing were declared invalid by the U.S. District Court for the District of Idaho in the case of Natural Resources Defense Council v. DOE, Case No. 01-413-S-BLW. The District Court's ruling is currently on appeal to the U.S. Court of Appeals for the Ninth Circuit. Accordingly, it is not appropriate to address these types of probabilities or consequences, nor to undertake a probability or consequence analysis of the litigation's outcome in this document at this time.

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Table 4. Funding (from HLW-2002-00161) - continued

PMP Budget Authority in Escalated Dollars

Project Title	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	IBS BA	
											Cumulative FY03-End	FY03-End
HL-01 H Tank Farm West	112,793	105,812	97,802	100,443	-	-	-	-	-	-	-	1,578,586
HL-04 H Tank Farm East & Sludge Operat	88,068	90,446	92,888	95,396	97,972	50,309	-	-	-	-	-	1,334,615
HL-01 Total	200,861	196,258	190,691	195,839	97,972	50,309	-	-	-	-	-	2,913,201
Move Support to Melter Outage												
HL-02 F Tank Farm	57,762	-	-	-	-	-	-	-	-	-	-	828,172
Move Support to Melter Outage												
HL-03 Waste Removal & Tank Closures												
WR Ops w/ Demo Projects	16,099	8,267	8,490	8,719	8,955	-	-	-	-	-	-	190,621
Am/Cm												1,745
LI: Salt Tanks	14,353	4,057	-	-	-	-	-	-	-	-	-	307,592
Low Curie	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	53,751
Actinide	24,646	25,312	25,995	26,697	-	-	-	-	-	-	-	321,746
Salt Alternatives (512-S, Tk 48, etc)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	7,725
LI: Water Wash & Isolation	27,547	2,161	21,355	25,230	26,532	3,170	-	-	-	-	-	260,007
WR: Tank Closure	77,964	60,699	42,823	66,359	90,147	89,823	18,088	-	-	-	-	724,963
HL-03 Total	160,609	100,496	98,662	127,005	125,634	92,993	18,088	(0)	-	-	(0)	1,868,149
HL-12 LI: Waste Removal												
LI: WR from Sludge Tanks	3,849	-	-	-	-	-	-	-	-	-	-	358,041
LI: Infrastructure Upgrades	29,322	28,589	-	-	-	-	-	-	-	-	-	290,186
LI: Acid Front End	-	-	-	-	-	-	-	-	-	-	-	78,737
LI: Acid Evap & Space Management	-	-	-	-	-	-	-	-	-	-	-	0
LI: Piping, Evaps & Infrastructure	-	-	-	-	-	-	-	-	-	-	-	-
HL-12 Total	33,171	28,589	-	-	-	-	-	-	-	-	-	726,964
HL-11 LI: Tk Fm Services Upgrade II	-	-	-	-	-	-	-	-	-	-	-	571
HL-05 Vitrification	168,339	177,466	184,640	188,211	181,927	92,494	-	-	-	-	-	2,599,274
Melter Outage												
HL-06 Glass Waste Storage	2,326	2,388	2,453	2,519	2,587	2,657	2,729	(0)	-	-	-	168,912
HL-13 Salt Disposition												
Salt EPC Support	70,383	72,283	74,235	76,239	78,297	40,206	-	-	-	-	-	767,389
LI: Salt Alternative	-	-	-	-	-	-	-	-	-	-	-	501,800
HL-13 Total	70,383	72,283	74,235	76,239	78,297	40,206	-	-	-	-	-	1,269,189
FA-24 Facility Decontamination/Decommissi	-	-	-	7,501	-	94,284	111,972	-	-	-	-	213,757
HLW TOTAL	693,451	577,481	550,681	597,313	486,417	372,942	132,789	(0)	-	-	-	10,588,189
HLW w/o Salt Total	623,069	505,198	476,446	521,074	408,120	332,736	132,789	(0)	-	-	-	9,319,000
	6,340											
Solid Waste Facilities												
ETF	22,201	22,477	25,624	23,126	23,751	12,196	-	-	-	-	-	362,155
SS	41,433	49,034	44,012	26,329	26,636	14,154	-	-	-	-	-	542,364
SW TOTAL	63,634	71,511	69,636	49,455	50,387	26,350	-	-	-	-	-	904,519
Life Cycle Cost	757,086	648,993	620,317	646,768	536,804	399,292	132,789	(0)	-	-	-	11,492,708

On July 3, 2003, parts of DOE Order 435.1 dealing with the authority for determining waste incidental to reprocessing were declared invalid by the U.S. District Court for the District of Idaho in the case of Natural Resources Defense Council v. DOE, Case No. 01-413-S-BLW. The District Court's ruling is currently on appeal to the U.S. Court of Appeals for the Ninth Circuit. Accordingly, it is not appropriate to address these types of probabilities or consequences, nor to undertake a probability or consequence analysis of the litigation's outcome in this document at this time.

3.0 RESULTS OF THE ANALYSIS

3.1 IDENTIFIED RISKS

The Risk Assessment Team identified 28 risks, including seven (7) **High**, six (6) **Moderate**, fourteen (14) **Low** risks, and one (1) **Uncertain** risk.

These risks are described below and summarized in Appendix B.

Each of these risks was identified and evaluated with consideration of the following assumptions:

- The schedule and cost baseline is that as represented by the PMP Supplement to Rev. 13 of the HLW System Plan.
- Any risk that creates an impact at the upstream side of the HLW system also affects the downstream process or facility, (e.g., throughput limitations at SWPF would delay closure of Saltstone and DWPF) with the additional costs for continuing operation beyond the target closure date for those two facilities to be included as part of the cost of the unmitigated risk.
- Much of the science and technology on which the aggressive production rates proposed by the PMP Supplement are based is still under development: e.g., determination of the rate and efficiency at which Cesium rich interstitial supernate can be drained out of the solid salt in the waste tanks; the rate and concentration levels at which the remaining solid low curie salt can be dissolved; the method by which the actinide removal rate will be improved to the 6 gpm target; etc.

3.1.1 LCS-002 Cesium or Actinides Exceed LCS Limits

This risk represents the possibility that the low curie salt solutions which are produced by dissolving the drained salt cake will still be too rich in Cesium concentration to meet the limits for disposal in Saltstone for at least 1M gallons of saltcake. This is a **High** risk as a result of having a likely probability, and a critical consequence based on a worst-case schedule impact of 3 years.

The current plan assumes that our understanding of the physical and chemical characteristics of the salt is adequate to be able to design a process to drain off high curie interstitial liquid before the salt is dissolved. Currently, it is assumed that the interstitial liquid consists mostly of residual supernate containing the majority of the Cesium. This Cesium bearing liquid is trapped in microscopic-sized spaces between the surfaces of adjacent salt crystals, representing 20% or more of the volume appearing to be solid salt. If efforts to drain this interstitial liquid does not reduce the level of residual radioactivity in the salt to allow disposal in Saltstone, the PMP schedule will not be met and cost savings will not be achieved. If additional processing (e.g., adding DWPF recycle to flush more Cesium out of the salt bed followed by additional draining) is required, then some cost savings may still be achieved, but savings will be less than projected in the PMP Supplement by an amount yet-to-be determined.

The risk handling strategy approach is to avoid this risk by implementing a more comprehensive waste sampling and characterization for saltcake, and implementing the best solution to come from analyzing the potential of blending with recycle, adding additional capacity to the design of SWPF, and investigating alternatives to provide improved cesium removal capacity and/or interstitial liquid removal for near term application to low curie salt processing.

3.1.2 SPP-00-003 Environmental Permitting

This risk represents the possibility that the South Carolina Department of Health and Environmental Control (SC DHEC) will not approve regulatory permits as a result of stakeholder objections to the new facilities or revised operating limits.

Any potential delays due to Federal court litigation in Idaho, appeal filed, concerning the WIR provisions of DOE Order 435.1, are not directly included as part of this risk, although by its terms the Idaho decision affects activities at SRS and the SC DHEC has suspended action on permits pending resolution of the legal questions. This is a **Low** risk as a result of having a very unlikely probability, with a significant consequence based on a \$270 million worst case cost impact, and a worst-case schedule impact of 1 year.

Three major permitting actions for key facilities (Saltstone, ARP, and SWPF) are necessary to implement the Program. The program baseline assumes general stakeholder and regulator support with no time-delay roadblocks. Failure to receive permits in a timely fashion delays the program. In the worst case (assumed to be 1-year delay in SWPF permit issuance), the schedule objectives for the PMP cannot be realized and additional HLW system life cycle costs will be incurred.

The risk-handling strategy is to implement a comprehensive communications strategy for the Program, which is ongoing and included in the current budget. This includes the effort to educate and inform the public through the Citizens Advisory Board and related committee meetings.

3.1.3 LCS-00-005, Cesium Exceeds 0.1 Ci/gal and/or Actinides Exceed 99nCi/g

This risk represents the possibility that the low curie salt solutions produced by dissolving the drained salt cake will contain too much residual Cesium or actinides and not meet the Saltstone limits of 0.1 Ci/gal Cs and 99 nCi/g actinides. This is a **Low** risk, although having a very unlikely probability, but with a negligible consequence based on a \$25 million worst case cost impact with no overall HLW system lifecycle schedule impact expected. This risk is accepted.

Because of the increase in radiation levels which would complicate operations and maintenance activities, this would cause a delay in LCS operations at Saltstone until modifications for 0.378 Ci/gal salt solution are complete in October 2004. If actinide levels were greater than 99 nCi/g, the material would have to be processed through ARP first. Saltstone capacity is available in the later years of the program (after 2014) which provides an opportunity to make up the LCS production. If ARP processing was required for LCS with actinide levels greater than 99nCi/g, it could require one additional year of processing at ARP (at \$25 million/yr).

3.1.4 SPP-00-006 Regulators and/or Stakeholder Concerns – WIR

This risk represents potential delays which may result due to Federal court litigation in Idaho, appeal filed, concerning the WIR provisions of DOE Order 435.1. Those risks will exist until the legal uncertainty is resolved.

On July 3, 2003, parts of DOE Order 435.1 dealing with the authority for determining waste incidental to reprocessing were declared invalid by the U.S. District Court for the District of Idaho in the case of Natural Resources Defense Council v. DOE, Case No. 01-413-S-BLW. The District Court's ruling is currently on appeal to the U.S. Court of Appeals for the Ninth Circuit. Accordingly, it is not appropriate to address these types of probabilities or consequences, nor to undertake a probability or consequence analysis of the litigation's outcome in this document at this time.

3.1.5 ARP-00-008 Recovery of Tank 48 as a Feed Tank for ARP is Delayed

This risk represents the potential impact of not having Tank 48 returned to HLW use as a feed tank for ARP prior to October 2006. This could result because of delays in the final disposition of the organic residual wastes remaining in Tank 48. These organic wastes are a result of research and operations to support previous salt waste processing efforts between 1985 and 1998. This is a **Moderate** risk, with a likely probability, and a marginal consequence resulting from a worst case cost impact of \$150 million with no schedule impact expected.

The PMP schedule requires that tank 48 be recovered for use as the feed tank for the ARP before the need date for the 241-96H Facility (October 2006). Tank 48 currently contains organic residual wastes that preclude its use for receipt of other waste material. If Tank 48 is not available as a Feed Tank for ARP on October 2006, a schedule slip of up to 2 years for the ARP occurs, which uses up 2 years of float in the ARP program schedule (at \$25M/yr), subsequently slowing down tank closure in F Tank Farm for 2 years (at \$50M/yr).

The risk handling approach is to avoid this risk. An ongoing R&D effort is underway to identify and demonstrate an effective method to treat the organic wastes and ensure that Tank 48 will be made available for use at the necessary point in the schedule.

3.1.6 ARP-00-009 Reassignment of Tank 49 as Initial Feed Tank for 512-S ARP

This risk represents the possibility that Tank 49 will not be available as a feed tank for the ARP by the required date of April 2004 as a result of tank space management issues in the

balance of the tank farm. This is a **Low** risk, with a likely probability, and a negligible worst-case, unmitigated cost impact of \$13 million. No schedule impact is predicted.

Tank 49 currently holds concentrated supernate and saltcake heel. The PMP assumes the reassignment of Tank 49 from its existing HLW storage function by April 2004 for use as the initial feed tank for the 512-S ARP. Delays in this reassignment would delay startup of the 512-S ARP. Tank Farm space management may be affected by an evaporator problem. Space for the current contents of Tank 49 must be made available in the tank farm through evaporation. Evaporator problems have been experienced recently. Integration of complex, multiple transfers of material is required to gain space.

The risk handling approach is to reduce this risk by developing an integrated transfer and evaporator plan to support Tank 49 reassignment as the ARP feed tank. A schedule slip of up to 6 months could occur in the ARP program schedule (at \$25M/yr). This is based on the assumption that emergent evaporator operational issues or transfer priority issues can be resolved within 6 months.

3.1.7 ARP-00-010 Delays to 241-96H Actinide Removal Process Startup

This risk represents the possibility that, as a result of resource conflicts with other projects, actinide removal capacity necessary to process the Low Curie, High Actinide volume of waste (assumed to be approximately one-third of the total salt waste volume) will not be achieved according to the schedule proposed in the PMP. This is a **Low** risk with a likely probability and a negligible consequence resulting from a \$38 million worst case cost impact (unmitigated) associated with a six-month delay.

The actinide removal capability in the modified 512-S facility is limited to approximately 1 gpm by the capacity of the available vessel volume and cycle time required for effective sorption of actinides using MST. The PMP target requires that the total actinide removal process capabilities of the 512-S and the 241-96H facilities provide a throughput of 3 gpm beginning in October 2006. In order to achieve the 3 gpm capacity, the SPP proposes to modify the Filter-Stripper Building (241-96H) components and beneficially reuse this existing facility to provide additional vessel volume for the sorption of actinides, which will then be sent to the 512-S facility for further processing.

The Risk Handling Strategy is to reduce this risk by obtaining resources to start design of the 241-96H facility early, and to accelerate the 512-S startup. A schedule slip of up to 6 months uses up 6 months of float in the ARP program schedule (at \$25M/yr), subsequently slowing down tank closure in F Tank Farm for 6 months (at \$50M/yr).

3.1.8 ARP-00-011 ARP Capacity Ramp-Up to 6 gpm Not Successful

This risk represents the possibility that the actinide removal capacity (6 gpm) required to meet the PMP objectives may not be achieved as a result of delays in the anticipated development of more effective filtration technology and/or chemical engineering process improvements. This is a **Moderate** risk with an unlikely probability but a critical consequence, based on a worst case cost impact of \$810 million resulting from a 3-year schedule delay in the processing of waste to remove actinides.

The PMP assumes ramping up ARP capacity from 3 gpm (refer also to ARP-00-010) to 6 gpm (in April 2007). The improvement to 6 gpm throughput capacity is based on both the need for increased throughput in vessel volume for sorption by MST (refer also to ARP-00-010) in conjunction with improvements in the mechanical and/or chemical engineering process associated with the removal of the actinides from the waste (i.e., installation of improved filtration technology from the current cross-flow filter utilized in Bldg. 512-S).

If the ARP capacity does not increase to 6 gpm, 3 gpm would be the maximum throughput. This would double the ARP lifecycle from April 2007, potentially extending the overall HLW program by 11 years. However, in the PMP, ARP is not fully loaded in its latter years. Also, in FY2019, it would be possible to run waste through SWPF. Fully loading the ARP in the latter years and utilization of SWPF actinide removal capabilities reduce the program impact to a net of 3 years.

This improved technology may not be available to support the required April 2007 capacity increase. A rotary micro-filter is available which is likely to be appropriate to this use. Although results to date have been promising, R&D on the filter is not complete. The filter is at the prototype demonstration stage in a laboratory environment using real waste.

3.1.9 ARP-00-012, Equipment Not Available for 241-96H ARP Process

This risk represents the possibility that the 3 gpm actinide removal capacity required to meet the PMP objectives may not be achieved as a result of delays in the acquisition of equipment, e.g., tanks, currently available as spares (but originally obtained for other facilities). This is a **Low** risk with an unlikely probability and a negligible consequence, resulting from a \$38 million worst case cost impact and no overall HLW system schedule impact.

Equipment (primarily process vessels) to be used in 241-96H ARP is assumed to be acquired from the Tank Farms and/or DWPF spares. If major equipment failures in the Tank Farm or DWPF require the use of spares earmarked for 241-96H ARP, startup of that facility will be delayed, and the increase in ARP throughput not achieved. Worst case is based on the 18-month delay in 241-96H startup that could result while waiting for a new process vessel to be manufactured and delivered. This consumes ARP float, but does not impact overall SPP completion.

The risk handling strategy is to avoid this risk, by procuring spares at the initiation of the 2½ year long 241-96H ARP project. The use of common spares among four salt processing facilities provides enhanced resource management.

3.1.10 ARP-00-016 Actinide and Strontium Concentration High or Low MST DF

This risk represents the possibility that the 6 gpm actinide removal capacity required to meet the PMP objectives may not be achieved because the chemical process that forms the basis of the actinide removal capability of the ARP may not remove actinides with the efficiency forecast based on lab scale testing with small volumes of real waste from a few select tanks. This is a **Moderate** risk with a very likely probability and a marginal consequence resulting from a worst case cost impact estimated at \$150 million, but no overall HLW system schedule impact.

The ARP is based on having an MST decontamination factor (DF) of 6 to 12 in order to meet the Saltstone WAC. The potential exists that the actual decontamination factor (DF) of the ARP is less than that anticipated and that actual waste concentrations result in a need for additional ARP processing. Actinides are not well characterized in the saltcake. Therefore dissolved salt may contain actinide levels higher than currently expected. It was estimated that an ARP schedule slip of up to 2 years could occur and thus use 2 years of float (due to longer processing times required) in the ARP program schedule (at \$25M/yr), also delaying tank closure in F Tank Farm for 2 years (at \$50M/yr).

The risk handling strategy is to mitigate this risk by: 1) exploring the potential for sending higher activity concentrations to Saltstone, and 2) verifying strontium and actinide removal decontamination factors for ARP feed composition through R&D. The projected actinide concentrations for the waste in two tanks are already near the regulatory limits for Class C waste, limiting the potential of that alternative. R&D to validate decontamination factors is ongoing. This risk will remain **Moderate**.

3.1.11 ARP-00-018 241-96H ARP Funding Strategy

This risk represents the possibility that the modifications to the existing Filter-Stripper building, 241-96H, to improve the actinide removal capacity to 3 gpm will not be achieved as a result of delayed action on facility modifications not initiated because of the competition for funding with other Salt Processing Program projects or initiatives. This is a **Low** risk, with a probability of very unlikely and a marginal consequence resulting from a worst case cost impact of \$150 million (unmitigated), but no overall HLW system closure impact.

ARP plans currently assume that 241-96H modifications will be implemented using operating funds. If this funding source is unacceptable, waiting for line item project funding will delay modifications at 241-96H.

This risk is accepted, as the two-year delay is within the float of the project. A schedule slip of up to 2 years for ARP occurs which uses up 2 years of float (due to longer processing times required) in the ARP program schedule (at \$25M/yr), also delaying tank closure in F Tank Farm for 2 years (at \$50M/yr).

3.1.12 SPP-00-021 Funding Competition Impacts SPP

This risk represents the possibility that the SPP objectives may not be achieved as a result of the competition for funding with other DOE-SR projects or initiatives. Delayed action on facility modifications and/or research to develop required process improvements (e.g., increase in ARP throughput from 3 to 6 gpm) will result in delayed closure of overall HLW system. This is considered a **High** risk, based on a very high probability and a critical consequence resulting from the conclusion that this would be an unquantified “serious threat to program mission.”

The PMP schedule is based on having the funding available for implementing the operations, projects, and initiatives at the time and in the sequence specified. Funding may not be available due to funding competition among many projects within the high level waste program over a long period. Further, funding authorization may not be obtained when required. Either of these cases results in delay to the program.

The risk handling strategy is to mitigate by: 1) requesting funding to support the program, and 2) participating in site budget prioritization, planning, and change control.

3.1.13 FM-00-022 Unavailability of Low Activity Feed for ARP

This risk represents the possibility that the 512-S ARP will be delayed due to the lack of feed caused by delays in tank closure activities in F Tank Farm. This is a **Moderate** risk, with a very likely probability and a marginal consequence, resulting from a worst-case unmitigated cost impact of \$75 million.

The PMP assumes that salt solution is available in Tank 49 as feed for transfer to ARP by July 2004. Tank 7 is required for transfers of sludge and salt from F Tank Farm to Tank 49. If schedule conflicts in priorities for use of Tank 7 are not resolved, these may prevent or interrupt the transfer of salt solution from F Tank farm to the feed tank for ARP. If operation of 512-S ARP is delayed due to lack of feed, and/or sustained feed is not available this could result in a one-year delay to the program. This uses up one year of float in the ARP program schedule (at \$25 million/yr), subsequently slowing down tank closure in F Tank Farm for one year (at \$50 million/yr).

The risk handling approach is to avoid this risk by modifying the HLW transfer plan to resolve priority conflicts. This planning is an element of ongoing program management and should not have a schedule impact.

3.1.14 SS-00-024 Saltstone Vault Unavailability

This risk represents the possibility that the Saltstone facility will not have the vault capacity required to receive low-curie salt grout at the rate planned in the PMP Supplement. This would result if Saltstone vault construction were delayed due to funding issues in FY2003. This is a **Low** risk, with a very unlikely probability and a marginal consequence, resulting from a worst case cost impact of \$135 million with a related 6-month extension in the overall HLW system lifecycle.

The SPP plan identifies the need for 8 additional saltstone vaults, the first of which must be available in 2006. A two-year period is required to provide a vault. This facility is in the budget request for FY04. A related request has been made that future funding for vault construction to be made with operating funds rather than project funds. If funding for the design of the vaults were not provided in FY03, processing would be delayed for at least 6 months while emergency reprogramming is pursued.

This risk is accepted. These modifications are in the FY04 proposed budget and approval for permission to allow future funding for these to be made from the operations budget is expected.

3.1.15 SS-00-025 Saltstone Modifications not Complete for 0.1 Ci/gal LCS

This risk represents the possibility that the modifications to the SPF to allow processing of low curie salt (LCS) with a maximum of .1 Ci/gal Cs will not be achieved as a result of delays in the completion of cleanout work on Tank 50. Modifications at SPF cannot be initiated until the removal and processing of solid material found in Tank 50 are completed.

This is a **Low** risk with a very likely probability but negligible consequence resulting from a worst case cost impact of \$45 million with a related HLW system schedule impact of 2 months.

In the past year, unidentified solids were observed on the bottom of Tank 50 as fluid levels dropped and legacy salt solution was processed to the SPF. Processing was halted while efforts were underway to analyze the condition for impact on safety, and determine a method to remove the solids. The effort to restore Tank 50 to service is underway concurrent with modifications to the SPF. Physical plant modifications required at SPF to accommodate 0.1 Ci/gal processing are funded and are scheduled to be complete by September 2003.

The risk handling strategy is to avoid this risk by optimizing the schedule for implementing the required modifications. Currently, the Tank 50 work is on schedule to complete in late September 2003.

3.1.16 SS-00-027 Saltstone Modifications not Complete for 0.378 Ci/gal LCS

This risk represents the possibility that the modifications to the Saltstone Processing Facility to allow processing of low curie salt with the maximum of .378 Ci/gal Cs concentration will not be achieved as required by October 2004 to meet the schedule requirements of the PMP Supplement. This is a **Low** risk with an unlikely probability and a negligible consequence resulting from a worst case cost impact of \$68 million and a related HLW system schedule impact of 2 months. Given the eighteen months allowed for the design and physical plant modifications, it may be possible to recover these two months. This risk assumes that the modifications to Saltstone for 0.1 Ci/gal operation are completed on schedule.

Modifications in addition to those required for 0.1 Ci/gal operation (see also SS-00-025) are required to reduce radiation exposure levels to operations and maintenance personnel when processing waste at the 0.378 Ci/gal concentration. These are necessary because the original Saltstone Processing Facility was not designed to operate with the concentration of Cs required to implement the PMP strategy.

This risk is accepted. Part of the modifications to Saltstone Facility for 0.378 Ci/gal operation (i.e., shielding, equipment qualification to withstand higher radiation, etc.) will be completed when required modifications are performed to Saltstone Facility for operation of 0.1 Ci/gal Cs concentration.

3.1.17 SPP-00-039 Equipment Failure Halts SPP Processing

This risk represents the possibility that the 75% attainment required for the HLW system to meet the planned processing schedule of the PMP supplement will not be achieved as a result of the cumulative impact of unscheduled outages resulting at each of the facilities in the process. This is a **High** risk, with a likely probability and a critical consequence of a worst case cost impact of \$540 million with a related 2-year HLW system lifecycle extension.

The PMP assumes 75% attainment for the individual facilities associated with the salt processing program and up to 75% attainment for the total system. Without improvement in the attainment performance of the individual facilities in the HLW system (including the new projects and initiatives to create increased throughput capacity), the 75% attainment rate cannot be met. The worst case impact is based on the infant mortality of a newly installed melter at DWPF without a spare backup, requiring up to 18 months for procurement and an additional 4 months for replacement.

The risk handling approach is to mitigate this risk by including ARP and SWPF in the integrated outage planning for the HLW system; identifying and procuring critical spare parts; and performing an integrated SPP attainment study with a focus on defining inter-facility needs. This risk will remain **High**.

3.1.18 SPP-00-043 Material and Chemical Balances Not Accommodated for the DWPF Interfaces

This risk represents the possibility that waste will not be processed to meet the schedule forecast in the PMP because of emergent process engineering issues resulting from differences in the predicted chemistry and characterization of the waste versus the actual chemistry of the waste and dissolved salt solution as it is discovered to be during future operations. The impact of this risk is evaluated to be a serious threat to the DWPF mission. This is a **High** risk with a very likely probability, with a critical consequence resulting from the Team's judgement that this risk is a significant threat to the program mission, and that should it occur, would result in SPP possibly completing only portions of the mission or requiring major facility redesign or rebuilding.

The PMP assumes that the concentrated cesium and actinide streams from SWPF and ARP are processed into glass by DWPF. However, the material and chemical balances are not yet fully developed for the DWPF interfaces with SWPF and ARP. Rheological and other fluid and mechanical properties of MST-bearing waste may result in process upsets (e.g., melt rate, pour rates) and reduced DWPF attainment. Reduced attainment of DWPF would result in extension of the Salt Program. A material balance flowsheet for the entire program has not been developed at this time.

The risk handling approach is to avoid this risk by 1) developing an integrated HLW system material balance flowsheet for salt processing, which includes DWPF; 2) evaluating the flowsheet for impact on the system plan; and 3) making appropriate design adjustments and/or glass formulation adjustments to accommodate the requirements of the new flowsheet. Note that there are constraints on changes which can be made to glass formulation because of the qualification of the waste form.

3.1.19 SWPF00-044 SWPF Potassium Impact to Solvent Extraction

This risk represents the possibility that performance requirements at SWPF cannot be met due to high potassium feed impacting Cs removal by solvent extraction. This would require additional processing, e.g., requiring recycling through the SWPF one or more times, or additional blending, which would increase the Cs removal cycle time, delay feed to DWPF, possibly extending the HLW life cycle. This is a **Low** risk with a very likely probability but a negligible consequence resulting from a worst case cost impact of \$68 million and a related overall HLW schedule extension of 3 months.

The PMP assumes that feed to SWPF can be processed in one pass to remove Cs to specified limits. It is judged that less than 10% of SWPF feed batches will have concentrations of potassium and cesium that are above what has been demonstrated for once through SWPF processing in laboratory testing. These potential high concentrations will be overcome through process optimization and/or a combination of molarity adjustments and blending. Less than 20% of the high potassium batches (approximately 2% of total SWPF feed volume) may have to be recycled through solvent extraction to meet minimum Cs removal requirements. Development of an integrated HLW system material balance flowsheet for salt processing will help to address this issue (see also SPP-00-043).

This risk is accepted. The total fraction of potential problem feed is low. The worst-case cost of the impact of the residual risk is low compared to the total SPP budget. SWPF is still in conceptual design, and ongoing technology development is in progress that provides a potential for eliminating this risk before SWPF becomes operational.

3.1.20 SPP-00-045 Chemical Constituents Exceed Saltstone WAC

This risk represents the possibility that the Waste Acceptance Criteria (WAC) at Saltstone will not be met because of high potassium, nitrates, or other chemical constituents. Other risks associated with radiological content are documented in SPP-00-25 and SPP-00-27. This is a **Low** risk with a very likely probability but a negligible consequence resulting from a worst case cost impact of \$200,000.

A material balance flowsheet integrating all HLW operations and SPP life cycles at the appropriate level of detail has not been developed at this time. The present material balance indicates that the current WAC at Saltstone cannot be met for specific tanks due to high potassium, nitrates, and other chemical constituents that would be present in the DSS.

The risk handling approach is to avoid this risk by including Saltstone in the integrated HLW system material balance flow sheet for salt processing (see also SPP-00-043), by testing grout formulations and, if required, revising grout formulations and/or the saltstone WAC.

3.1.21 SWPF-00-046 High Feed Cesium and Actinide Concentrations to SWPF

This risk represents the possibility that the SPWF cycle time will be longer than currently forecast because of the time required for decontaminating the salt solution. This is a **High** risk with a very likely probability and a critical consequence resulting from a worst case cost impact greater than \$640 million and a related overall HLW schedule impact of 2 or more years. Additional capital costs may be incurred in further optimizing the SWPF actinide or Cs removal capability.

The PMP processing schedule is based on feed concentrations that can be processed through SWPF and meet the Saltstone WAC. Based on the current level of knowledge of waste characterization, it is predicted that some of the high curie waste streams to be provided to SWPF will exceed the Cs and actinide concentrations that can be processed efficiently and still meet the current Saltstone WAC (Class A actinide and cesium limits) as specified in the EPC contracts. These waste volumes would require additional processing time at SWPF for actinide removal (possibly requiring higher MST concentrations) and/or re-cycling the waste for additional Cs removal.

The risk handling approach is to avoid this risk by 1) verifying strontium and actinide concentrations in SWPF feed tanks; 2) establishing an integrated SWPF feed strategy as input to the HLW system material balance flowsheet; 3) verifying strontium and actinide removal DF values for SWPF feed compositions through additional technology development effort; and 4) optimizing SWPF design to maximize actinide removal capability. In FY03, a sampling program has been funded and is ongoing, which will better define the strontium and actinide concentrations in anticipated high curie waste feed.

3.1.22 SPP-00-048 MST Loading Impacts Ti Loading in DWPF Glass

This risk represents the possibility that some future batches of waste would require quantities of MST for actinide removal that would create a sludge that exceeds the Titanium Dioxide (TiO_2) limits of the waste acceptance criteria (WAC) for making glass at DWPF. This is a **High** risk with a very likely probability and a significant consequence resulting from a worst case cost impact of \$500 million for the cost of production and final disposition of an additional 230 canisters of vitrified waste.

The DWPF WAC limits were established to ensure that criteria for glass formulation are met. MST concentrations used at SWPF and/or ARP could result in TiO_2 concentrations in excess of DWPF WAC limits if actinide concentrations in SWPF feed are sufficiently high. Higher TiO_2 concentration will result in increased canister production if the anticipated TiO_2 concentrations cannot be shown to be acceptable. Information available today indicates that the TiO_2 concentration for some batches may exceed the DWPF WAC limits. An additional 230 canisters (rate per year) would be produced at a cost of \$500k for canister production cost, with an associated \$500k cost for canister disposition/repository, for each canister, and the HLW lifecycle would be extended by one year (at \$270 million).

The risk handling approach for this risk is to avoid it by taking action now to possibly enable a higher limit for titanium in the glass and exploring alternative actinide removal agents that could eliminate the need for MST, before the design is complete. Ongoing research is funded for FY03 (refer to Appendix B, Risk Summary Table, Remarks) to contribute to these risk handling strategies, as well as a contractual requirement for the EPC vendors to optimize the process capabilities of the SWPF.

3.1.23 SWPF-00-050 Rogue Constituents in SWPF Feed

This risk represents the possibility that a currently unidentified chemical constituent in the waste (e.g., some process component or constituent currently trapped in the interstitial volume of salt) could negatively impact the efficiency (or viability) of the CSSX process. This is a **Low** risk with a very unlikely probability and a marginal impact resulting from a worst case cost impact of \$135 million and related overall HLW system schedule impact of six months.

The CSSX process has been demonstrated through real waste laboratory testing and analysis using the known and expected worst-case waste constituents. In addition, salt waste supernates have been thoroughly characterized based upon process history, samples taken specifically for Salt Program technology development, and other samples taken to support operations over the past 40 years. Some eight to ten tanks have been tested for Cs batch distribution using the optimized solvent composition coefficients and found to be acceptable, and several lab scale CSSX process system tests using real waste have been conducted. Based on CSSX testing and waste characterization, the potential for rogue constituents significantly affecting SWPF persists. There is a possible six-month delay resulting from additional time needed to reprocess or blend feed if a small number of batches is found to contain rogue constituents.

The risk handling approach is to reduce this risk by creating an interface control agreement addressing feed management and verifying waste treatability by sampling and analysis of feed staged for SWPF.

3.1.24 SWPF-00-051 Requirements and Standards Change

This risk represents the possibility that Federal, State, and/or local standards to which the existing HLW system the other required projects and initiatives are designed and built, will change (after the start of design and before hot operations) in a way which will impose different and/or more stringent requirements. This is a **Moderate** risk with an unlikely possibility but a significant consequence resulting from a worst case cost impact of \$415 million and related impact on the overall HLW system schedule of 18 months (at \$270/year).

A change in standards prior to the startup of the SWPF would cause delays while changes are made to the existing specifications and design documents, delaying the acquisition of critical, long lead-time component parts. Depending on the timing, rework may be required. The estimated impact on the SWPF is a 9-month delay to final design, 9-month delay to construction, which could extend the HLW lifecycle by 18 months (at \$270 million/yr).

Additional overhead costs would be incurred as a result of the changes required to related operations support, including procedures, training, safety analysis, etc., depending on the time and scope of the changes.

Given that these changes would be driven by changes federal, state, or local standards, this risk is accepted.

3.1.25 SWPF-00-052 Failed Equipment and Organic Waste Disposition

This risk represents the possibility that delays will occur in identification of a final disposition path for failed large, highly contaminated equipment which cannot be decontaminated (e.g., cross-flow filters) and/or organic waste from SWPF. This is a **Low** risk, with a very unlikely probability and a negligible consequence that is not quantified.

It is assumed by the PMP that a disposal path for failed equipment and organic waste will exist; however, no disposal path has yet been identified for organic waste. The project is still in the conceptual design stage and will be developing a method to deal with this material. This is considered a project issue, but it would be a major impact if this issue does not allow the solvent extraction process to move forward. This will require major programmatic changes if this risk is realized.

The risk handling approach is to accept this risk.

3.1.26 SWPF-00-055 High-Curie Salt Treatment Capacity and Schedule Exceeded

This risk represents the possibility that the SWPF will not have adequate throughput capacity to meet the objectives of the PMP. Given the criteria specified in the EPC contracts for design of the SWPF (1.2 million gal/yr design target versus 2.8 million gal/yr required for the PMP), this will occur unless action is taken to modify the contract specifications to which the EPC contractors are currently working. This is a **High** risk with a very likely probability and a crisis consequence resulting from the potential lifecycle extension beyond the PMP target date. This would result in added cost to the program of more than \$6.1 billion, with a related lifecycle extension of more than 10 years.

The design baseline for the SWPF conceptual design is a process capability of 1.2 million gal/yr of high curie salt solution. The PMP assumes an SWPF throughput of 2.8 million gal/year and the assumed startup date is one year earlier in the PMP than specified in the DOE Project Execution Plan.

The risk handling approach is to avoid this risk using multiple strategies, including analyzing the potential for expanding the SWPF capability to 2.8 M gal/year, evaluating technologies to provide additional actinide and Cs removal capability, and expediting the schedule for SWPF. The contract for the EPC vendors working on the conceptual design was recently revised to require a sensitivity analysis of a 50% scale facility. This will be followed by a throughput capacity design decision prior to the project's Critical Decision 1 (CD-1). Technology Development is currently in progress to evaluate opportunities for actinide and Cs removal capacity enhancement (refer to Appendix B, Risk Summary Report, Remarks).

3.1.27 FM-00-058 Salt/Sludge Tank Utilization Conflicts

This risk represents the possibility that certain key tanks required for accelerated sludge processing (Tanks 41,42,48,49, and 50) will not be available for use in implementing the PMP due to tank farm space management issues. This is a **Low** risk with a very unlikely probability, but a significant impact resulting from a worst case cost impact of \$270 million and a related HLW system impact of one year.

The SRS WSRC Closure Business Unit has dedicated a system-planning manager responsible for monitoring the status of system with respect to its effect on the assumptions required to implement the PMP. A business (management) review team is in place to control changes to the system plan. The plan is revised annually to accommodate the changing volumes of the waste, using knowledge gained from evaporator operations, sampling, and other program inputs. The integrated HLW system material balance flowsheet (see also SPP-00-043) will also help reduce this risk.

This risk handling approach is to reduce the probability that this risk will occur by maintaining the HLW system plan to continue to identify and resolve the conflicting tank usage. This may reduce probability of this risk occurring, but probability is still in the very unlikely range and the risk remains **Low**.

3.1.28 SWPF-00-059 SWPF Safety Analysis Impacted

This risk represents the possibility that changes to the safety strategy and/or analysis of the SWPF during final stages of design could cause delays in construction and subsequent hot operations. This is a **Moderate** risk with a likely possibility and a significant consequence resulting from worst case cost impact of \$270 million and a related 1-year extension in the HLW overall schedule.

Existing facilities supporting the SPP have the required safety analysis documents but the SWPF is in the early stages of design. If SWPF design changes are required to meet Documented Safety Analysis (DSA) controls and are made late in the project, there will be cost impacts and schedule delays to the SWPF, extending the overall HLW system lifecycle. The contractor designing the SWPF is required to conduct Hazards Analysis/Safety Analysis early in the SWPF design schedule. While the design and related controls will be established prior to SWPF construction, final regulator/oversight approval of the controls will occur in the later stages of design and into the construction phase.

The risk handling approach is to reduce the probability that this risk will impact the project is to conduct early and frequent reviews of SWPF safety strategy and safety analysis hazards controls with stakeholders and the DNFSB.

3.2 RISK HANDLING

Risk handling strategies have been identified such that successful implementation of these strategies will result in reduction, mitigation, or avoidance of risk. These strategies and the residual risks are described by risk number in Section 3.1, Identified Risks, documented on the individual Risk and Opportunity Assessment forms in Appendix A, captured in the configuration controlled Risk Database application software that creates the forms, and summarized on the Risk Summary Table (Appendix B). The individual risk strategies are being implemented by the owners of the individual projects, and programs that comprise the Salt Processing Program. These owners are accountable to the Director, High Level Waste Salt Processing Division, for implementing the identified risk handling strategies, and are required to monitor and report status and trends in risk levels on a periodic basis. The implementation of risk management at SRS, as required by DOE Order 413.3, Program and Project Management for the Acquisition of Capital Assets, is described in WSRC SRS policies and procedures, project management plans, and very specifically in the Disciplined Conduct of Projects (DCOP), Roles, Responsibilities, Accountabilities, and Authorities (R2A2) Manual, Rev. 1, dated October 2002 (Reference 13). The R2A2 manual includes a description of the risk management responsibilities of all SRS management involved in projects and programs, including the Federal Project Manager.

One (1) Uncertain Risk

One (1) Uncertain Risk #6 Risk remains uncertain due to litigation in Idaho concerning the WIR provisions of DOE Order 435.1.

Seven (7) High Risks

Two (2) **High** risk (Risk #39, 21) Being mitigated, but the risk level remains **High**.

Five (5) **High** risks (Risk #2, 43, 46, 48 and 55) Being avoided

Six (6) Moderate Risks

One (1) **Moderate** risk (Risk #51) Being accepted, and remains **Moderate**

One (1) **Moderate** risk (Risk #59) Being reduced, but the new risk level remains **Moderate**

One (1) **Moderate** risk (Risk #16) Being mitigated, but the new risk level remains **Moderate**.

Three (3) **Moderate** risks (Risk #8, 11 and 22) Being avoided

Fourteen (14) Low Risks

Six (6) **Low** risks Being accepted, and remain **Low**
(Risk #5, 18, 24, 27,
44, and 52)

Five (5) **Low** risks Being reduced to decrease probability and remain **Low**
(Risk #3, 9, 10, 50,
and 58)

Three (3) **Low** risks Being avoided
(Risk #12, 25 and 45)

3.3 SECONDARY IMPACTS

The team evaluated the impact of individual risks and considered the results of multiple-risk events. The team determined a potential for second order impacts exists, and therefore, the full impact combinations of the identified risks may not be captured by the Risk Identification and Assessment Forms. For example, the following three events may all occur:

- Recovery of Tank 48 as a Feed Tank for ARP Is Delayed
- Equipment Not Available for 241-96H
- ARP Capacity Ramp Up to 6 gpm Not Successful

With the occurrence of all three events, a much greater impact could result, with impact to the program for all assessable areas, which are interdependent with the operating success of ARP. Such secondary impacts, while possible, are exceedingly difficult to quantify at this time. In addition, recognition of the primary risk events and implementation of appropriate risk handling strategies for these will also serve to reduce the potential for secondary impacts.

3.4 TRACKING AND TRENDING

A comparison was made between the risks identified on the Risk Identification and Assessment Forms and the risks identified with the PMP to ensure that this Risk assessment Report did not overlook these Risks. It was established that no conflict exists between the PMP and this risk assessment. Also, emerging risks identified in this Risk assessment Report will be considered in subsequent issues of the HLW System Plan.

These risk-handling strategies will be tracked and trended to ensure that they are either implemented or otherwise dispositioned, and to ensure that the costs, schedules and impacts of risk handling strategies are understood and progressing as planned. To provide a single source for tracking and trending data, a risk-action database will be maintained. An appropriate project owner will be identified for each risk that is responsible for monitoring and communicating risk status to the Risk Manager. The Risk Manager will ensure that the database is updated and, as necessary, recommend additional actions. Additional Risk Analyses will be performed, as they are required to support individual SPP projects and to provide information to SPP management.

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4.0 CONCLUSIONS AND RECOMMENDATIONS

The Salt Processing Program at SRS is essential to the success of the accelerated cleanup strategy. The program that has been laid out is aggressive and has significant levels of risk that will require implementation of risk-handling strategies. Active management and mitigation of risk is necessary to minimizing impacts to the program.

This risk assessment has determined a significant level of risk is associated with the Salt Processing Program as defined in the PMP. The cost and schedule associated with some of the risks, if realized, may be measured in billions of dollars and years of schedule delays. Risk-handling strategies have been identified along with the projected funding and schedules for the Salt Program. Many technology development activities, as identified in this report, are already in progress.

The risks identified as the result of this process fall into one of four general categories.

Project Management: Those risks associated the completion of the individual projects or initiatives necessary to provide the system through-put required to meet the expectations of the PMP. This includes the operation of existing facilities, and the projects which provide facilities or modifications that enable the required process capabilities for the system (e.g., saltstone modifications, facility outage management).

System Planning: Those risks associated with the ability of the M& O contractor to optimize the sequence of processing waste volumes to minimize the HLW life cycle, including the ability to accurately predict the makeup of future feed streams to the processing facilities.

Technology Development: Those risks associated with gaps in knowledge resulting from the limited application of the technology used to process high level waste (e.g., effectiveness of MST).

External Influences: Those risks associated with events or decisions outside the direct control of WSRC or DOE-SR management.

Those risks related to external influences are outside the control of WSRC or DOE-SR management. WSRC has initiated action on many of the risk handling strategies identified, and recommends that the future overall risk mitigation strategy be focused in the following areas:

1. Risk handling strategies for risk identified as High should be immediately implemented to minimize program impact. Appendix - B, Risk Summary Table, summarizes risk-handling strategies for corresponding risks.

2. To ensure that the capacity of the HLW system can meet the performance expectations of the PMP, SPP should perform an attainment study to determine the quantitative maximum potential process capability of the integrated HLW system, including the existing and proposed process facilities. This should include an analysis of the secondary impacts from the interaction between coupled facilities (e.g., statistical analysis of the ARP schedule risks). Results of this study need to be available prior to the start of final design for the SWPF in order to enable the design team to accurately size the processing capacity of the facility, including buffer storage capacity.
3. To reduce the probability that an interruption in operation occurs in any individual facility or the system resulting from inadequate blending strategies, or use of feed batches which require multiple process cycles, or acceptance of a non-compliant feed batch, SPP should initiate further refinement of the HLW system planning tools to include a comprehensive material balance flowsheet integrating all HLW facilities and modeling the performance of the processing facilities. This material balance flowsheet would be at the level of detail necessary to identify potentially non-compliant waste streams with sufficient lead time to preclude system interruptions.
4. To minimize the risk associated with the limited experience using CSSX technology for high level waste processing on a production basis, DOE should continue to provide funding for ongoing technology development activities which reduce risk. Priority should be placed on those activities that have the greatest potential of reducing high risks and multiple risks of a lower ranking.
5. Responsibility for coordination of all risk analyses performed on projects or operational initiatives required to meet the expectations of the PMP should be assigned to a single manager responsible to the Salt Processing Program Manager. All risk analyses performed on projects or operational initiatives required to meet the expectations of the PMP should be reviewed and evaluated by that manager to ensure that emergent risks in any individual project or initiative that could impact any other project or the overall Program would be identified; that risk handling strategies are being implemented by the responsible project owner or facility manager; and that the status of risks affecting the program are monitored and communicated to senior program management in timely manner.

Risk status will be monitored and reported to the Manager, SPP, and the Director, SPD, on a periodic basis. This analysis will be reviewed and updated periodically to capture the latest developments that may affect achieving the PMP scheduled goals.

5.0 REFERENCES

1. WSRC-RP-2002-00245, SRS Environmental Management Program Performance Management Plan, Revision 3.
2. HLW-2002-00161, High Level Waste Division PMP Supplement to HLW System Plan, Revision 13.
3. DOE's Plan of Action to Re-Assess Savannah River Site's High Level Waste Management Strategy - DNFSB Recommendation 2001-1 Implementation Plan, Revision 2, April 2002, cover letter dated May 10, 2002 from Spencer Abraham.
4. Y-RMP-H-00009, Risk Management Plan for the Salt Processing Program, Revision 0, 2/13/03.
5. WSRC E7, Conduct of Engineering and Technical Support
6. HLW-SDT-2001-00180, Salt Waste Processing Program Risk Analysis Report, Revision 0, June 7, 2001.
7. M-RAR-S-00002, Caustic Side Solvent Extraction Pilot Risk Analysis Report, Revision 0, 8/22/01.
8. Y-RAR-S-00009, Actinide Removal Process Risk Analysis Report, Revision 0, 12/19/02.
9. Y-RAR-S-00006, Low Curie Salt Risk analysis Report, Revision 0, 9/18/02
10. G-ESR-Z-00002, Saltstone Restart and LCS Processing, Vulnerability Assessment Report, Revision 0, 8/8/02.
11. G-ESR-S-00012, Defense Waste Processing Facility Vulnerability Assessment Report, Revision 0, 1/24/2003.
12. WSRC-IM-98-00033: Systems Engineering Methodology Guidance Manual, Appendix B: Risk (and Opportunity) Analysis and Management.
13. Disciplined Conduct of Projects, Roles, Responsibilities, Accountabilities, and Authorities (R2A2), Revision 1, October 2002