Volume I

Inspection of Environment, Safety, and Health Management at the

ISM

Savannah River Site

February 2004

Office of Independent Oversight and Performance Assurance
Office of the Secretary of Energy

INDEPENDENT OVERSIGHT
INSPECTION OF
ENVIRONMENT, SAFETY, AND HEALTH MANAGEMENT
AT THE SAVANNAH RIVER SITE

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Acronyms

ALARA	As Low As Reasonably Achievable
AMCP	(SR) Assistant Manager for Closure Projects
AMWDP	(SR) Assistant Manager for Waste Disposition Projects
AHA	Automated Hazards Analysis
ARA	Airborne Radioactive Area
CFR	Code of Federal Regulations
CPC	Chemical Processing Cell
CY	Calendar Year
D&D	Deactivation and Decommissioning
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
DWPF	Defense Waste Processing Facility
EM	DOE Office of Environmental Management
EQ	Environmental Qualification
ES&H	Environment, Safety, and Health
FR	Facility Representative
FRAM	Functions, Responsibilities, and Authorities Manual
FY	Fiscal Year
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
ISO	International Standards Organization
LFL	Lower Flammability Limit
NCR	Nonconformance Report
NFPA	National Fire Protection Association
NNSA	National Nuclear Security Administration
OA	Office of Independent Oversight and Performance Assurance
ORPS	Occurrence Reporting and Processing System
OSHA	Occupational Safety and Health Administration
PAAA	Price-Anderson Amendments Act
POC	Point of Contact
PPE	Personal Protective Equipment
R2A2	Roles, Responsibilities, Authorities, and Accountability
RCO	Radiation Control Organization
RWP	Radiation Work Permit
SER	Safety Evaluation Report
SME	Subject Matter Expert
SR	Savannah River Operations Office
S/RID	Standards/Requirements Identification Document
SRIP	Savannah River Implementing Procedure
SRS	Savannah River Site
SRSO	Savannah River Site Office
SSC	Structure, System, or Component
STAR	Site Tracking, Analysis, and Reporting
STSM	Senior Technical Safety Manager
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question
WSRC	Westinghouse Savannah River Company

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Volume I

1.0 INTRODUCTION

The Secretary of Energy's Office of Independent Oversight and Performance Assurance (OA) conducted an inspection of environment, safety, and health (ES&H) and emergency management programs at the U.S. Department of Energy (DOE) Savannah River Site (SRS) in January and February 2004. The inspection was performed as a joint effort by the OA Office of Environment, Safety and Health Evaluations and the Office of Emergency Management Oversight. This volume discusses the results of the review of the SRS ES&H program. The results of the review of the SRS emergency management program are discussed in Volume II, and the combined results are discussed in a summary report.

This is the first inspection that OA has conducted since Secretary of Energy Spencer Abraham established the new Office of Security and Safety Performance Assurance in December 2003. This action merged the OA and the Office of Security into the new Office of Security and Safety Performance Assurance as part of an effort to improve coordination between these offices in addressing safeguard and security policy issues within DOE. OA and the Office of Security remain independent of one another, ensuring the integrity of the independent oversight functions. Both offices report to the Director of the Office of Security and Safety Performance Assurance, which reports directly to Secretary Abraham.

The DOE Office of Environmental Management (EM) is the lead program secretarial office for SRS. As such, it has overall Headquarters responsibility for most activities at the site. The National Nuclear Security Administration (NNSA) has line management responsibility for the site's tritium operations. At the site level, line management responsibility for EM-funded activities falls under the Manager of the Savannah River Operations Office (SR). The NNSA Savannah River Site Office (SRSO) provides line management oversight for the NNSA-funded operations, with support from SR in various technical and administrative areas.

SRS is managed and operated by Westinghouse Savannah River Company (WSRC), under contract to DOE. WSRC has a number of teaming partners and uses subcontractors for some activities, such as construction. However, all of the contractor organizations are required to abide by the SRS institutional policies, manuals, and processes, which were developed by WSRC, to perform activities on the SRS site.

SR and SRSO have mission responsibilities in the areas of environmental stewardship, stockpile stewardship, nuclear material stewardship, and nonproliferation. Under EM/SR direction, environmental stewardship activities at SRS include the management, treatment, and disposal of radioactive and non-radioactive wastes resulting from past, present, and future operations. SRS also manages excess nuclear materials, including transportation, stabilization, storage, and disposition, to support nuclear nonproliferation initiatives. Under NNSA/SRSO direction, SRS supports nuclear weapons stockpile stewardship by ensuring the safe and reliable recycling, delivery, and management of tritium resources; by contributing to the stockpile surveillance program; and by assisting in the development of alternatives for large-scale pit production capability. SRS encompasses approximately 310 square miles of DOE-owned property near Aiken, South Carolina, and is located approximately 20 miles from Augusta, Georgia.

SRS activities, which include facility operations, facility maintenance, waste management, and environmental restoration, involve various potential hazards that need to be effectively controlled. These hazards include exposure to external radiation, radiological contamination, nuclear criticality, hazardous chemicals, and various physical hazards associated with facility operations (e.g., machine operations, high-voltage electrical equipment, pressurized systems, and noise). Significant quantities of radiological and chemical hazardous materials are present in various forms at SRS.

Throughout the evaluation of ES&H programs, OA reviews the role of DOE organizations in providing direction to contractors and conducting line management oversight of contractor activities. OA is placing more emphasis on the review of contractor self-assessments and DOE line management oversight in ensuring effective ES&H programs. In reviewing DOE line management oversight, OA focused on the effectiveness of EM/SR and NNSA/SRSO in managing the SRS contractor, including such management functions as setting expectations, providing implementation guidance, monitoring and assessing contractor performance, and monitoring/evaluating contractor self-assessments. Similarly, OA focuses on the effectiveness of the contractor self-assessment programs, which DOE/NNSA expects to provide comprehensive reviews of performance in all aspects of ES&H.

The purpose of the ES&H inspection was to assess the effectiveness of selected aspects of ES&H management as implemented by WSRC under the direction of EM/SR and NNSA/SRSO. The OA inspection team used a selective sampling approach to determine the effectiveness of EM/SR, NNSA/SRSO, and WSRC in implementing DOE ES&H requirements. The approach involved examining selected institutional programs that support the integrated safety management (ISM) program and implementation of requirements in selected SRS organization, facilities, and activities.

The ES&H inspection was organized to evaluate the following selected aspects of the ISM program:

- EM/SR, NNSA/SRSO, and WSRC implementation of selected ISM guiding principles, including safety-related roles and responsibilities (ISM Guiding Principle #2) and identification of safety standards and requirements (ISM Guiding Principle #5). The review also examined the recent DOE efforts to establish system engineers for safety systems, which is one part of the DOE corrective action plan for Defense Nuclear Facilities Safety Board Recommendation 2000-2, which addresses safety system reliability.

- EM/SR, NNSA/SRSO, and WSRC feedback and continuous improvement systems.

- SRS implementation of the core functions of safety management for selected facility activities. Facility activities that were reviewed included:

    - Deactivation and decommissioning (D&D) projects at selected facilities, including 246F and 247F, performed by WSRC at the direction of EM/SR

    - Operations, maintenance, and facility modifications at the H-Tank Farm performed by WSRC at the direction of EM/SR

    - Operations, maintenance, and construction at the Tritium Facilities (232H, 233H, 234H, 238H, and 264H—the Tritium Extraction Facility, currently under construction) performed by WSRC under NNSA/SRSO direction.

- Functionality of selected essential systems at one EM/SR facility—the Defense Waste Processing Facility (DWPF)—and one NNSA/SRSO facility—233H. The systems selected for review at DWPF include the Zone I Ventilation Exhaust System, the Chemical Processing Cell Safety Grade Nitrogen

System, and the safety-class Melter Off-Gas Instrumentation and Associated Interlocks. The systems selected at 233H include the Fire Suppression System and the Exhaust Ventilation System.

During the review of these programs and activities, OA devoted particular attention to selected ES&H requirements, including work control processes, subcontractor ES&H controls, waste management programs (hazardous, mixed, and radioactive low-level), radiological work planning and permits, radiological controls, assessment and control of hazardous chemicals, injury and illness record keeping, facility maintenance, electrical work, welding, construction, safety system engineering, configuration management, unreviewed safety question (USQ) processes, surveillance, testing, maintenance, and operations. In reviewing management systems, OA examined current operations and selected ongoing and planned EM/SR, NNSA/SRSO, and WSRC initiatives.

Section 2 provides an overall discussion of the results of the review of the SRS ES&H programs, including positive aspects and weaknesses. Section 3 provides OA's conclusions regarding the overall effectiveness of EM/SR, NNSA/SRSO, and WSRC management of ES&H programs. Section 4 presents the ratings assigned during this review. Appendix A provides supplemental information, including team composition. Appendix B identifies the specific findings that require corrective action and follow-up. Appendix C presents the results of the review of selected guiding principles of ISM. Appendix D presents the results of the review of the feedback and continuous improvement processes. Appendix E provides the results of the review of the application of the core functions of ISM for SRS facility activities. The results of the review of essential system functionality are discussed in Appendix F.

2.0 RESULTS

In the past two years, the SRS site has undergone a significant transition in its approach to accomplishing its cleanup mission. Many major SRS production facilities, such as F-Canyon, have been shut down and are awaiting D&D. The remaining operating defense facilities—the Tritium Facilities—are under NNSA control. New equipment, such as a new melter at the DWPF, has been installed and is used to process waste materials. NNSA established the SRSO as a separate organization reporting directly to NNSA and responsible for management of the remaining defense facilities and activities. In addition, SR and WSRC have undergone major reorganizations to better meet their future mission activities, which include a heavy emphasis on a project-oriented approach to the site cleanup and accelerated cleanup schedules. Further, SR and WSRC have established a new operating contract, which focuses on cleanup schedules, provides significant incentives for efficiency and meeting the stretch goals (e.g., early completion of cleanup of facilities and areas), and has a new set of evaluation criteria. WSRC has also implemented a new hazards analysis and control process, called the automated hazards analysis process.

While these changes are appropriate for the mission and have contributed to good progress in cleanup activities, they have presented some challenges from the ES&H program, ISM, and oversight perspectives. As a result of the reorganization, many line managers and ES&H personnel are in new organizations and have new roles, and must cope with a learning curve and start-up of new organizational elements. Many procedures and processes used in the past no longer reflect the new organization and allocation of ES&H personnel to line organizations. Historical approaches to assessments and line management oversight were not well suited to the challenges associated with accelerated D&D efforts (e.g., different hazards in different phases of D&D, new and unique activities, limitations on the ability to characterize hazards, schedule pressures, etc.). In addition, SR and SRSO are separate organizations, but SRSO relies on SR for support and expertise in a number of areas; thus, significant effort was devoted to developing interfaces and support agreements. Further, both SR and SRSO use the same site contractors (WSRC and the site security contractor) and thus significant effort was devoted to coordinating efforts to provide direction to the contractor and to evaluate contractor performance.

As discussed below, EM/SR, NNSA/SRSO, and WSRC have maintained a good safety record as they have addressed these challenges. With some exceptions, the ISM programs at SRS have been sustained and/or adapted to the new organizational elements and are currently effectively implemented. However, certain aspects of SR, SRSO, and WSRC feedback and improvement systems are not effectively implemented, in part because SR, SRSO, and WSRC have not yet adapted their processes to the new organizational structures. In addition, the safety systems evaluated are in good material condition and have a robust design, but certain aspects of those safety systems are not sufficiently tested and analyzed to ensure their ability to perform their safety function.

2.1 Positive Attributes

Several positive attributes were identified in ISM implementation by EM/SR, NNSA/SRSO, and WSRC. Most work activities, particularly those involving higher hazards, were performed with a high regard for safety, and environmental programs were effective.

SRS has sustained a good safety record while site cleanup activities have been accelerated. SRS worker safety and environmental performance indicators, such as recordable and lost workday case rates, historically have been among the lowest in the DOE complex and have been improving for several years. In the past year, work activities at SRS have increased significantly as D&D efforts have accelerated. For example, SRS is scheduled to D&D about 250 buildings during the period of the current contract, and several buildings have undergone D&D in the past year. During this time, SRS has sustained a low injury and illness rate on a sitewide basis. The mature ISM program and SRS's behavioral-based safety programs have contributed to the sustained good performance and improving trends. In addition, the overall injury rates for subcontractors are improving, which correlates with a number of changes to subcontractor safety management, such as strengthening selection criteria and subcontractor worker protection plans.

Many aspects of the SRS ISM program are rigorous, comprehensive, and mature. Although some implementation weaknesses were identified, the ISM program at SRS is mature, comprehensive, well designed, and well documented. Roles and responsibilities are defined in detail in institutional documents and implementing procedures. The WSRC process for managing requirements is comprehensive and effective. SR and WSRC recently devoted significant effort and resources to a reverification of their ISM program. WSRC controls at the operating tritium facilities are particularly effective. Engineering controls, such as glove boxes and ventilation, are used extensively. Operating procedures are detailed and include numerous measures to preclude errors, such as stop points for quality assurance to verify proper safety conditions. In other parts of the site where there are less opportunities to minimize radiation dose through use of engineering controls, WSRC has implemented innovative controls for potential high radiation dose situations. For example, at H-Tank Farm where there is significant potential for external dose during maintenance work, WSRC has linked electronic pocket dosimeters being worn by workers to a local computer that provides real-time information about accumulated doses to individuals, allowing supervisors to adjust activities and personnel in an effort to maintain doses as low as reasonably achievable (ALARA). This approach is a noteworthy practice that would be beneficial for consideration at other DOE sites.

SRS has a robust waste management program that aggressively pursues pollution prevention goals and opportunities, and implements effective controls for disposal of radioactive waste. Pollution prevention programs include Green is Clean for reducing the amount of low-level radioactive waste, and pollution prevention opportunity assessments for identifying and funding projects to reduce waste generation. The site has submitted and won several awards for pollution prevention programs and projects. Excess chemicals are redistributed or reused, and new chemical purchases are evaluated for substitution of less- or non-hazardous replacements. To ensure that disposal meets regulatory and DOE requirements, tight controls have been implemented beginning at the point of generation, using waste generator training programs, deployed Waste Generator Certification Officials, and effective procedures and guidance manuals, and ending with effective acceptance criteria for the transfer of waste into the solid waste program for either onsite or offsite disposal.

WSRC has established and implemented an effective, structured process to identify, evaluate, develop, communicate, and apply lessons learned from work activities and events. A rigorous, well-documented process provides for screening externally-identified lessons learned as well as lessons learned from internal activities and events, analysis for applicability to SRS, determination of necessary corrective or preventive actions, and dissemination to affected organizations and workers. Effective application of lessons learned is facilitated by well-written, thorough analyses and preventive actions that are tailored to the conditions, organizations, and processes existing at SRS. Management support, dedicated coordinators and institutional-level staff, rigorous documentation, continuous self-assessment, and user-friendly software and databases all contribute to an efficient, effective program. The effective lessons-learned program is a noteworthy practice; other DOE sites may benefit from examining and adapting elements of the SRS lessons-learned process.

WSRC has established and implemented an effective, broad-based, behavior-based safety observation program that has increased worker awareness of safe and unsafe work behaviors, contributing to continuous improvement in safety performance. Thousands of trained observers conduct many thousands of work observations annually, identifying and correcting unsafe work practices and identifying unsafe working conditions. Local safety improvement teams administer the process in each organization and review observation data for trends and initiate corrective actions as appropriate. The growth and success of this program is promoted by clearly communicated support and encouragement from all levels of management.

WSRC has developed innovative approaches to the analysis and control of dimethyl mercury and mold contamination hazards. The WSRC Industrial Hygiene organization has worked in conjunction with facility line managers and outside laboratories to characterize and control mold and dimethyl mercury hazards. At the tank farms, significant resources have been dedicated to the identification, analysis, and control of mercury and dimethyl mercury, which was discovered in liquid waste tanks, evaporators, and process waste systems during the past two years. To confront these hazards, research has been conducted to investigate the formation of dimethyl mercury in liquid waste systems, ventilation systems have been installed to reduce work exposures, and the development of new detection equipment and analysis methods has begun. Similarly at 247F, significant resources have been allocated to the identification and control of the mold contamination, which has been found throughout many of the older SRS facilities awaiting D&D. As a result, new methods have been developed for the analysis, encapsulation, and control of mold spores, and administrative controls have been implemented to protect the D&D workforce. These industrial hygiene measures are noteworthy, and other DOE sites may benefit from examining and adapting the approaches to their needs.

EM/SR and WSRC have a systematic approach for addressing legacy hazards, from both the sitewide perspective and the facility-level perspective. Significant recent management attention—from EM to SR to WSRC—has been focused on accelerating cleanup. As part of reengineering EM management priorities for the SRS, the "AREA Closure" unit concept was developed to help prioritize legacy hazard management and cleanup priorities for SRS. The concept systematically considers a number of important factors, such as the type of hazards, proximity to the SRS site boundary, and current and future missions in support of the cleanup. SRS has performed surveys of approximately 250 buildings identified for D&D under the current contract to determine legacy hazard issues and identify any needed actions. Legacy hazards involving waste or potential waste storage in facilities awaiting D&D have been evaluated and are scheduled to be processed. Many actions are ongoing to address legacy hazards, including consolidation of nuclear materials and stabilizing legacy materials. Currently, final negotiations with the State regulators are ongoing to approve the area closure concept that is now being implemented at SRS, and DOE is evaluating the basis for the cleanup endpoints, which depends on whether SRS will be open to the public or controlled by the government, and thus subject to a less restrictive cleanup criteria.

2.2 Items for Management Attention

Although many aspects of ISM at SRS are effective, WSRC implementation of construction safety requirements at inspected facilities were not always sufficiently rigorous, and there are deficiencies in the unreviewed safety question (USQ) process and analysis for two essential systems. EM/SR, NNSA/SRSO, and WSRC feedback and improvement programs are not always sufficient to ensure that ES&H requirements are effectively implemented and that deficiencies are self-identified and corrected.

For two DWPF safety-class systems, testing and analysis are not sufficient to ensure that the systems will perform their design safety function. SRS safety systems are in good material condition, are maintained effectively, and have a robust design. However, there are two systems that have not been sufficiently tested and analyzed to ensure that the systems will perform their design safety function. Two check valves in the Chemical Processing Cell Safety Grade Nitrogen System have not been regularly tested, and no allowable leakage surveillance requirements have been established. The Melter Off-Gas System Instrumentation and Associated Interlocks do not meet the single-failure criterion for safety-class systems. Existing documentation does not adequately justify exemption from this requirement. The deficiencies in two safety-class systems indicate insufficient rigor in the WSRC analysis, testing, and quality assurance processes as applied to these two safety systems. Insufficient technical review by SR is also indicated by the approval of a documented safety analysis and technical safety requirements that had implementation deficiencies related to these two safety-class systems.

The SRS USQ process is not adequately designed or implemented. The high rate of incorrect USQ screenings (15 of 32 reviewed) and an incorrect USQ evaluation (leading to a potential inadequacy in the safety analysis) indicate a deficiency in the USQ program. The primary cause of the deficient screenings and evaluation is an inadequate USQ procedure. The USQ procedure provides direction and guidance that is inconsistent with 10 CFR 830, Subpart B, and DOE Guide 424.1-1 and that can be, and has been, misleading and non-conservative. Federal regulation 10 CFR 830 recognized that guidance documents are not mandatory but are considered an acceptable method to satisfy the requirements. Federal regulation 10 CFR 830 references DOE Policy 450.2A, *Identifying, Implementing and Complying with Environment, Safety and Health Requirements,* which allows alternate methods to be used; however, the alternative methods must be justified to ensure an adequate level of safety. The required justifications have not been performed in the cases where the SRS USQ procedure deviates from DOE Guide 424.1-1. The SRS technical review was not sufficient to identify and correct the inadequate USQ process prior to approval. As a result, changes to the facilities or procedures as described in the documented safety analysis and potential inadequacies in the documented safety analysis are not being evaluated by WSRC in accordance with the requirements of 10 CFR 830 to determine whether they constitute a USQ. In addition, some weaknesses in the DOE Guide are also contributing to inconsistent field implementation of the USQ process.

Safety controls are not always effectively communicated to the workers and effectively implemented by the workforce. The automated hazards analysis is a new process at SRS and provides an effective means of identifying and analyzing hazards. However, WSRC has not established adequate mechanisms to ensure that controls identified in the automated hazards analysis are implemented and effectively integrated into work activities. In addition, construction and subcontractor personnel are not always rigorously and consistently implementing construction safety requirements, resulting in potentially unsafe conditions and practices. D&D workers and their supervisors do not always recognize inadequately analyzed hazards as potentially unsafe conditions, and consequently do not resolve the discrepancies in accordance with site procedures and management expectations.

WSRC processes for analyzing and assessing worker exposures to hazards and for implementing necessary controls have a number of deficiencies. WSRC radiological control personnel have not consistently performed radiological air monitoring in accordance with established procedures, as necessary, to verify protection from exposure to airborne radioactivity and to demonstrate continued adequacy of the site's current annual routine bioassay technical basis. In addition, WSRC is not conducting effective ALARA reviews in accordance with site procedures in connection with D&D project work. Further, WSRC is not analyzing and documenting occupational exposures to some hazards (noise, hazardous chemicals, and beryllium) in accordance with the requirements of DOE orders and site requirements.

Important elements of SRS feedback and improvement programs are not effectively designed or implemented. SR, SRSO, and WSRC conduct a large number of assessments, and many aspects of their feedback and improvement programs are mature and effective. However, some important elements are not currently effective. SR has not implemented an effective self-assessment program that focuses on its internal functions. SRSO oversight is not sufficiently comprehensive and does not adequately address construction activities. In addition, SRSO Facility Representative assessments, self-assessments, and corrective-action/commitment management, are not implemented in accordance with some of the applicable site-specific requirements. WSRC performs numerous assessments that identify and correct deficient conditions, but weaknesses in processes and implementation hinder consistent evaluations of performance, especially for crosscutting and institutional ES&H programs. Furthermore, WSRC has not established and implemented a fully effective issues management process that consistently evaluates performance, identifies adverse trends and root causes, and prevents recurrence through appropriate actions.

3.0 CONCLUSIONS

EM/SR, NNSA/SRSO, and WSRC have faced a number of challenges associated with transition of organizations, project approaches, and processes. In most cases, site management has effectively ensured that ES&H programs were effectively implemented through the transition. For example, SRS environmental protection programs continue to be rigorous and comprehensive. The reverification of the ISM program was effective in identifying needed improvements. However, some weaknesses are evident in safety systems, hazard controls and their implementation, and feedback and improvement processes. Some of these weaknesses are attributable to the challenges associated with new processes and organizational interfaces; SR, SRSO, and WSRC have a number of ongoing actions, such as additional worker training and reemphasis of stop-work expectations.

Many elements of the SRS institutional ISM program are mature and have been effectively implemented by the new organizational elements. Some aspects of SRS institutional programs are notably effective, such as the lessons-learned process and the behavior-based safety program. SR, SRSO, and WSRC feedback improvement programs perform numerous inspections and have contributed to improvements in ES&H programs. WSRC has implemented a systems engineering approach that is consistent with DOE requirements, and SR is well positioned to meet the expected requirements for DOE safety system oversight. With a few exceptions, SR, SRSO, and WSRC have adequately identified and communicated responsibilities for ES&H functions. WSRC has an effective process for identifying requirements and ensuring that they are clearly incorporated into working-level processes and procedures.

Many aspects of ISM are effectively implemented in SRS operating facilities, particularly those with stable operations and management teams. Most work observed by OA was performed safely, and many elements of ES&H programs are effective. Implementation of ES&H controls in operating tritium facilities was detailed, comprehensive, and rigorous. Environmental protection programs were effective, and pollution protection efforts were aggressive and rigorous. Innovative measures to measure and control radiation dose were used in high-dose situations. Extensive efforts have been devoted to controlling mold and mercury hazards. Essential safety systems at SRS are in good material condition, operators are well trained, and most operating procedures are well designed. Additionally, most aspects of configuration management are effective.

However, improvements are also needed in some aspects of worker safety at SRS facilities. Deficiencies in implementation and oversight of construction safety requirements are evident, particularly in the major construction effort for a new Tritium Extraction Facility. There are gaps in some aspects of exposure assessments and implementation of hazard controls in such areas as stop work, beryllium, and air monitoring. The recently implemented automated hazards analysis process is a good process improvement and provides a number of benefits, but it currently has some deficiencies (e.g., translating the controls to work instructions).

Although there are many positive aspects in the feedback and improvement process, many deficiencies are contributing to recurring deficiencies. SR, SRSO, and WSRC assessments and corrective actions have not been consistently effective in identifying and correcting deficiencies in facilities, processes, and work activities. For example, the WSRC issues management program has some process and implementation deficiencies, and some assessment activities are not sufficiently comprehensive (e.g., few assessments of crosscutting programs). In some cases, new organizational elements in SR and SRSO, or elements that have been reorganized, have not sustained all required oversight activities, such as self-assessments.

In addition, a few safety systems have deficiencies that need timely management attention. Specifically, two DWPF systems have deficiencies in testing or safety analysis that threaten their ability to perform their safety functions. In addition, the USQ program has a number of deficiencies in the procedure and implementation of screening and evaluation functions. These deficiencies were not identified by the WSRC system engineers or in SR technical reviews of the documented safety analysis and USQ procedure. WSRC has initiated some appropriate actions, but increased attention is needed to ensure that safety systems are fully analyzed and are verified to be able to perform their function for all accident conditions.

Overall, the ISM programs at SRS are mature and well structured and effectively address many of the potential hazards. Some elements are notably effective, such as the environmental protection program, the approach to dose monitoring, the behavior-based safety program, dissemination of lessons learned, and additional controls for mold and mercury. However, improvements are needed in several important aspects of the SR, SRSO, and WSRC implementation of ISM, including implementation of controls, safety basis analysis and documentation for some safety systems, USQ processes, certain aspects of exposure assessments, and SR, SRSO, and WSRC feedback and improvement systems. Although improvements are needed in a number of areas, SRS has maintained a good safety record.

4.0 RATINGS

The ratings reflect the current status of the reviewed elements of the SRS ISM program:

Safety Management System Ratings

Guiding Principle #2 – Clear Roles and Responsibilities ....EFFECTIVE PERFORMANCE
Guiding Principle #5 – Identification of Standards and Requirements.......EFFECTIVE PERFORMANCE

Feedback and Improvement

Core Function #5 – Feedback and Continuous Improvement ....NEEDS IMPROVEMENT

Implementation of Core Functions for Selected Work Activities

Core Function #1 – Define the Scope of Work..EFFECTIVE PERFORMANCE
Core Function #2 – Analyze the Hazards..EFFECTIVE PERFORMANCE
Core Function #3 – Develop and Implement Hazard Controls..........................NEEDS IMPROVEMENT
Core Function #4 – Perform Work Within Controls ....NEEDS IMPROVEMENT

Essential System Functionality

Design and Configuration Management ....SIGNIFICANT WEAKNESS
Surveillance, Testing, and Maintenance ....EFFECTIVE PERFORMANCE
Operations..EFFECTIVE PERFORMANCE

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APPENDIX A

Supplemental Information

A.1 Dates of Review

Scoping Visit	December 16 - 17, 2003
Onsite Planning Visit	January 12 - 16, 2004
Onsite Inspection Visit	January 26 - February 6, 2004
Report Validation and Closeout	February 18 - 20, 2004

A.2 Review Team Composition

A.2.1 Management

Glenn S. Podonsky, Director, Office of Security and Safety Performance Assurance
Michael A. Kilpatrick, Director, Office of Independent Oversight and Performance Assurance
Patricia Worthington, Director, Office of Environment, Safety and Health Evaluations
Thomas Staker, Deputy Director, Office of Environment, Safety and Health Evaluations

A.2.2 Quality Review Board

Michael Kilpatrick
Thomas Staker
Robert Nelson
Patricia Worthington
Dean Hickman

A.2.3 Review Team

Patricia Worthington (Team Leader)

Bob Freeman (Management Systems Lead)
Phil Aiken
Ali Ghovanlou
Robert Compton
Albert Gibson

Bill Miller (Essential Systems Functionality Lead)
Charles Campbell
Michael Gilroy
Don Prevatte
Joe Panchison
Michael Shlyamberg

Brad Davy (Core Functions Lead)
Vic Crawford
Ivon Fergus
Marvin Mielke
Mark Good
Joe Lischinsky
Jim Lockridge
Edward Stafford
Mario Vigliani

A.2.4 Administrative Support

Mary Anne Sirk
Tom Davis

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APPENDIX B
Site-Specific Findings

Table B-1. Site-Specific Findings Requiring Corrective Action Plans

FINDING STATEMENTS	REFER TO PAGES
1. The Savannah River Operations Office (SR) self-assessment program is not effectively implemented in accordance with the SR self-assessment program procedure, and SR self-assessment processes do not provide for sufficient independent internal assessment of SR technical programs and their implementation.	35
2. Savannah River Site Office feedback and improvement processes, including Facility Representative assessments, technical assessments, self-assessments, and corrective-action/commitment management, are not sufficiently comprehensive and do not fully meet applicable requirements.	37
3. Westinghouse Savannah River Company (WSRC) has not established and implemented a fully effective assessment program that consistently evaluates performance, especially for crosscutting safety and health and institutional safety management processes.	39
4. WSRC has not established and implemented a fully effective issues management process that consistently evaluates performance, identifies adverse trends and root causes, and prevents recurrence through appropriate actions.	41
5. WSRC has not established adequate mechanisms to ensure that controls identified in the automated hazards analysis are effectively integrated into work activities and implemented prior to performing the work.	50
6. WSRC radiological control personnel have not consistently performed radiological air monitoring in accordance with established procedures, as necessary, to verify protection from exposure to airborne radioactivity and demonstrate continued adequacy of the site's current annual routine bioassay technical basis.	50
7. Construction and subcontractor personnel are not always rigorously and consistently implementing construction safety requirements, resulting in unsafe conditions and practices that could cause injury.	50
8. Deactivation and decommissioning (D&D) workers and their supervisors do not always recognize inadequately analyzed hazards as potentially unsafe conditions, and consequently do not resolve the discrepancies in accordance with site procedures and management expectations.	50
9. WSRC is not analyzing and documenting occupational exposures to some hazards (noise, hazardous chemicals, and beryllium) in accordance with the requirements of DOE 440.1A and site requirements.	50
10. WSRC is not conducting effective as-low-as-reasonably-achievable (ALARA) reviews in accordance with site procedures in connection with D&D project work.	50

Table B-1. Site-Specific Findings Requiring Corrective Action Plans (continued)

FINDING STATEMENTS	REFER TO PAGES
11. WSRC has not fully demonstrated through rigorous analysis and/or testing that two safety-class systems at the Defense Waste Processing Facility (DWPF) will perform their design safety function.	85
12. SR technical reviews were not sufficient to identify deficiencies with implementing the DSA and technical safety requirements for two DWPF safety-class systems.	85
13. WSRC is not evaluating changes to the facilities or procedures as described in the DSA, or potential inadequacies in the DSA, in accordance with 10 CFR 830 to determine whether they constitute an unreviewed safety question (USQ); deficiencies in the USQ procedure and its implementation are a contributing factor.	89
14. SR has not ensured that the Savannah River Site USQ process, procedure, and implementation are adequate.	89

APPENDIX C
Guiding Principles of Safety Management

C.1 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) evaluation of safety management systems focused on selected guiding principles of integrated safety management (ISM) at the Savannah River Site (SRS). OA examined Guiding Principle #2 (Clear Roles and Responsibilities) and Guiding Principle #5 (Identification of Standards and Requirements).

DOE Headquarters Office of Environmental Management (EM), National Nuclear Security Administration (NNSA), EM's Savannah River Operations Office (SR), NNSA's Savannah River Site Office (SRSO), Westinghouse Savannah River Company (WSRC), and subcontractor personnel were interviewed to determine their understanding of the ISM program and their responsibilities, as well as the status of ongoing initiatives and corrective actions. The OA team reviewed various documents and records, including ISM program documents; environment, safety, and health (ES&H) procedures; functions, responsibilities, and authorities manuals (FRAMs); ES&H manuals; contract provisions related to safety; subcontract provisions; selected aspects of staffing, training, and qualifications of technical personnel; and various plans and initiatives. The evaluation of the guiding principles also considered the results of the concurrent OA review of the core functions, essential systems, and feedback and improvement systems.

The review of the guiding principles focused on institutional programs and implementation of those programs by selected organizations:

- EM/SR, focusing on the SR Assistant Manager for Closure Projects (AMCP) and the SR Assistant Manager for Waste Disposition Projects (AMWDP) organizations. The AMCP organization has DOE line management responsibility for deactivation and decommissioning (D&D) projects, including the projects reviewed by OA during this inspection at 246F and 247F. The AMWDP has DOE line management responsibility for waste management activities, including the H-Tank Farm activities and Defense Waste Processing Facility (DWPF) essential systems that were reviewed by OA on this inspection.

- NNSA/SRSO, which has line management responsibility for tritium operations reviewed by OA, including the activities and essential safety systems at Buildings 232H, 233H, 234H, 238H, and 264H.

- WSRC, focusing on WSRC institutional organizations with safety responsibilities (e.g., the WSRC ES&H organization), and the WSRC line organizations with responsibility for managing the closure projects, tank farms, and the Tritium Facilities.

OA also focused on the EM/SR, NNSA/SRSO, and WSRC actions that have been planned or taken as part of the DOE corrective action plan for Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2000-2, which addresses system reliability and the need for safety system engineers. The area of safety system reliability and safety engineers was selected as a focus area for calendar year (CY) 2004 as part of OA's review of previous problem areas and future DOE priorities. OA also reviewed the status of SRS efforts to manage legacy wastes, which is also an OA focus area.

C.2 RESULTS

C.2.1 Clear Roles, Responsibilities, Authorities, and Accountability

Guiding Principle #2: Clear and unambiguous lines of authority and responsibility for ensuring safety shall be established and maintained at all organizational levels within the Department and its contractors.

EM/SR

EM recently (October 2003) reorganized its management structure. The new structure streamlines management reporting and clarifies lines of responsibility for safety. Within the new EM Headquarters organization, roles, responsibilities, authorities, and accountability (R2A2) have been appropriately defined and delegated. The EM Office of the Chief Operating Officer has been delegated primary responsibilities for site operations, ISM, and ES&H oversight. Some aspects of the reorganization, such as the ES&H organization, are in the early stages of implementation. However, EM has been actively involved in certain SRS initiatives and issues, such as SR and WSRC progress on the efforts to establish system engineers for important safety systems.

The SR Manager reports directly to the EM Chief Operating Officer and is appropriately empowered to ensure safety at SRS. SR has recently reorganized its management structure to correspond to the current and planned SRS modes of operation, which include more emphasis on the ability to manage individual closure projects, support accelerated site cleanup and restoration, and manage the SRS contract.

As part of the SR reorganization, the various SR line management organizations (e.g., AMCP and AMWDP) have been given more responsibility and authority for their respective mission areas. In accordance with the cleanup contract, SR direction to WSRC must flow through the assistant managers. Correspondingly, Facility Representatives (FRs), system engineers, and some ES&H subject matter experts (SMEs) have been assigned to support the various SR line management organizations. All SR line management organizations apply SR institutional processes to identify R2A2s and hold individuals and organizations accountable for performance. SR maintains smaller centralized organizations, such as ES&H, to support line management and perform crosscutting assessment activities.

R2A2s for SR sitewide support organizations have been clearly defined in the newly published SR Functions, Responsibilities, and Authorities Procedure. ES&H institutional program owners were very knowledgeable of their technical areas and understood their R2A2s. ES&H program owners have established a close working relationship with their WSRC program counterparts.

Within the two individual assistant manager organizations reviewed (AMWDP and AMCP), R2A2s are well defined and being appropriately implemented in most cases. The FR program is mature and the FR responsibilities are well defined. FRs, system engineers, and ES&H SMEs are well qualified and experienced. The AMWDP and AMCP organizations are appropriately organized to perform their line management oversight functions and interface effectively with their contractor counterparts. For example, AMWDP staff worked effectively with WSRC to enhance the complex interfaces among various organizations related to waste transfer controls, which had contributed to a previous inadvertent transfer event.

Although the R2A2s for SR organizations are conceptually sound and being appropriately implemented in most cases, most SR organizations have been impacted by the numerous simultaneous changes that have occurred (e.g., reorganizations, new types of contracts, numerous personnel reassignments, realignment of management responsibilities, reallocating of responsibilities from a centralized organization to the field, and additional work associated with start-up of new/revised organizations.) SR line management and centralized support organizations are in a state of transition and experiencing some difficulties as they adapt to their new R2A2s and resource levels. For example, certain assessment functions are not being rigorously performed (see Appendix D).

SR is working to fully implement these R2A2s and better integrate the interfaces between the centralized organizations and the line management organizations, such as AMCP and AMWDP. For example, SR is also working towards establishing an overall strategy document for assessment programs and a unified issues management process to provide a better framework for improving ES&H programs. In addition, SR plans to have each line organization identify points of contact for each functional area to interface with institutional ES&H program owners. At the assistant manager level, AMCP has established "DOE-Area Closure Project Teams" to help better integrate interfaces among project managers, FRs, and ES&H personnel and improve coordination of oversight of contractor projects. These initiatives are conceptually sound but not yet fully developed and implemented.

SR has mature programs for evaluating contractor performance and holding the contractor accountable for safety performance. The incentive award fee parameters in the new SR-WSRC contract are based solely on work completion. However, appropriate provisions have been included in the contract to hold WSRC accountable for safety performance. For example, SR has imposed fee reductions for safety-related events. SR also has mature processes (e.g., annual appraisals) for holding organizational elements and individuals accountable for safety performance.

NNSA/SRSO

Within NNSA, R2A2s for safety management, program execution, and program management of SRSO and SRS tritium facilities are well understood. In accordance with the NNSA reengineering effort, NNSA site office managers, including the SRSO Manager, report directly to the NNSA Administrator and the Principal Deputy Administrator. Within NNSA, the Deputy Administrator for Defense Programs is responsible for providing programmatic direction to SRSO and maintaining operational awareness of operations and ES&H at the SRS tritium facilities. Safety management functions, responsibilities, and authorities flow from the DOE Functions, Responsibilities, and Authorities Manual (FRAM) to the NNSA FRAM.

NNSA participates in regular meetings and interactions with SRS personnel who address ES&H issues. For example, NNSA Deputy Assistant Administrator for Military Application and Stockpile Management (NA-12) and Office of Operations and Readiness (NA-124) personnel routinely participate in quarterly reviews for SRS tritium facilities, and NA-124 provides a quarterly report on production, operations, occurrence reporting (including ES&H issues), and projects.

As part of the NNSA reengineering process, SRSO is undergoing a reorganization and staffing reduction. The Managed Staffing Plan (approved by the NNSA Administrator in July 2003) calls for a reduction in SRSO staffing (from 23 to 20 by the end of fiscal year (FY) 2004, with 9 new positions and 12 eliminated positions) and flattening of the SRSO organization (elimination of division director level).

Within SRSO, most roles and responsibilities are well documented, communicated, and understood. Safety management R2A2s adequately flow down from the NNSA FRAM to the SRSO FRAM. SRSO maintains a Safety Management Functions Matrix that communicates specific R2A2s to individual SRSO staff members and identifies applicable implementing procedures. The SRSO Deputy Manager also informally maintains a Functions/Assignments Matrix that clearly identifies the responsible SRSO point of contact (POC), a WSRC tritium POC, a SR support person (if applicable), and an NNSA Headquarters POC (if applicable) for each functional area.

Although SRSO is part of NNSA and is organizationally separate from SR, SRSO, in many cases, continues to use SR processes and procedures for their activities and relies on SR for many support functions. For example, SRSO operates under the umbrella of the SR ISM program, and the SRSO oversight activities use SR procedures and tools. SRSO also relies on SR for important activities, such as requirements management (e.g., maintaining the standards/requirements identification documents [S/RIDs]), emergency management, security, and environmental permitting. SRSO and SR have established formal agreements that appropriately define the R2A2s of SR and SRSO. As part of these agreements, SRSO may utilize ES&H SMEs to support SRSO in areas where it does not have in-house expertise.

Currently, the interfaces between SRSO and SR are working well. No performance problems were attributed to the interfaces or use of SR processes by SRSO personnel. However, SRSO uses SR procedures that do not always reflect SRSO's specific organizational interfaces. In addition, NNSA is in the process of issuing guidance documents in a number of areas, such as NNSA organization self-assessments, that may necessitate development of SRSO processes that diverge from those of SR. SRSO plans to coordinate closely with NNSA Headquarters, the NNSA Service Center, and SR as procedures and processes are revised/developed.

SRSO and SR have also coordinated effectively on the process for evaluating the performance of WSRC, which performs work for both SRSO and SR. Within the overall framework of the SR contract performance evaluation process, SRSO has clear R2A2s for evaluating the work performed by WSRC in support of NNSA activities (i.e., work related to the Tritium Facilities). For example, the SRSO Manager is the Contracting Officer and evaluates WSRC against the tritium-related, performance-based incentives and can invoke contract clauses that adjust the fee for less than adequate ES&H performance or events.

SRSO managers, FRs, and ES&H personnel are well qualified and experienced. They demonstrated a good understanding of their R2A2s during OA interviews and observation of work activities. SRSO staff who are identified as Technical Qualification Program participants are fully qualified. Two of the three current Senior Technical Safety Managers (STSMs) plan to transfer or retire in the next year. However, SRSO has filled System Engineer and Facility Manager positions; the position descriptions for these positions are consistent with the STSM criteria and could be used to fill the void associated with the expected loss of two current STSM-qualified individuals.

SRSO has adequate mechanisms (e.g., Functions/Assignments Matrix and annual performance appraisals) for communicating expectations to the staff and for holding the staff accountable for their performance. SRSO meetings observed by the OA team (e.g., SRSO daily staff meeting and the defense program weekly status meeting) were used effectively to ensure that individuals understood that they were accountable for actions assigned to them. Although not currently causing performance problems, SRSO position descriptions do not reflect the current organization, and do not accurately reflect current roles, responsibilities, and authorities. Position descriptions for most current SRSO positions were revised and updated in April 2003 and sent to the NNSA Service Center, but have yet to be finalized. Position descriptions for the new positions (e.g., systems engineer, facility manager, and management analyst) have been finalized.

WSRC

WSRC sitewide organizations are responsible for a number of important ES&H programs, such as nuclear safety, environmental compliance, industrial safety, industrial hygiene, and quality assurance. In addition, sitewide organizations develop some processes and tools (e.g., automated hazards analysis [AHA] tools) and implement important assessment functions (e.g., the Facility Evaluation Board process). R2A2s for these organizations are well defined in a number of documents, including the ISM system description document, sitewide manuals, and procedures. The R2A2s for the sitewide organizations have been appropriately implemented. For example, WSRC has a number of committees and councils, such as the Authorization Basis Committee, Safety and Health Review Committee, and Site As-Low-As-Reasonably-Achievable Committee, that provide for consistency across the WSRC organizations, promote communication of ES&H issues, monitor ES&H performance, and promote continuous improvement.

WSRC Activities Under EM/SR. R2A2s for the line organizations within the H-Tank Farm Project and the 247F D&D project are well defined and documented in project plans and work documents. For example, R2A2s for the project manager, SMEs (i.e., safety professionals, industrial hygienists), first-line manager, planner, radiation control organization, work coordinator, and crafts for the 247F D&D project are defined in Facility Disposition Project work plans and procedures. WSRC has detailed procedures for most functions that provide specific details on R2A2s.

With some exceptions, these R2A2s are communicated and understood at the facilities and are effectively implemented. At the activity level, WSRC facility managers and project managers are provided appropriate ES&H and engineering support in most ES&H disciplines through matrixed staff, who are well integrated into facility activities. However, WSRC is in the process of reorganizing Industrial Hygiene resources to better align with the need for Industrial Hygiene support based on hazards.

WSRC processes for evaluating organizational and individual accountability (e.g., annual appraisal processes) are mature and implemented in accordance with WSRC procedures. Employees, in consultation with their supervisors, agree on roles, responsibilities, goals, and metrics to be used in the evaluation of performance. Accountability for safe operations at the task level is reinforced through pre-job briefings and other facility-specific mechanisms.

Although R2A2s are generally effective, two areas were identified in which they were not sufficiently communicated, understood, or implemented. One such area involves the responsibility for integration of hazards identification and controls into work instructions, and clear communication of this information to those responsible for work execution. Although several processes and individuals are involved, the processes are not well defined (see Appendix E and Finding #5), and implementation responsibility for translating controls to work instructions is not well defined in some cases. A second area needing continued attention is the communication and understanding of stop-work authority. An appropriate stop-work policy and associated R2A2s have been appropriately defined in sitewide documents. A recent WSRC corporate-wide assessment of recent events and issues, and the Review and Integration Team report, identified workers' understanding and execution of stop-work responsibilities as an area needing improvement, and some corrective actions have been taken. However, for some D&D work activities observed by OA, workers and first-line supervisors did not demonstrate a proper recognition of when to invoke their stop-work responsibilities when confronted with unexpected conditions or hazards (see Appendix E and Finding #8). WSRC managers are aware of this recurrence of an identified weakness and are conducting meetings to reemphasize stop-work expectations to the workforce.

Through its ISM reverification and internal assessments (some of which were prompted by recent events and deficiencies), WSRC has self-identified weaknesses in some aspects of R2A2s. For example, WSRC assessments identified weaknesses in the implementation of some R2A2s in the AHA process, prompting a series of "assistance reviews" by the AHA process-owner organization to help line organizations improve their R2A2 definitions and processes. Another WSRC assessment identified that R2A2s were not well defined or understood as the organizations were realigned, and that workers were not stopping work when unanticipated hazards were encountered. WSRC has taken some sitewide actions to communicate management's expectation to ensure adequate safety and to correct potential misperceptions that schedules had a higher priority than rigorous implementation of safety controls. WSRC has also taken some organization-specific measures as discussed below.

WSRC organizations have a number of ongoing initiatives to address identified weaknesses at the H-Tank Farm and D&D projects. For example, the H-Tank Farm Facility Manager has selected conduct of operations (including procedure compliance and lockout/tagout) as an area of focus for improvement during 2004 and is in the process of implementing a program that combines mentoring and more detailed assessments in specific areas, and emphasizes the behavior-based safety program. To monitor procedure compliance, the H-Tank Farm Operations Manager collects a daily sample of completed operating procedure data sheets and examines them to verify proper sign-off of steps by workers, supervisors, managers, and ES&H personnel. At D&D projects, WSRC management initiatives include:

- Establishing the Responsible Manager position and providing associated training to strengthen line management ownership of quality and technical adequacy of work packages

- Providing training and expectations for first-line supervisors and craft to communicate stop-work expectations, and using behavior-based safety techniques to improve use and ownership of the stop-work process by the craft

- Stopping the practice of subcontracting turnkey-type D&D projects, and assuming full responsibility for all D&D work on site

- Using personnel with D&D experience (D&D leads) to mentor work crews and provide suggestions on different techniques and methods to approach ongoing D&D work in a safe manner.

Such initiatives are appropriate for the type of weaknesses self-identified by WSRC and identified on this OA inspection. However, continued WSRC management attention is needed to ensure that management expectations and R2A2s are clearly communicated and understood. Although not systemic, OA identified a few cases where workers did not stop work to resolve discrepancies (see Appendix E and Finding #8).

WSRC Activities Under NNSA/SRSO. Unlike most other WSRC organizations, the WSRC Defense Programs organization performs work primarily under NNSA/SRSO programmatic direction and NNSA/SRSO oversight. However, the WSRC Defense Programs organization uses WSRC procedures and processes, and the results of the review of the WSRC Defense Programs' R2A2s are similar in most respects to those discussed above. R2A2s are clearly defined and understood, and individuals are appropriately held accountable for ES&H performance using mature and generally effective WSRC institutional processes, as discussed above. OA did not identify any performance weaknesses in the WSRC Defense Program implementation of the R2A2 processes.

Some aspects of WSRC Defense Programs are particularly effective in their implementation. For example, the WSRC Tritium Facilities have a longstanding practice of rotating managerial staff among operations, engineering, and maintenance assignments. This practice promotes communication and cooperation and development of crosscutting expertise among a very mature and capable management team. During interviews, managers and staff clearly understood assigned R2A2s, and each person who was interviewed referred to appropriate source-level documents and manuals and their own Personal Assessment and Development Process documents as references for information on their specific R2A2s. WSRC Defense Programs managers made effective use of meetings (e.g., weekly status meetings, monthly contractor performance feedback meeting, 234H turnover and schedule meetings, and a quarterly all-hands meeting) to communicate information to staff. For example, the quarterly all-hands meeting effectively addressed the recent event at SRS FB-Line in the context of the ISM core functions and related the event to recent, less significant events at the Tritium Facilities.

WSRC Defense Programs has a number of ongoing process improvement efforts that are well designed to further improve performance. These include an effort to enhance maintenance planning/approval and a Product Quality Steering Team that is charged with taking a broad view of tritium operations and making recommendations for improvement, including consideration of the space shuttle Columbia accident investigation and lessons learned from a recent product quality event.

Summary of Guiding Principle #2. EM/SR, NNSA/SRSO, and WSRC R2A2s are generally well documented and communicated. EM/SR, NNSA/SRSO, and WSRC have mature processes for holding organizations and individuals accountable for performance. Although the R2A2s are conceptually sound and being appropriately implemented in most cases, some aspects of SR and SRSO R2A2s are in a state of transition and some SR responsibilities for assessments are not being effectively performed. With few exceptions (e.g., integration of controls into work instructions, and understanding of stop-work responsibility by a few individuals), WSRC R2A2s are effectively understood and implemented. SR, SRSO, and WSRC have self-identified a number of weaknesses and areas for improvement related to R2A2s and have established an appropriate set of corrective actions, including mentoring, training, and behavior-based safety programs.

C.2.2 Identification of Standards and Requirements

Guiding Principle #5: Before work is performed, the associated hazards shall be evaluated and an agreed-upon set of safety standards shall be established that, if properly implemented, will provide adequate assurance that the public, the workers, and the environment are protected from adverse consequences.

SR/SRSO

SR and SRSO have established appropriate ES&H requirements in the DOE/WSRC contract for EM and NNSA activities. SR provides direction and oversight of WSRC for maintenance of an S/RID for requirements applicable to both EM/SR activities and NNSA/SRSO activities. Responsibilities for this support are adequately defined in a formal SR/SRSO management agreement that was established in August 2003. SR has worked effectively with WSRC to ensure a comprehensive listing of applicable ES&H requirements in the SRS S/RID. Maintenance and implementation of the S/RID is required by the WSRC contract, and S/RID changes are approved by WSRC, SR, and SRSO. The requirements management program is consistent with NNSA Policy Letter for Standards Management, NAP-5. Requirements contained in the SRS S/RID are appropriate for the hazards at SRS.

SR and SRSO have adequately identified and assigned responsibilities for implementing requirements that are applicable to Federal activities. SRSO has developed a Safety Management Functions Matrix that defines each applicable ES&H requirement, assigns implementation responsibility, and references implementing procedures. The matrix is current with respect to recent organization and staffing changes and contains most applicable requirements. SR maintains a formal process for flowdown of requirements from DOE directives into implementing procedures, which ensures that requirements applicable to the Federal staff are flowed down to appropriate implementing procedures.

WSRC

The SRS S/RID is a mature and effective mechanism for flowdown of ES&H requirements and is adequately maintained and updated. The S/RID was established in 1995 and has been revised several times since that time to improve effectiveness and efficiency. Formal WSRC procedures govern the maintenance and use of this document. The SRS S/RID is maintained as an electronic database that includes a description of each applicable ES&H requirement, the source document from which the requirement was taken, and the facility type, by hazard category, for which the requirement is applicable. Each S/RID source requirement is assigned to one of approximately twenty functional areas, and a Functional Area Manager is assigned responsibility for flowing the requirement down through training and implementing procedures. The ES&H requirements and responsibility assignments are clear and current.

WSRC institutional procedures ensure that the S/RID is maintained current. WSRC has established a formal process for timely revision of the S/RID based upon changes to applicable DOE directives. A WSRC procedure assigns responsibilities and specifies a method and timeliness criteria to ensure that applicable changes are identified and incorporated into the S/RID. Responsibilities for identifying changes to laws and regulations are also assigned in procedures, and functional area managers are required to review their assigned S/RID areas biennially to ensure that requirements are adequate and consistent.

External ES&H requirements are adequately addressed in the SRS S/RID and lower-tier documents. The OA team traced several external requirements through implementing documents to determine whether the SRS workforce was provided the information necessary for safety and compliance. In general, external requirements, including contract clauses, applicable Federal regulations, and DOE directives, were adequately addressed in the S/RID and lower-tier documents. For example, Occupational Safety and Health Administration (OSHA) requirements for reducing occupational injuries due to needle sticks and other sharps-related injuries have been effectively managed by WSRC. Federal regulation 29 CFR 1910.1030, *Bloodborne Pathogens*, was revised about two years ago to implement the Needle Stick Safety and Prevention Act of November 6, 2000. The WSRC medical staff was well aware of the change and had incorporated the change into annual training on bloodborne pathogens and issued an exposure control plan as required by the regulation. OA's sample also indicated that WSRC had appropriately addressed new and modified requirements in its S/RIDs and implementing procedures in the areas of fire protection standards, environmental/pollution protection requirements, and system engineering. For one requirement in the OA sample (related to submittal of plans for transportation of hazardous materials), the WSRC SME was aware of the requirement and had initiated appropriate steps to implement it, but one of the elements of the requirement (i.e., to confirm the qualifications of truck drivers) was in a draft procedure that had not yet been issued.

WSRC has effectively flowed down requirements in DOE Order 450.1, *Environmental Protection Program*, and Executive Order 13148, *Greening the Government Through Leadership in Environmental Management*, by developing procedures for an environmental management system and a pollution prevention program. These procedures apply to WSRC and subcontractors. The EMS procedure uses the ISO 14001 framework for presenting requirements for organizations to follow in order to maintain an environmental management system as part of ISM. The pollution prevention procedure requires actions to meet DOE goals for waste reduction and for conducting pollution prevention opportunity assessments that select high-return projects for reducing waste.

The WSRC procurement process includes adequate measures to ensure that appropriate ES&H requirements are included in subcontracts. ES&H representatives are involved throughout the procurement process, including development of requests for proposals, reviewing bidder safety qualifications, and development of final contracts. Procurement procedures require pre-qualification of bidders based on past safety performance. These procedures also require that all subcontracts for hazardous work include an appropriate ISM clause and include a requirement for the subcontractor to designate an onsite safety professional or safety representative. These procedures were appropriately followed for subcontracts reviewed during this inspection. The WSRC Employee Safety Manual requires the tailoring of ES&H requirements in subcontracts based upon work location and associated hazards.

Most applicable ES&H requirements have been flowed down to subcontractors. According to the DOE/WSRC contract, WSRC is responsible for compliance with ES&H requirements and for flowing down ES&H requirements to any tier subcontractor to the extent necessary to ensure the contractor's compliance with the requirements. WSRC does not normally include a listing of applicable laws, regulations, or directives in subcontracts, but instead relies on a variety of other mechanisms to ensure that applicable requirements flow down to its subcontractors. For example, WSRC relies principally upon worker protection plans, which are prepared by subcontractors and reviewed by site ES&H personnel, as a means of assuring compliance with OSHA requirements. Site requirements, including reference to applicable WSRC procedures, have been included in special terms and conditions in subcontracts in general employee training and in the subcontractor safety handbook.

These measures have been effective in most cases. However, a few applicable requirements have not been flowed down. For example, subcontracts with two construction/service subcontractors did not adequately address some worker safety requirements from DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*. Specific requirements that were not incorporated were: (1) requirements to comply with threshold limit values established by the American Conference of Governmental Industrial Hygienists for control of personnel exposures to hazardous materials, which in some cases are more restrictive than the personnel exposure limits specified in OSHA regulations, and (2) fire watch requirements that were added to DOE Order 440.1A following a fatal accident at another DOE site and that are more restrictive than those in National Fire Protection Association (NFPA) standards.

Summary of Guiding Principle #5. A formal requirements management system has been in place at SRS for several years. An S/RID process provides systematic flowdown of an appropriate set of ES&H requirements through SRS procedures. WSRC management understands that these requirements are applicable regardless of who performs the work, and the requirements have been adequately addressed in subcontracts. The OA team did not observe performance deficiencies that were attributed to flowdown of requirements.

C.2.3 System Engineering Program

In 2002, DOE added requirements for a system engineering program in DOE Order 420.1A, *Facility Safety*. This action was part of the DOE implementation plan for DNFSB Recommendation 2000-2, which recommended that DOE adopt the longstanding nuclear industry practice of designating system engineers for systems and processes that are vital to safety. The safety system engineers have responsibilities for evaluating and ensuring the safe operations of safety systems, such as those discussed in Appendix F. As discussed in Appendix F, these systems are in good material condition and are effectively tested, maintained, and operated, with a few notable exceptions. In response to DNFSB 2000-2, DOE also established plans for improving its capabilities for DOE oversight of safety systems, including: (1) assessing DOE needs and capabilities for oversight, and (2) revising DOE's technical qualifications as needed.

WSRC

WSRC has incorporated the DNFSB Recommendation 2000-2 requirement for safety system engineers into the SRS S/RID and has appropriately addressed most of the requirements in WSRC institutional and lower-tier procedures. WSRC Engineering Manual E-7, *Conduct of Engineering and Technical Support*, includes appropriate requirements for assignment of engineers. Responsibilities are generally defined at the institutional level in the E-7 Engineering Manual and are more specifically defined in division-level documents. Assigned responsibilities are consistent with DOE Order 420.1A.

A cognizant system engineer has been designated for each safety-class, safety-significant, and defense-in-depth system. Most cognizant system engineers have been given design authority for their assigned systems. Appropriate training and qualification requirements have been established and implemented for system engineers. WSRC has applied the training and qualification requirements of DOE Order 5480.20A Chg 1, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*, to cognizant system engineers. Formal training qualification requirements have been established, including initial training and annual continuing training in accordance with an engineering technical staff training program, and systems training developed and administered at the business-unit level. Cognizant system engineers who were interviewed during this inspection had received the required training and they demonstrated good knowledge of their assigned systems.

In addition to establishing a systems engineering program, WSRC has taken a number of other steps to assess safety systems. However, as discussed in Appendix F, there were deficiencies in some aspects of design/testing of safety-class systems that indicate that the assessments and system engineer approach are not yet providing the necessary critical examinations of systems that are vital to safety.

SR

OA's review of the SR programs for safety-system oversight determined that the assignment of engineers to monitor the operability of safety systems has been a longstanding practice at SR. DOE, in its latest correspondence with DNFSB, indicated that SR was fully staffed with the SMEs needed to fulfill its oversight responsibilities. Although a commitment of significant engineering resources to the review of authorization basis documents submitted by WSRC pursuant to 10 CFR 830, Subpart B, has reduced the frequency of field walkdowns and assessments by SR engineers in recent years, these assessments have continued, and results have been combined with FR observations in bi-monthly reports. The current SR safety-system oversight function includes routine assessments of system configuration and condition.

SRSO

Although the system engineers are not yet formally required, SRSO has some aspects of safety-system oversight in place. However, the safety-system oversight function is not fully developed in SRSO. Safety-system oversight by SRSO is performed primarily by FRs as part of their routine assessment activities. A recent staffing change reduced the number of technical engineers from two to one, and implementation of DNFSB Recommendation 2000-2 is just one of several responsibilities assigned to the remaining technical engineer. Detailed duties, responsibilities, and authorities have not been assigned and training and qualification requirements have not been established within the SRSO for safety-system oversight functions. SRSO management is taking action to define the responsibilities, training, and qualifications based on guidance being developed by DOE Headquarters.

Summary. WSRC has implemented applicable requirements, provided appropriate training, and has knowledgeable engineers assigned to appropriate systems. Although requirements for DOE have not yet been issued, engineering assessment of safety systems has been a longstanding practice in SR, and SR is taking steps to strengthen this oversight by establishing more formal responsibility assignments and qualification requirements. SRSO has not developed a formal system for safety-system oversight. Although most elements of safety-system oversight are in place, deficiencies in safety-system design and testing are evident (see Appendix F).

C.2.4 Legacy Hazards

EM/SR and WSRC have a systematic approach for addressing legacy hazards, from both the sitewide perspective and the facility-level perspective. Significant recent management attention—from EM to SR to WSRC—has been focused on accelerating the cleanup.

As part of reengineering EM management priorities for the SRS, the "AREA Closure" unit concept was developed to help prioritize legacy hazard management and cleanup priorities for SRS. According to this concept, all AREAs are identified on an integrated schedule for sequencing closure activities. AREAS closest to the SRS site boundary, in general, are being scheduled first because of their proximity to the public and because these AREAS were generally not as challenging from a hazard perspective (thus allowing refinement of techniques in less hazardous conditions), have no future operational missions, and currently have no operational needs.

The sitewide priorities reflect the future need for facilities and the fact that many AREAS identified for eventual closure still have ongoing or planned operational activities to support cleanup. Thus, while F-Area would be considered a more hazardous AREA than other AREAS that are undergoing D&D earlier (e.g., M and TNX) because of the nature of the operations that were performed there, F-Area still has ongoing operations to process nuclear materials (nuclear stabilization activities), and thus F-Area is only in the beginning stages of deactivation, as compared with such AREAS as M and TNX, which are well along in the D&D/cleanup process.

The first step of implementing the AREA closure concept was to restructure and re-bid the SRS management contract. This occurred in August 2003, and the new contract focused on endpoint closure milestones/dates and prompted the contractor and SR to transition to the project-oriented approach to management. The new approach caused a significant increase in D&D activities. The current contract period calls for D&D of about 250 buildings. Many of these buildings are in the M, TNX, and 700 Areas, and other less hazardous buildings are in other AREAS. Due to the significant increase, WSRC recognized a need to bring in additional D&D expertise and selected a contractor with previous D&D experience (at Rocky Flats) to provide support.

The approximately 250 buildings identified for D&D under the current contract were all surveyed to determine legacy hazard issues and establish any needed priorities. With the exception of 247F, all were determined to have similar (non-radiological) hazard characteristics/risks. Only 247F presents higher hazards, such as radiation, chemicals (e.g., HF and UF_6), perchlorates (chemical explosive concerns), and nuclear material holdup issues (presenting critical concerns, albeit small).

The 247F building is the most hazardous facility SRS has performed D&D on to date. This facility will be the "model" and training ground to tackle the more hazardous buildings in the near future. Lessons learned will be incorporated into future D&D efforts. As part of contract incentive for WSRC to demonstrate that they can manage D&D/cleanup, SR placed significant importance on WSRC deactivation of F-Canyon and demolition of 59 F-Area buildings.

Currently, final negotiations with the State regulators are ongoing to approve the AREA closure concept that is now being implemented at SRS. In addition, the *Risk-Based End States Vision* document is in revision (based on feedback from EM headquarters) to more clearly depict the methodology and endpoints for SRS closure, including the basis for the cleanup endpoints. One of the key aspects of the long-term plan is a decision that the Federal government will be the owner and operator of SRS for the long term (>300 years). If this decision is made, the cleanup endpoints will be based on the recognition that the land will not be open to the public, but controlled by the government, such that cleanup endpoints would be less restrictive. Also, if this decision is made, a Congressional decision is needed to declare the

Federal Government's commitment as the owner/operator for the long term for the State regulators to relax the cleanup standards now in effect.

Since the site is in transition, many key actions are ongoing to address legacy hazards and allow closure on an AREA basis to proceed. These actions typically include consolidation of nuclear materials, such as moving all spent fuel to one storage facility, allowing the remaining facilities to be scheduled for deactivation. The consolidation of spent fuel has already occurred with the movement of spent fuel to K Reactor. Final nuclear materials stabilization activities are also needed prior to deactivation of F-Canyon and FB-Line. The site has made significant progress towards completion of the DOE implementation plan for the DNFSB recommendation on stabilization of nuclear materials. One of the key activities was the removal of americium/curium materials in F-Canyon, placing it in high-level waste tanks for processing in DWPF.

Legacy hazards involving waste or potential waste storage in facilities awaiting D&D have been evaluated and scheduled for work off. The D&D project has performed a walkdown of all waste storage areas holding low-level waste, mixed waste, or hazardous waste and has begun the process to dispose of the waste after characterization. Facilities holding these waste areas were also walked down to ensure that miscellaneous containers were moved into conforming storage. Only a few containers not in the designated storage areas were discovered, and these containers were processed. The few hazardous waste areas were already under proper management at the "M" area. A broad evaluation determined that no special hazards were present and therefore all legacy waste is being disposed of when characterization is completed.

Across the site, legacy mixed waste totaling 600 cubic meters has been added to a Site Treatment Plan as part of the Federal Facility Compliance Act agreement with the State. As part of the accelerated contract, SRS has committed to dispose of 95 percent of the mixed waste on the Site Treatment Plan by FY 2006, after the mixed waste streams are fully characterized and a path for disposal is determined.

C.3 CONCLUSIONS

Although a few areas warrant further enhancement, EM/SR, NNSA/SRSO, and WSRC have a mature ISM program and most aspects of the institutional programs are effective. With some exceptions, clear roles and responsibilities have been established and communicated to responsible staff. The processes for establishing requirements and incorporating them into work instructions are effective. While SRS organizations have undergone significant reorganizations, the transitions have not adversely impacted the generally effective processes for managing R2A2s and requirements.

SR and WSRC have devoted significant resources and attention to the systems engineering approach in accordance with new and pending DOE requirements. Although the systems engineering approach is meeting DOE requirements, it did not identify some deficient conditions with safety-class systems.

SRS organizations have a systematic process for identifying and prioritizing legacy hazards. Progress on D&D has been accelerated significantly as a result of management efforts, including a new site contract.

C.4 RATINGS

The ratings of the guiding principles reflect the status of the reviewed elements of the SRS program.

Guiding Principle #2 – Clear Roles and Responsibilities .... EFFECTIVE PERFORMANCE
Guiding Principle #5 – Identification of Standards and Requirements.......EFFECTIVE PERFORMANCE

C.5 OPPORTUNITIES FOR IMPROVEMENT

This OA inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are intended to be reviewed and evaluated by the responsible line management, and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

SR

1. **Establish requirements for systematic assessment of the WSRC system engineering program.** Specific actions to consider include:

   - Assign responsibilities for routine oversight of WSRC system engineering performance.

   - Periodically integrate routine oversight findings to assess effectiveness of the WSRC system engineering program.

SRSO

1. **Update and formalize processes to reflect SRSO's current organization and interfaces with SR.** Specific actions to consider include:

   - Develop a management system description to describe SRSO management processes (i.e., lessons learned, employee concerns, equal employment opportunity, and technical assessment support) and its relationship with SR and with Headquarters organizations.

   - Incorporate the SRSO Functions/Assignments Matrix into the management system description.

   - Work with the NNSA Service Center (per the service agreement) to get position descriptions in place to support the office, recognizing that assignment to appropriate Technical Qualification Program functional area qualifications (for the new office positions) is triggered by completion of the position description process.

   - Qualify the two new senior/key positions (Systems Engineer and Facility Manager) as STSMs.

   - Establish and formalize an approach to oversight of safety systems and the WSRC system engineering program. Select systems requiring safety-system oversight and assign roles and responsibilities for providing this oversight. Coordinate with SR to develop roles, responsibilities, and qualification requirements and to assess the effectiveness of the WSRC system engineering program.

WSRC

1. **Assess and enhance processes for ensuring that ES&H requirements are included in subcontracts and working-level instructions.** Specific actions to consider include:

   - Consider using a checklist of potentially applicable requirements as an aid in developing requisitions and contracts for subcontracts.

- Provide more specificity in company-level engineering requirements for periodic safety-system reviews. Consider specifying requirements for frequency of reviews and documentation of results.

APPENDIX D
Feedback and Continuous Improvement (Core Function 5)

D.1 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) evaluated feedback and improvement programs at the Savannah River Site (SRS). The organizations that were reviewed included the DOE Headquarters Office of Environmental Management (EM), National Nuclear Security Administration (NNSA), EM's Savannah River Operations Office (SR), NNSA's Savannah River Site Office (SRSO), and Westinghouse Savannah River Company (WSRC).

This OA inspection focused on feedback and improvement programs as they are applied to environment, safety, and health (ES&H) programs at the following facilities and activities selected for review on this inspection:

- Deactivation and decommissioning (D&D) projects, focusing on projects at 246F and 247F performed by WSRC at the direction of EM/SR and the SR Assistant Manager for Closure Projects (AMCP)

- H-Tank Farm activities performed by WSRC at the direction of EM/SR and the SR Assistant Manager for Waste Disposition Projects (AMWDP)

- Tritium Facilities (232H, 233H, 234H, 238H, and 264H) activities performed by WSRC under NNSA/SRSO direction.

The OA team examined the EM/SR and NNSA/SRSO line management oversight of integrated safety management (ISM) processes and implementation of selected line management oversight functions, including the Facility Representative (FR) program, ES&H assessments, oversight procedures, self-assessments, the issues management process, the lessons-learned program, and the employee concerns program. The review of SR focused on AMCP and AMWDP, with primary focus on the organizational elements within AMCP that have responsibility for the projects at 246F, 247F, and 241-1M, and the AMWDP organizational elements with responsibility for the H-Tank Farm. The OA team reviewed WSRC processes for feedback and continuous improvement and implementation of those processes, including assessment processes, corrective-action/issues management, lessons learned, injury and illness investigations, and employee concerns.

D.2 RESULTS

D.2.1 SR Line Management Oversight

SR historically has had a comprehensive and well-designed process for oversight of contractors. Some aspects of the program are mature and effective. However, some of the SR oversight processes are in transition because of the reorganization of SR and WSRC. In addition, the new approach to site operations, which includes a project-oriented approach to managing facility cleanup and accelerated schedules, has prompted SR to reevaluate its approach to oversight of its contractors. SR recognizes that the frequencies and approaches used in the past do not necessarily represent the optimal use of line oversight resources for the project-oriented approach in which the cleanup progresses through various phases, which involve different degrees of risk.

The SR process for reorganizing its oversight is designed to provide a more streamlined and integrated approach to oversight of contractor safety performance that is compatible with the new contract. SR reports that the new approach will include an overall strategy/management systems document, a single integrated assessment plan, a single reporting and issues management database, and a revised set of procedures. An SR task team is currently working to develop the new program.

In the interim, SR is implementing a number of oversight activities including a technical assessment program, an FR program, a self-assessment program, and an employee concerns program. These activities are in various states of transition and are operating at different levels of effectiveness, as discussed below.

Technical Assessment Program. The technical assessment program encompasses a number of activities, including ES&H assessments and management walkthroughs. The program is well documented, and the procedure provides sufficient guidance and requirements for development and implementation of the annual assessment plans and deficiency categorization and reporting. For example, management walkthrough program expectations (e.g., total hours per month and techniques) are generally defined in the procedure, and each assistant manager is expected to appoint a walkthrough coordinator, set goals, and monitor performance to ensure that expectations are met. Issues identified during the walkthrough are to be communicated to the appropriate FR and contractor point of contact for follow-up and action.

SR recently issued an annual assessment schedule, which reflects all planned assessment activities for FRs, subject matter experts (SMEs), and ES&H institutional assessments. Numerous technical assessments and surveillances are scheduled and being conducted by SMEs assigned to line organizations. Technical assessment program results are integrated with results of FR activities and are formally reported to WSRC for review and action, on a periodic basis. SR oversight activities appropriately review ongoing contractor assessments. This approach has enabled SR to monitor and evaluate the effectiveness of the contractor's assessment processes. For example, an independent SR team was established to monitor and assess the contractor's integrated safety management system (ISMS) reverification assessment. One instance in the emergency management area was identified in which required assessments were not being performed by SR in accordance with DOE requirements (see Volume II).

SR defines the general requirements for each of its line organizations to perform line oversight assessment and operational awareness activities for facilities and WSRC programs within its area of management responsibility. Some elements of the technical assessment program are being effectively implemented by the AMCP and AMWDP organizational elements that were reviewed. For example, walkthroughs are being conducted, with results and assessment hours being reported by assistant managers as required by the site procedures for both organizations. However, as discussed below, the two assistant manager organizations that were reviewed during this OA inspection are at different levels of maturity and development for some of the elements of the current line oversight program.

AMWDP has a relatively stable management team and was not dramatically affected by the reorganization. Consequently, AMWDP has a relatively mature organization and is continuing to perform assessments and operational awareness activities in accordance with established processes. In general, AMWDP is effectively implementing the processes and is performing assessments that identify substantive issues. AMWDP assessments cover an appropriate spectrum of ES&H programs, including conduct of operations program elements, lockout/tagout, hoisting and rigging, Occurrence Reporting and Processing System (ORPS) reporting, the temporary modification program, the unreviewed safety question (USQ) process, and the management self-assessment program. In addition, AMWDP reviews nuclear safety programs and identifies design issues (e.g., errors in design calculations and modification packages) and communicates them to WSRC. The high level of rigor and attention reflected in

AMWDP's review of facility and design aspects as part of its line oversight processes exceeds the focus on design elements observed by the OA team in most other DOE oversight programs.

AMWDP effectively communicates results of assessments to WSRC and requires written responses and actions. Since January 2003, assessment results have been rolled up into a single report and regularly issued to the responsible WSRC managers at DWPF and high-level waste operating projects. The documentation indicates that AMWDP has identified substantive issues and prompted a number of corrective actions and improvements within the WSRC waste management operations. For example, AMWDP elevated performance issues associated with material transfer events and identified a programmatic concern with the waste material transfer program, which have led to a number of improvements at the affected tank farm facilities. AMWDP also identified several performance issues in DWPF, including implementation of the temporary modification program, the rigor of some USQ screenings, and adequacy of alarm response procedures. AMWDP performs appropriate follow-up of the WSRC written responses to AMWDP concerns and adequately documents their follow-up activities in the bi-monthly reports.

AMCP was formed as part of the reorganization and is thus a relatively new organization, with many new managers. In addition, AMCP has responsibility for performing assessments and operational awareness of closure projects, which involve extensive D&D and other such activities that are different from the facility operations for which most SR oversight processes were designed. AMCP is currently in the process of establishing its organization functions and adapting oversight processes to its organization. These efforts are in various stages of maturity and effectiveness.

Some AMCP oversight processes are functioning adequately and contributing to enhancements in ES&H programs at the facilities and activities under AMCP purview. For example, the FRs and assigned project managers were actively involved in oversight of 247F project activities, and SME involvement in biohazard evaluation, control, and monitoring has been extensive. Although still evolving, communication and formal reporting processes of oversight activities are functioning adequately, and AMCP oversight concerns for D&D work are being communicated to the contractor. For example, AMCP identified concerns with inadequate isolation of hazards (one involved the cable cutting at 247F) and a number of poor work practices in such areas as personal protective equipment and unauthorized work. Based on these concerns, WSRC initiated a number of actions (e.g., an improved work control process, training/expectations for first-line supervisors and craft, and development of a self-assessment strategy).

However, a number of AMCP oversight processes are in the early stages of implementation. Although there is limited performance data to verify their effectiveness, these processes are appropriately designed and have the potential to further improve AMCP oversight. AMCP recently established "DOE-Area Closure Project Teams" to better integrate the activities of project managers, FRs, and SMEs for D&D and soil and groundwater projects. Assessment planning, reporting, and corrective action tracking processes have been recently established. AMCP recently issued an annual assessment plan, and SMEs are currently performing assessments of nuclear safety bases and fire protection in accordance with the assessment plan. The AMCP plans reflect a number of enhancements. For example, the FR coverage of D&D projects is based on a graded approach that considers the hazards associated with facility D&D efforts; this approach appropriately increases the amount of FR coverage of AMCP facilities/projects (compared to the recommended baseline coverage per the SR procedure) to reflect the changing and unpredictable nature of hazards at facilities undergoing D&D.

In addition to AMCP efforts, SR is taking a number of appropriate sitewide actions to strengthen the effectiveness of the technical assessment program. These include revising the procedure to: (1) reflect SR organizational changes, (2) reflect new requirements for a single integrated annual assessment plan, (3) provide clear identification of required technical assessments, and (4) increase the responsibilities and expectations of the Technical Assessment Program Committee, which is chartered to monitor the effectiveness of the program and to make recommendations for improving the program.

Currently, each SR line management organization (e.g., AMCP and AMWDP) has its own assessment and issues tracking processes. OA's review indicates that the AMCP and AMWDP organizations are actively tracking and following up on issues and verifying corrective actions, in most cases. However, an ongoing SR initiative (i.e., to develop a single issues management database) will facilitate trending and development of meaningful performance indicators for the entire technical assessment program.

Facility Representative Program. The SR FR program is mature and effective in most respects. The program is well documented and the procedure provides sufficient guidance and requirements for development and implementation of an FR assessment plan, FR coverage, and deficiency categorization and reporting. SR has established the FR Council, which is an effective mechanism for sharing information and lessons learned among FRs at SRS and between the FRs and contractor facility managers.

FRs for both AMCP and AMWDP are implementing the FR program requirements consistent with the FR procedure. FRs for both organizations are well qualified and knowledgeable of the facilities, work processes, and safety performance for areas under their purview. FRs are well integrated into the contractor's daily activities and have established a good working relationship and trust with their facility manager counterparts and contractor staff.

Self-Assessment. SR has established a self-assessment program and an independent assessment function to evaluate the effectiveness of SR ES&H management systems. A few self-assessments have been conducted and documented. SR conducted an internal program review and appropriately identified areas of improvement in its processes for conducting oversight of the WSRC emergency management program (see Volume II). SR also examined some of its line oversight processes as part of the ISM reverification. In addition, SR committees, such as the FR Council, Technical Assessment Program Committee, and Nuclear Safety Council, perform some elements of a self-assessment function through overseeing the implementation of their assigned program by the various SR line organizations. SR also recently conducted an external assessment of SR safety culture to determine the extent to which SR employees understand the importance of safety in conducting work and ensuring effective avenues exist for raising safety issues.

However, the SR self-assessment processes are not sufficiently comprehensive and are not being fully implemented as required by SR procedures. Although required by the technical assessment program procedure, SR has not performed self-assessments of its technical assessment program in several years. The triennial assessment of the FR program, required by the FR standard, is overdue. This assessment was previously assigned to the SR Performance Assurance Group, which conducted independent assessments of SRSO operations, but this group was eliminated as part of the SR reorganization. Discussions with several SR managers and staff indicated that line organization self-assessments are not currently being conducted as required by the SR self-assessment procedure. The 2004 schedule of assessments reflects only assessments of SRS contractors, and does not include any assessments that focus on SR activities.

In addition, some elements that support the self-assessment program have not been effectively established in accordance with the SR self-assessment procedure. Performance indicators for the self-assessment program have not been established and utilized. Annual evaluations of the self-assessment program have not been performed and documented. Some SR line organizations have not developed self-assessment plans and schedules as required. Some planned 2003 self-assessment activities were not completed as scheduled.

Recently, the SR Organizational Evaluation and Improvement team, established as part of the SR reorganization, was assigned responsibility for conducting independent assessments of internal SR activities. This team is taking actions to enhance the self-assessment processes at SR (e.g., assessment plans and schedules are to be conducted in accordance with the technical assessment program procedure) and has initiated or scheduled assessments of several key SR functions, such as the employee concerns program and project management. However, the current assessment plans and schedules do not address many important SR technical programs, such as the technical assessment program, the FR program, nuclear safety oversight, emergency management, and Federal Employee Occupational Safety and Health. In addition, the Organizational Evaluation and Improvement team lead position is currently vacant, although SR management is in the process of filling this position. SR plans to revise its self-assessment procedure to reflect organizational changes and changes in self-assessment approaches.

Finding #1: The SR self-assessment program is not effectively implemented in accordance with the SR self-assessment program procedure, and SR self-assessment processes do not provide for sufficient independent internal assessment of SR technical programs and their implementation.

SR management is aware of a need to improve the effectiveness of self-assessment processes and programs for assessing SR internal operations. A number of actions are ongoing to redefine the SR self-assessment process. For example, the SR Manager has directed (per a December 2003 memorandum to assistant managers and office directors) the SR Office of Environment, Safety, and Health to develop formal and technical assessment plans for contractor oversight and self-assessment of SR work consistent with SR's May 2003 *EM Project Oversight and Assessment Policy*.

Employee Concerns Program. SR has an effective employee concerns program. The program is well defined and provides sufficient guidance, including a well-defined tracking system for case files and management actions in response to investigations. Information about the program is appropriately disseminated to employees through posters and training.

OA's review of records and discussions with the employee concerns program manager indicate the program is being effectively implemented. SR investigations were thorough. SR personnel have appropriately reviewed the results of investigations that were referred to WSRC, and the employee concerns program manager regularly reports the status of the program to the SR Manager.

SR has not yet updated its reporting processes to reflect the recent reorganizations and contractual arrangements. However, personnel are familiar with the process, and the outdated references have not resulted in performance problems.

D.2.2 SRSO Line Management Oversight

Although SRSO is organizationally separate from SR, SRSO relies on SR for support in a number of sitewide feedback and improvement processes (e.g., lessons learned and employee concerns). The results of the evaluation of SR employee concerns processes and SRS lessons-learned programs are discussed in Sections D.2.1 and D.2.3, respectively.

In addition, SRSO uses many of SR's oversight processes, including the FR procedure, the technical assessment program, and the self-assessment procedure. As discussed above, SR is enhancing some of these processes and SRSO may benefit from the enhancements. However, as discussed in Appendix C, some of the SR processes no longer accurately reference the current organizations and need to be updated. As discussed in the following paragraphs, SRSO implementation of the SR processes has some weaknesses.

The SRSO FR program is mature and effective in most respects. FRs are well integrated into the contractor's daily activities and have established a good working relationship and trust with their WSRC facility manager counterparts and staff. The SRSO FR assessment program is performed in accordance with the SR procedure guidance for type and frequency, and most assessments were completed on time. However, the scope and rigor of FR assessments is questionable based on a review of the last six months of FR assessments. SRSO had not identified findings or concerns (as defined by Savannah River Implementing Procedure [SRIP] 430.1) in any FR assessments in the past six months.

In addition, there were numerous worker safety concerns in a construction area for which NNSA/SRSO has responsibility (see Finding #7 in Appendix E). Although SRSO has assigned an FR to the tritium extraction facility, the FR has performed limited reviews to date, and no deficiencies have been identified. However, the FR plans to intensify oversight activities as the facility nears the start-up phase. Other oversight personnel had not identified the deficiencies in the construction area either. SRSO has coordinated with WSRC to have construction safety personnel perform reviews, but these reviews were not effective in identifying and correcting deficient conditions.

SRSO's implementation of the technical assessment program does not fully meet SR procedural requirements. One of the three assessments due (as of February), in accordance with the annual plan, was not completed on schedule. For the completed assessments, SRSO did not have documentation of validation of finding closure and subsequent verification of effectiveness, as required by the SR procedure. Management walkthrough monthly roll-up reporting, which is required by the SR procedure, has not been accomplished since May 2003, and the results of previous walkthroughs are not readily accessible. There are also concerns that the planned technical assessments may not be completed on schedule. Ten of the 14 scheduled SRSO technical assessments listed in the 2004 plan are to be performed by technical personnel who have already left SRSO, or will be leaving in the very near future. It is not clear that remaining technical personnel will be able to absorb the planned assessments.

Deficiencies are also evident in SRSO's self-assessment program. SRSO does not have an annual self-assessment plan or an annual evaluation of the self-assessment program, although both are required by the procedure. SRSO has not performed a formal self-assessment of its internal operations since its inception. The last self-assessment of the SRSO self-assessment program was narrowly focused (accomplishment of annual plan commitments) and was performed approximately two years ago by an SR organization that no longer exists. SRSO is in the process of developing a self-assessment program in accordance with recent NNSA guidance.

SRSO issues management, commitment tracking, and corrective action tracking processes are not sufficiently rigorous or comprehensive. SRSO currently has a mixture of formal and informal processes. A formal process (action assignments and tracking) defines SRSO staff action with the capture of commitments and actions into the SRSO Action Tracking Log, but this system is limited in scope. The lack of formal commitment tracking and corrective action tracking processes was identified in previous assessments in 1999 and 2002 as being weaknesses. SRSO does use regular meetings (e.g., the Defense Programs weekly status meeting) as a means of tracking issues and actions. The informal SRSO Current Hot Topics and Events Process contributes to the identification, communication, coordination, and closure of some office issues and commitments. However, findings tracked by these informal mechanisms do not benefit from root cause analysis or trending. SRSO can and does utilize the WSRC Defense Programs Corrective Tracking System for some findings.

SRSO recognizes the current weaknesses in commitment tracking and corrective action tracking processes. The SRSO Deputy Manager has developed a concept that he intends to formalize in a formal SRSO procedure. SRSO personnel also indicate that the recent NNSA guidance on the development of a self-assessment program is likely to drive SRSO to develop its own corrective action tracking system.

Finding #2: SRSO feedback and improvement processes, including FR assessments, technical assessments, self-assessments, and corrective-action/commitment management, are not sufficiently comprehensive and do not fully meet applicable requirements.

D.2.3 WSRC Feedback and Improvement

Assessments. WSRC has established and implemented the framework of a comprehensive safety assessment program comprised of safety inspections/walkthroughs, management work observations, topical self-assessments, functional area and facility/organizational management evaluations of programs and performance, and comprehensive independent assessments of facilities, organizations, and projects. Requirements for a formal, integrated assessment program have been defined in institutional policies and procedures to establish sitewide consistency in assessment of ES&H performance. Site procedures specify that formal, periodic management evaluations be conducted, typically annually, by the various assessment units to review and analyze recent assessment and performance data to determine the scope and focus of future self-assessment activities. Organization managers are required to develop detailed assessment plans establishing the bases, approach, methods, and frequencies for implementing self-assessments for a specific period. Line and support organizations are conducting a variety of planned self-assessments ranging from routine safety inspections to structured evaluations of specific processes or performance. WSRC management has clearly communicated the expectations and requirements for management presence in the field monitoring work processes.

At the tritium facilities and H-Tank Farm, management has established effective programs where operations and maintenance managers conduct frequent, documented work activity observations and coaching, often on weekends and backshifts. Numerous assessments of the elements of conduct of operations are conducted in these facilities. These programs provide excellent opportunities for managers to regularly observe actual field conditions, work control process effectiveness, and worker performance and promote direct communication between workers and management. However, guidance provided to personnel conducting these activities focuses on operational efficiency, with little mention of the need to monitor safety performance and communicate safety performance expectations. The results of these activities are adequately documented and verify that procedural and physical condition deficiencies and performance weaknesses are being identified and corrected. Self-assessments at the tritium facilities are focused on addressing the mandatory assessments of specific performance objectives and criteria delineated in an institutional source and compliance document. This document details performance objectives and criteria for evaluating 23 functional areas and includes assessment elements required by regulatory authorities and DOE orders. Fifteen to twenty self-assessments of performance and processes are scheduled by the D&D project based on the results of annual management evaluations conducted by a team of functional area managers with input from senior management. These assessments also focus on addressing the performance objectives and criteria in the site compliance document. Team assessments of functional/topical areas are effective elements of the H-Tank Farm assessment program.

The WSRC assessment program also requires that programmatic-level self-assessments be conducted by functional area program managers and topical SMEs. Assessments of programs that must meet regulatory or DOE order assessment requirements, such as radiological protection, environmental compliance, employee concerns, and Occupational Safety and Health Administration (OSHA) lockout/tagout, are being completed as required, with sufficient scope and rigor.

The cornerstone of the WSRC assessment program is an independent assessment program that conducts numerous comprehensive and rigorous evaluations of individual projects, organizations, and safety programs. These assessments, conducted by multidiscipline teams of experienced personnel called Facility Evaluation Boards, use structured and consistent criteria and protocols to evaluate implementation of the principles and core functions of ISM. Fifteen of these independent evaluations were conducted in calendar year (CY) 2003. Management at all levels relies on the results of these independent assessments to monitor and judge safety performance and to focus their self-assessment efforts.

Notwithstanding the number and variety of assessments being performed by WSRC, several aspects of the assessment program are not being implemented effectively, and some aspects of safety programs and performance may not be sufficiently monitored. Management evaluations, performed by organizations and functional area managers, and functional area assessments are not scheduled consistently, performed when required, or in compliance with site procedure requirements. Most management evaluations do not document any details of the required analysis of Facility Evaluation Board reports and assessment issues, and some do not indicate the resulting changes in assessment focus, as required by the site procedure. A management evaluation of the safety and health functional area was not conducted in 2003. WSRC management has identified deficiencies in management evaluations and has developed a new performance analysis process to address them (discussed further below).

Since the reorganization, self-assessment activities in the Facility Support Services Division, the institutional ES&H Department, and the D&D project have not been implemented as required by site procedures. Although some self-assessments are being performed in individual functional areas, such as radiological protection and environmental compliance, no departmental schedule or plan has been developed for the support organizations, and few assessments of crosscutting processes had been performed. Although a 2003 assessment schedule was developed for occupational safety and health, few functional/topical area assessments have been performed. The adequacy of processes and performance for topical areas (e.g., hearing protection, forklift operations, hoisting and rigging, or lead handling) are not being regularly planned, scheduled, or performed. For example, the sitewide implementation of such processes as issues management and self-assessment had not been assessed. Implementation of the Price-Anderson Amendments Act (PAAA) program was last assessed in 1999. Although some safety and health program elements are evaluated individually to some extent by the Facility Evaluation Boards, many subject areas have not been assessed and there is no collective evaluation of sitewide performance for many of the various elements of the safety and health program. The reduction in institutional ES&H staff and distribution of ES&H personnel to line organizations may have contributed to a lessening of institutional ownership for these common functional areas and a corresponding reduction in oversight of performance. Although it was clear that institutional staff owned the sitewide processes, the responsibility and authority to ensure effective implementation was not clearly defined or understood. In the D&D project, only 3 of the last 17 scheduled self-assessments in CY 2003 were conducted, and none had been conducted since August 2003. WSRC management at the tritium facilities monitors performance regularly and directs reactive assessments, and many routine work evolution observations address a variety of ES&H elements and the institutionally specified performance objectives and criteria. However, topical/functional area assessments are not formally planned and scheduled on a periodic basis.

A lack of rigor in the performance of assessments is indicated in some areas. WSRC tritium facilities personnel, personnel from the WSRC teaming partner who have responsibility for construction, and construction subcontractor safety personnel conduct many routine walkdown inspections of construction area conditions and activities at the tritium facilities and other construction areas. However, numerous and obvious unsafe conditions and practices were evident in construction areas (see Appendix E). Contractor inspection records indicated that few safety issues were being identified during walkdowns, and DOE had not identified separate findings or issues related to current construction activities.

In response to recent changes at SRS, including a new contract structure, major reorganizations, a recent radiation exposure event, and other safety concerns, WSRC senior management directed a sitewide ISMS Phase I and II reverification effort, which was completed in January 2004. The review concluded that SRS was continuing to implement an effective ISM program, but identified several opportunities for improvement. A senior management panel was formed to evaluate data from the event investigation, the ISMS reverification results, and other sources and to develop and manage corrective actions. The panel issued a Review and Integration Team report in February identifying five broad opportunities for improvement, including several issues identified by the OA team, such as weaknesses in hazards analysis, feedback and improvement, and the understanding of stop-work expectations. An October 2003 management review of recent issues and events also reflected awareness of many issues identified by the OA team.

Finding #3: WSRC has not established and implemented a fully effective assessment program that consistently evaluates performance, especially for crosscutting safety and health and institutional safety management processes.

Issues Management. WSRC has established an adequate sitewide corrective action policy that addresses management of safety issues identified by the following defined set of sources: other WSRC processes and programs, including PAAA non-compliances; stop-work orders; self-assessments; independent assessments; and externally generated issues resulting from such processes as operational readiness reviews and accident investigations. Another issue documentation vehicle within the scope of this policy is the problem identification and resolution process, which provides a sitewide format and process for documenting deficiencies in quality assurance and radiological protection programs and issues identified by ORPS. The policy specifies the requirements for managing these problems in a tailored and consistent manner that includes a significance determination, analysis of the problem, identification of corrective actions and lessons learned, effectiveness reviews and recurrence controls for significant issues, and tracking to closure. The management and tracking of problems within the scope of this policy is the responsibility of the various line and support organizations. Each organization reviewed by the OA team used one or more tracking systems that included safety issues and management elements specified in the scope of the sitewide corrective action policy.

WSRC has established a sitewide corrective action policy, safety issues are documented and evaluated, and corrective actions are developed, implemented, and tracked to closure in many cases. However, effective management of this critical feedback information is being hindered by weaknesses in process and implementation. Weaknesses in the corrective action program include the following:

- The rigor of management and documentation of issues and corrective actions varies in quality across WSRC organizations and projects, and the current fragmented sets of data make analysis of overall performance at SRS for many ES&H topical areas difficult, especially on a sitewide basis.

- Some safety deficiencies are excluded from the scope of the corrective action policy either by definition, interpretation, or inconsistent application of the process. The site policy defines its applicability based on the specified listing of processes that can identify deficiencies. For example, deficiencies resulting from non-ORPS-reportable injuries and illness are not included. Injury and illness issues are not specifically included in the policy, and the formal critique process, which would be within the scope of the policy, is not typically used for these investigations. The inclusion of safety issues resulting from some other self-assessment activities are subject to interpretation also, such as management walkthroughs, work observations, health and facility safety inspections, and construction safety inspections. The current D&D tracking system procedure also excludes DOE, environmental, emergency preparedness, and OSHA findings (among others), which is not consistent with the site corrective action policy.

- The site corrective action policy does not provide sufficient guidance to clarify the distinctions between significance categories, especially between Category 3 (i.e., "minor impact" on safety) and Category 4 (i.e., "some impact" on safety). The lack of guidance and non-conservative categorizations by organizations results in a distribution of the issue classifications such that few issues are being subjected to the PAAA screening, identification of recurrence controls, and the effectiveness reviews, which are required for only the top two categories. Of the thousands of categorized items in the organizational tracking systems of D&D, H-Tank Farm, and tritium facilities during the last two years, less than a dozen have been rated in the top two categories. Of the 600 problem identification reports written in CY 2003, 97 percent were categorized as Category 3 or 4.

- Some deficiencies have not been adequately managed in accordance with site policy and procedural requirements, resulting in incomplete analysis, corrective actions, or recurrence controls. The D&D hearing protection program performance deficiencies identified by the OA team in Appendix E are longstanding, repetitive issues that have not been effectively addressed to prevent recurrence. Three D&D self-assessments in 2003 and the autumn 2002 Facility Evaluation Board report identified deficiencies in the D&D hearing protection program, two of which were identified as a systemic problem. This repetitive programmatic issue was not identified on a problem identification and resolution report, as required by site procedures; several of the corrective actions resulting from one of these assessment findings remain open more than six months later; and the completed actions and findings to date have not prevented recurrence. A recent incident involving personnel incorrectly exiting a contamination area and traversing buffer areas with contaminated materials and anticontamination clothing was not documented on a problem identification and resolution report. The site-level ES&H organization prematurely closed individual corrective actions for a Category 3 problem identification and resolution report before line personnel had completed the identified actions.

- At the Tritium Facilities, several issues were incompletely addressed or incorrectly closed. An event where an exhaust ventilation damper was found out of position in a glovebox room undergoing modification that was documented as closed had no documentation of any analysis, corrective actions, or final resolution. The tracking database documentation did not specify any detail of the work control processes involved, the details of what work was ongoing, in what position the damper was found, why it was not a reportable item, the corrective actions taken, or any recurrence controls. A tracking system entry for a post-job review corrective action had not been assigned a due date and the software did not trigger this as an action to be worked by the assigned individual. As a result, the action was not taken. An action for another issue was identified in the database as corrected on the spot (i.e., actions completed), but the text indicated that a procedure change needed to be initiated. The procedure had not been revised, and a change request had not been initiated.

- Correction and closure of safety issues are not always timely or appropriate. D&D recently closed or deleted numerous overdue Category 4 corrective actions from their tracking system because corrective actions need not be taken for Category 4 issues. However, many of these were valid deficiencies or lessons learned for which corrective action was appropriate. Nineteen D&D issues and 65 corrective actions dating back to March of 2002 were overdue at the time of this inspection.

- Some safety issues identified through investigations of injury and illness incidents have not been effectively managed as discussed below.

- Deficiencies in emergency management had not been fully addressed and resolved because of weaknesses in casual analysis, corrective action identification, and recurrence controls (See Volume II).

- For the WSRC Defense Programs organization, which has responsibility for the Tritium Facilities, assessment activities have contributed to good safety performance in the tritium operations but have not identified numerous worker safety deficiencies in construction projects. Similar worker safety deficiencies were also evident to a lesser extent in construction-like activities performed by the WSRC tank farm and D&D organizations. Although assessments had been performed in construction areas, corrective actions and recurrence controls were not sufficient to prevent numerous deficiencies (see Appendix E).

Finding #4: WSRC has not established and implemented a fully effective issues management process that consistently evaluates performance, identifies adverse trends and root causes, and prevents recurrence through appropriate actions.

A new process for conducting performance analysis is being developed and is scheduled for a phased implementation by June 2004. This new process is intended to consolidate much deficiency data into a sitewide system and improve the analysis of assessment findings for both individual organizations and projects and collectively for the SRS. An element of this process, called the Site Tracking, Analysis, and Reporting (STAR) system, will provide a single database for documenting safety issues. Another element of this process will require semiannual analysis of data by organizations, and quarterly analysis on a sitewide basis. Although this new process holds promise to address some of the weaknesses identified by the OA team and WSRC management, there are several limitations in the process as currently structured. For example, the scope of issues covered by the corrective action program is still defined in terms of the source of the problem, rather than the significance or categorization of the issue. For example, injury and illness incidents are specifically excluded from applicability of the corrective action process. The new process does not address the currently insufficient guidance in the corrective action policy regarding significance determinations, specifically the differentiation between Categories 3 and 4, or requiring the specification of recurrence controls for only the very few issues identified as Category 1 or 2. The new revision of the site corrective action policy incorporating the new performance assessment tracking system process refers to a canceled DOE directive implementation instruction.

Injury and Illness Investigations. Injury and illness statistics for SRS reflect that recordable and lost workday case rates are among the lowest in the DOE complex and have been improving for several years. Workers are directed to report all injuries and illnesses to supervisors and are evaluated and treated by the site medical clinic or referred to personal or local medical services. Injuries and illnesses are documented on standard report forms, and injuries determined to be OSHA-recordable injuries are documented on DOE accident/injury report forms, which include a statement of the corrective actions taken and those recommended. Investigations and the determination of corrective/preventive actions are performed by line management, and supported by their area safety specialists. The institutional safety reporting office staff process cases and are responsible for classifying and reporting in accordance with OSHA and DOE requirements. Documentation reviewed by the OA team indicated that classifications and record keeping were appropriate. The safety reporting office maintains and conducts trending of injury and illness data to inform management of performance and identify adverse trends. The institutional ES&H department has used these analyses to identify adverse trends and unacceptable numbers of certain injuries and has initiated remedial actions. For example, in July 2003, an adverse trend was identified in slips, trips, and falls, and a safety presentation developed by the safety and health staff was routed to business unit communicators for dissemination to the workforce.

Some injuries and exposures occurring during the past year at SRS were not consistently evaluated with sufficient rigor to clearly identify root and contributing causes and drive effective recurrence controls. Many of the reported, individual injury and exposure incidents are uncomplicated results of routine work activities (e.g., bumps, cuts, slips, strains, and ergonomic complications). However, a smaller set of incidents involve more complex work activities or reflect weaknesses in such ISM functions as work planning and control mechanisms. Although site procedures provide sufficient guidance and direction for line management to conduct thorough investigations of injury and near-miss incidents, the approaches and level of rigor applied in a sample of event investigations reviewed by the OA team varied significantly and often did not fully address important aspects of the events. Non-ORPS-reportable injury and illness events are not required to be managed in accordance with the site corrective action program and are specifically excluded by the draft procedure revision for the new performance assessment program. In most cases, formal critiques were not conducted to document and assess incident conditions, and problem identification and resolution reports have not been used to document deficiencies and resolutions. Preventive actions typically were limited to internal (local to the affected organization) lessons learned shared at safety meetings or in a reading program. Examples of instances where corrective actions and recurrence controls were insufficient include (see Finding #4):

- Investigation of a worker injury involving improperly restrained waste drums that slid off a hydraulic lift tailgate of a truck did not address the adequacy of vehicle maintenance or inspection of equipment, although it determined that the tailgate was damaged before the event. Further, the investigation did not address the need for safety chains or more rigor in work planning or supervision.

- No specific action was taken for an injury where a worker stepped through a thin plywood sheet, which was painted such that it looked like steel covered a hole in a grating. A behavior-based safety observation report of a reenactment of the event was generated, but it contained no directed actions.

- The investigation of an OSHA-recordable incident where a radiological protection inspector inhaled nitric acid fumes when responding to an operational incident did not address contamination questions, a number of management errors, or incident response processes and training. The only corrective action was an informal lessons learned.

- The investigation of an OSHA-recordable burn sustained by a construction worker doing a start-up test on a fabricated boiling water tank did not adequately identify causes and recurrence controls. A number of corrective actions were taken to improve the design of the tank to prevent recurrence during normal operations. However, the investigation determined that it was an isolated incident of an engineer failing to implement proper procedures, and concluded that no further action was required, although this incident was discussed at a subsequent monthly construction manager safety meeting. It did not identify any corrective actions to address the fact that the tank was being built and tested without work control documents, hazard identification, or specified controls. It did not address such issues as whether there was sufficient supervisory oversight or why the crafts person performed the work without proper procedures.

The latest assessment related to line management corrective actions for injury and illness incidents was conducted in March 2000. This assessment was limited to determining whether corrective actions specified on the DOE injury/illness report forms had been completed, and did not evaluate the adequacy of the investigation processes or the appropriateness of the specified actions. No findings were identified, and WSRC performance was identified as in compliance with procedural requirements. SR had conducted a recent assessment, and the site safety reporting organization had conducted several recent self-assessments of line and site-level record keeping, processing, and reporting of injuries and illnesses but did not address the management of corrective actions.

Lessons Learned. WSRC has established and implemented a comprehensive, well-documented lessons-learned program, which is identifying, communicating, and implementing many lessons learned, including lessons from external sources and those learned from SRS incidents and activities. The site-level lessons-learned staff continuously screens a large population of externally generated lessons from a variety of sources for applicability to SRS. Functional area managers and SMEs conduct further reviews of lessons identified during the initial screening before lessons are drafted and disseminated for information or action. The lessons reviewed and the resulting evaluations are documented in a comprehensive database. In CY 2003, WSRC issued 106 lessons learned to project/support lessons-learned coordinators, including one Bulletin (for which DOE required a response), nine Notifications (for which WSRC requires a formal response from projects/organizations), and 96 Special Information Notices (no response required from recipients). Twenty lessons learned from SRS events and work activities were forwarded to DOE to share complex-wide. Issued lessons learned are well written, comprehensive, and tailored to the processes, organizations, and activities at SRS.

When recipients are directed to take actions the feedback is documented in the site database, providing a means to efficiently collect information and assurance that the required actions are taken. The database provides potential users a comprehensive, searchable source for issued lessons, and links to national sources. Lessons-learned coordinators responsible for the facilities and projects reviewed by the OA team maintained records of internal reviews and actions, the generation of lessons learned for application within the line organization, and communication to the site or to the DOE complex. The coordinator for the H-Tank Farm had developed a comprehensive and effective database to track evaluations and actions. OA verified that the Tritium Facilities have entered all 10 CY 2003 lessons learned from the site lessons-learned coordinator that required feedback into their commitment tracking system and included detailed documentation of the results of inspections/analyses by facility SMEs/responsible managers. Documents in all line organizations reviewed by the OA team reflect that lessons learned are being routinely communicated to managers and workers. For several years, managers and lessons-learned staff and coordinators have worked to continuously improve the effectiveness of the SRS lessons-learned program through reengineering of processes, self-assessment, and a currently ongoing improvement team.

Although the lessons-learned program is generally strong, a few aspects of the program could be more rigorous. Lessons learned that have limited rather than sitewide applicability, described by SRS as "noteworthy," are sent only to the specific affected group SME or coordinator, without any feedback or formal documentation of applicability reviews or actions taken. Many of the reviews documented by functional area managers and SMEs do not clearly indicate applicability to SRS (e.g., no definitive statements indicating what process or conditions would preclude the event from happening at SRS). The OA team identified several instances where lessons learned with potential generic applicability were developed and disseminated only within a project and were not forwarded to the site coordinator for broader dissemination.

Employee Concerns Program. WSRC has established and implemented an employee concerns program that generally conforms to the expectations in DOE orders and associated guidance and provides an effective avenue for workers to voice and obtain objective evaluation and resolution of ES&H concerns. This program is advertised through posters, initial new-hire and annual refresher training, and a website. SRS workers are encouraged to report and seek resolution of safety concerns through their supervisors, but several other mechanisms are available for workers to report their concerns. With minor exceptions, the evaluations and documentation of concerns, evaluations, contacts, resolutions, and communication of findings with the concerned individual were thorough and appropriate. Annual program self-assessments are conducted as required by DOE order. Monthly status reports are provided to senior management, and WSRC employee concerns program management meets regularly with the WSRC president. Furthermore, there is evidence of routine interactions with the DOE employee concerns staff.

However, several examples of deficiencies in the investigation and documentation of employee concerns were identified by the OA team review. The documentation in packages for two CY 2002 concerns did not reflect that they had been reopened at the request of DOE, as identified on the employee concerns status database. The packages indicated that the cases had been closed and did not contain documentation that any additional work had been done since July 2003. For another closed package, the name of the concerned individual was disclosed to line and support organizations unnecessarily when confidentiality had been requested, and the actions did not respond to concerns expressed by the concerned individual. In another closed case, the investigation did not fully address the basic concern that an organization was deterring the reporting of injuries. Although the investigation package contained a detailed evaluation of the example cited in the concern, concluding that the concern was at least partially substantiated, the fundamental issue cited in the concern was not addressed.

Other Feedback Mechanisms. In addition to the various formal elements of the WSRC assessment program, other feedback mechanisms have been established to provide continuous improvement. WSRC has established an extensive and effective behavior-based safety observation program that provides real-time feedback to workers on at-risk or safe behaviors and collective identification and correction of safety performance weaknesses. This program is worker-owned and strongly supported by management. There are over 4,000 trained observers who conducted over 15,000 observations in CY 2003. Thirty-four local safety improvement teams, all chaired by non-exempt employees, manage the behavior-based safety process in various organizations and evaluate observations for common themes and adverse trends. There is evidence that actions have been taken to address systemic issues identified through behavior-based safety observations. All WSRC managers have been trained as observers so they understand the process and purpose.

The automated hazards analysis (AHA) procedure refers to conducting post-job reviews, provides a form to document these reviews, and assigns responsibility to the facility/project AHA champion to review random evaluations to confirm the effectiveness of the AHA feedback process. However, it does not clearly specify when post-job reviews are to be performed or assign responsibility to perform them. Few AHA post-job reviews are being documented by the H-Tank Farm or the D&D project, which is aware of this weakness and has incorporated more rigorous controls on post-job reviews in a new work control process procedure scheduled to become effective in March. Tritium facilities workers and supervisors conduct formal, documented post-job reviews for some complex tasks or projects where major difficulties were encountered to provide feedback to work package planners and management. The Tritium Facilities have documented 15 post-job reviews in a database over the last year and a half with assigned actions that are tracked to completion. However, required post-job reviews are not being conducted for more routine work activities. For example, although tritium preventive maintenance work packages contain a section soliciting feedback from mechanics on several work process elements, none of the work packages reviewed by OA contained any feedback from workers.

D.3 CONCLUSIONS

SR oversight is adequate in most respects, and some elements are mature and effective, such as the FR program and the employee concerns program. However, some elements of SR assessments have been impacted by reorganizations and the processes are not fully adapted to the new organizational structure, particularly in AMCP. In addition, the SR self-assessment program is not functioning effectively across SR. SR has a good handle on the current weaknesses, and appropriate actions to address them are ongoing or planned.

Some elements of SRSO oversight are adequate (e.g., FR coverage of tritium operations), and SRSO performs some assessments of WSRC tritium operations. However, SRSO oversight is not sufficiently comprehensive and does not adequately address construction activities. In addition, some FR assessments, self-assessments, and corrective-action/commitment management are not always implemented in accordance with some of the applicable site-specific requirements.

WSRC has established and implemented many effective feedback and improvement processes, resulting in continuous improvement in many areas and at all facilities evaluated by the OA team. WSRC has established and implemented the framework of a comprehensive safety assessment program comprised of safety inspections and walkthroughs, management work observations, topical self-assessments, functional area and facility/organizational management evaluations of performance, and rigorous and comprehensive independent assessments of facilities and organizations. WSRC has also established and implemented a comprehensive, well-documented lessons-learned program, an extensive and effective worker-owned and management-supported behavior-based safety observation program, and an effective employee concerns program. However, the adequacy of some safety programs and performance may not be sufficiently evaluated because of weaknesses in assessment processes and implementation. WSRC has established a sitewide corrective action policy; safety issues are documented and evaluated; and corrective actions are developed, implemented, and tracked to closure. However, effective management of this critical feedback information is being hindered by process and implementation weaknesses. In addition, the causes of incidents resulting in injury and exposures, and the appropriate recurrence controls, are not always fully determined.

D.4 RATING

Core Function #5 – Feedback and Continuous Improvement .... NEEDS IMPROVEMENT

D.5 OPPORTUNITIES FOR IMPROVEMENT

This OA inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are offered to the site to be reviewed and evaluated by the responsible line management, and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

SR

1. **Enhance and formalize the self-assessment program.** Specific actions to consider include:

   - Ensure that self-assessment procedures are revised as needed and that managers are accountable for fully implementing them.

   - Ensure that responsibilities are assigned to the appropriate organizations and that interfaces are established among SR organizations to facilitate the conduct of self-assessments of SR activities.

   - Reevaluate self-assessment priorities and schedules.

   - Consider a self-assessment of SR oversight of construction and construction-like activities to determine how to better promote improvements in worker safety. Also consider assessment of SR technical programs, such as the technical assessment program, the FR program, nuclear safety oversight, emergency management, and Federal employee occupational safety and health.

SRSO

1. **Enhance assessment processes and implementation in the areas of commitment/corrective action management, self-assessments, and FR assessments.** Specific actions to consider include:

- Update procedures and instructions to reflect the current organization, and develop supplemental implementing procedures or documentation for processes that utilize SR procedures.

- Develop and implement formal corrective action tracking and commitment management processes.

- Evaluate the current FR assessment program, increase its technical rigor, and improve its value to the organization.

- Evaluate the current SRSO technical assessment program and either make adjustments to conform to SRIP 223.4 or develop an SRSO implementing procedure that meets NNSA guidance and results in a formal and effective technical assessment program.

- Consider a web-based tool to support the management walkthrough/assessment program so that results are readily available to both SRSO and the WSRC Tritium Facilities.

- SRSO should develop a formal and effective self-assessment process that addresses NNSA guidance and SR processes. Consider a timely self-assessment of SR oversight of construction and construction-like activities to determine how to better promote improvements in worker safety.

WSRC

1. **Ensure that sitewide performance for crosscutting processes and occupational safety and health programs and topical areas are sufficiently evaluated.** Specific actions to consider include:

   - Use the performance analysis of issues as a supplement to, not a substitute for, planned and scheduled, structured, periodic, horizontal reviews of performance for ES&H topical areas and administrative safety management processes.

   - Ensure that under the new STAR performance assessment process line management conducts meaningful, in-depth management reviews of the qualitative aspects of performance monitoring data in addition to statistical, quantitative analysis.

   - Employ ES&H topic-specific planned assessments, scheduled on an appropriate frequency, to evaluate performance and processes at the tritium facilities and at an institutional, sitewide level.

2. **Strengthen issues management processes and performance to ensure that safety problems are consistently evaluated with sufficient rigor to ensure that effective corrective actions are taken and that recurrence controls are implemented where appropriate.** Specific actions to consider include:

   - Ensure that the population of problems subject to the new STAR tracking system are clearly defined and understood. Focus issues management attention on the significance and nature of the problem rather than the source.

   - Publish guidance to aid in establishing proper and consistent significance categorization of safety problems.

   - Establish a review process to ensure accurate and consistent categorization by implementing organizations and provide ongoing monitoring of the implementation of corrective action policy requirements. Consider establishing a Corrective Action Review Board (or Boards) of counterparts and program managers/SMEs, a process that has been used successfully at several DOE sites.

- Ensure that the correct message is being communicated regarding the evaluation of safety issues. Add guidance and direction to the site corrective action policy that encourages the use of informal processes to identify root and contributing causes whenever possible.

- Consider lowering the threshold for requiring the development and implementation of recurrence controls. As a minimum add guidance and direction to the site corrective action policy that encourages the consideration of recurrence controls for all deficiencies where appropriate.

- Add the development and implementation of corrective actions and recurrence controls to the supervisor/employee injury/illness flowchart in procedure 18 of Manual 8Q, *Reporting, Responding, Investigation and Recording of Occupational Injury/Illness or Near Misses.*

- Ensure that the new sitewide database for documenting safety problems is not encumbered with the tracking of commitments and other non-deficiencies that detract from or obscure meaningful performance assessment.

3. **Strengthen the site injury and illness reporting procedure and processes.** Specific actions to consider include:

- Provide more guidance and direction for conducting and documenting the investigation of injuries and exposures such that appropriate and consistent rigor is applied for incidents where deficiencies in the implementation of ISM principles and functions are apparent.

- Establish a more formal process for screening, review, and oversight of line management injury and exposure investigations by safety and health professionals, at least for incidents with potential ISMS deficiencies.

4. **Further strengthen lessons-learned and employee concerns programs through additional guidance and increased rigor.** Specific actions to consider include:

- Apply the established lessons-learned analysis and documentation processes to the limited-scope (e.g., "noteworthy") lessons learned.

- Add more structure to project/organizational lessons-learned processes to encourage sharing of internal lessons learned across organizational boundaries. Provide incentives for sharing this information.

- Establish more formal guidance and direction for the conduct of post-job reviews, including completion of the AHA post-job review form. Establish a formal review or monitoring process or regular self-assessments to encourage this feedback from workers and supervisors.

- Apply additional rigor to documenting employee concern investigation details and status in investigation packages.

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APPENDIX E
Core Function Implementation (Core Functions 1-4)

E.1 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) evaluated work planning and control and implementation of the first four core functions of integrated safety management (ISM) at selected Savannah River Site (SRS) facilities and activities. The OA review of the ISM core functions focused on environment, safety, and health (ES&H) programs as applied to selected facilities, organizations, and activities.

The assessment of ISM Core Functions #1 through #4 at SRS focused on three types of activities, and encompassed work performed by the Westinghouse Savannah River Company (WSRC)—including WSRC teaming partners and subcontractors—under the direction of the DOE Office of Environmental Management (EM)/Savannah River Operations Office (SR) and the National Nuclear Security Administration (NNSA)/Savannah River Site Office (SRSO). These three types of activities are:

- Operations, maintenance, construction, and facility modifications at the H-Tank Farm performed by WSRC at the direction of EM/SR (see Section E.2.1)
- Deactivation and decommissioning (D&D) projects at selected facilities, including 246F and 247F, performed by WSRC at the direction of EM/SR (see Section E.2.2)
- Operations, maintenance, and construction at the Tritium Facilities (232H, 233H, 234H, 238H, and 264H) performed by WSRC under NNSA/SRSO direction (see Section E.2.3).

For all three areas, OA examined waste management and environmental compliance activities, reviewed procedures, observed ongoing operations, toured facilities, observed equipment operations, interviewed managers and technical staff, reviewed interfaces with ES&H staff, and reviewed ES&H documentation (e.g., permits and safety analyses). Specific OA team activities and work observed in the three areas is discussed further in the respective results sections. As one of its focus areas, OA also examined electrical intrusions at the site level and selected facilities (see Section E.2.4). The review was predicated on the number of electrical penetration and excavation events across the DOE complex, which contributed to an OA decision to identify energetic/electrical intrusions as a focus area.

Although SR and SRSO are separate organizations with different reporting chains, WSRC performs work for both SR and SRSO under a single contract. With respect to the core functions, WSRC has established common policies and procedures for ISM that are implemented by all organizations on site. These include established work control and hazards analysis processes. One process in particular, the newly implemented automated hazards analysis (AHA) program, has become a key mechanism for ensuring that hazards are appropriately identified, analyzed, and controlled. Primarily procedure developers and work planners use this computer-based system, with assistance from other subject matter experts, to analyze the hazards associated with work and identify the applicable controls.

SRS environmental programs include the "Green is Clean" program, which provides workers with a process for keeping non-radioactive sanitary waste segregated from low-level radioactive waste. This program was effectively implemented at all three areas reviewed. It provides a means to reduce the volume of low-level waste by controlling the introduction of non-contaminated waste into low-level waste containers. In the radioactive buffer areas, containers are provided with green bags for clean waste, thus preventing this waste from becoming contaminated (packing material, cotton glove liners). Also, items that could incorrectly indicate radioactive waste, such as radioactive labels or tape, are placed into certified non-radioactive “green” bags for disposal as sanitary waste in a public landfill.

Overall, SRS has a mature, well-defined approach to the ISM core functions. Within that ISM framework, however, the team did identify six findings. The findings are presented below for easy reference, because the observations leading to these findings are addressed in more than one of the three areas reviewed. The results section for each of the three areas reviewed includes appropriate references to the applicable finding.

Finding #5: WSRC has not established adequate mechanisms to ensure that controls identified in the AHA are effectively integrated into work activities and implemented prior to performing the work. (Primarily Core Function #3, but also Core Function #1 and the Electrical Intrusion section)

Finding #6: WSRC radiological control personnel have not consistently performed radiological air monitoring in accordance with established procedures, as necessary, to verify protection from exposure to airborne radioactivity and demonstrate continued adequacy of the site’s current annual routine bioassay technical basis. (Primarily Core Function #3)

Finding #7: Construction and subcontractor personnel are not always rigorously and consistently implementing construction safety requirements, resulting in unsafe conditions and practices that could cause injury. (Primarily Core Function #4)

Finding #8: D&D workers and their supervisors do not always recognize inadequately analyzed hazards as potentially unsafe conditions, and consequently do not resolve the discrepancies in accordance with site procedures and management expectations. (Primarily Core Function #4)

Finding #9: WSRC is not analyzing and documenting occupational exposures to some hazards (noise, hazardous chemicals, and beryllium) in accordance with the requirements of DOE 440.1A and site requirements. (Primarily Core Function #2, but also Core Function #3)

Finding #10: WSRC is not conducting effective as-low-as-reasonably-achievable (ALARA) reviews in accordance with site procedures in connection with D&D project work. (Primarily Core Function #3)

E.2 RESULTS

E.2.1 H-Tank Farm

All of the high-level liquid waste produced at SRS to date is stored in 49 waste tanks in the F and H Tank Farms. Approximately 100 million gallons of high-level waste has been concentrated by evaporation to a present volume of approximately 37 million gallons. The insoluble solids settle and accumulate on the bottom of the storage tanks (referred to as sludge). Liquid above the sludge is concentrated by evaporation to reduce its volume. In addition to waste storage, H-Tank Farm also serves as the sludge feed supply to the Defense Waste Processing Facility, where the sludge is immobilized into borosilicate glass.

The OA review focused on both routine and non-routine activities at the H-Tank Farm. Routine activities observed at H-Tank Farm included operator rounds and Control Room operations, radiation control personnel monitoring activities, and activity hazards analysis meetings. Non-routine activities observed included facility and construction work supporting a 3H evaporator modification, diversion box work, and response to adverse weather conditions.

Core Function #1 – Define the Scope of Work

Most H-Tank Farm activities have good frameworks in place for defining the scope of work, and most design and work processes are effectively implemented. Facility documents, such as maintenance and construction work packages, design change packages, radiation work permits (RWPs), and task-specific implementing procedures, provide definitions of process-level work activities sufficient to allow the identification of hazards. For example, the design change notice for the 3H evaporator seal pot modification provides detailed descriptions and drawings of the work in sufficient detail to be able to perform a comprehensive hazards analysis for the activity.

The facility documents are used to develop specific AHA scopes of work for subsequent hazards analysis. Most AHA scopes of work were accurate. However, in some cases, the insufficient definition of specific subtasks within the AHA resulted in an inability to adequately identify and analyze the hazards unique to the specific tasks of the job. For example, while noise hazards were known to exist on certain jobs, they were linked only to the overall job and not to a specific activity or subtask. Consequently, for some assigned tasks, workers may not be able to identify the applicability of listed controls at the appropriate point in the job sequence. The lack of definition of specific subtasks contributes to the deficiencies discussed in Core Function #3 and Finding #5.

Summary. Processes have been implemented for defining the scope of work at the H-Tank Farm, and most activities have adequate work scopes defined. However, some specific AHA subtasks are not sufficiently described to ensure that appropriate hazards analysis is tailored to the specific activities.

Core Function #2 – Analyze the Hazards

The site's AHA process provides a comprehensive method of performing activity hazards analyses and was recently implemented at the H-Tank Farm for all facility activities, including operations, maintenance, and construction. While the site is still on a learning curve for implementing the AHA process, it generally results in a comprehensive hazards analysis, requires involvement of the appropriate ES&H professionals, and identifies a comprehensive list of controls. For example, safety, industrial hygiene, and radiation control personnel, as well as Waste Generator Certification Officials, are routinely involved in the process. For the most part, the AHA administrative procedure establishes the appropriate mechanism to ensure that the AHA comprehensively analyzes activity-level hazards and identifies an appropriate control set.

The AHA team process at H-Tank Farm provides an effective forum for the applicable subject matter experts to ensure that all hazards and appropriate controls are identified. For example, the AHA team meeting addressing Tank 11 slurry pump runs was well attended by the appropriate ES&H professionals, and the meeting resulted in a comprehensive multidisciplinary hazards analysis of the activity.

Some specific hazards, such as the presence of dimethyl mercury, have presented unique challenges to H-Tank Farm in recent years. In June 2001, elevated elemental mercury vapor levels were detected in the 3H evaporator service building during a routine survey. The levels of mercury vapor were not anticipated based on the operating experience from the 2H and 2F evaporators. Further research by the Savannah River Technology Center suggested the presence of both elemental and dimethyl mercury, which has a lower exposure limit than elemental mercury. To gain a better understanding of the dimethyl mercury hazard, SRS committed significant resources to the identification and analysis of the dimethyl mercury hazard. For example, formation testing continues to be conducted by the Savannah River Technology Center and an offsite analytical laboratory. Investigative sampling to detect the presence of dimethyl mercury continues at selected areas (e.g., H and F Areas). Blood and urine samples from 85 workers (on a voluntary basis) have also been analyzed to determine whether any workers have been adversely exposed to airborne concentrations of dimethyl mercury.

Although the AHA process is comprehensive in its approach to hazards analysis, WSRC has not taken advantage of the opportunity to incorporate some known and prominent site hazards into the AHA question set. For example, the AHA question set includes general questions about biological hazards or chemical use, but does not address some previously identified hazards, such as mold exposure or exposure to dimethyl mercury. Mold had been discussed in June 2003 for possible inclusion in the AHA question set, but site industrial hygiene management determined that there were too many variables in mold management strategies to include mold in the AHA at that time. While specific control strategies may be dependent on the facility or condition, the identification of mold as a specific hazard in the AHA question set would trigger the necessary analysis and determination of the necessary mold controls.

Summary. The AHA process provides a comprehensive method of performing activity-level hazards analyses and has been effectively implemented at the H-Tank Farm. Additionally, the dimethyl mercury hazard unique to tank farms has received a considerable amount of analysis, although the results of this analysis have not been incorporated into the AHA question set.

Core Function #3 – Develop and Implement Hazard Controls

The AHA process provides a comprehensive system for identifying appropriate ES&H controls for activity-level maintenance and operations. The WSRC AHA process applies to maintenance and construction work packages as well as new and revised technical procedures and all but the most basic maintenance tasks. For example, the maintenance and construction AHAs for the 3H evaporator modifications included controls addressing industrial safety topics (e.g., ladder safety and fall protection), industrial hygiene topics (e.g., hearing protection and confined space atmospheric monitoring), radiation control topics (e.g., RWP requirements and contamination control methods), and waste management topics (e.g., interim waste storage locations and use of the Green is Clean program).

In addition to the AHA process, the suite of controls at H-Tank Farm includes elements from safety basis documents, operations procedures, waste management programs, radiological control, and specific controls for other unique hazards, such as dimethyl mercury. Aspects of these controls are further described below.

Safety basis administrative controls include an approved documented safety analysis, complete with comprehensive technical safety requirements. Implementation of the technical safety requirements at H-Tank Farm is effective, with good operator knowledge and awareness of ongoing plant conditions affecting the safety basis controls. In cases where safety basis limiting conditions of operation action statements are implemented, H-Tank Farm effectively uses a computerized limiting conditions of operation tracking program that ensures that all actions are addressed and associated completion times are tracked.

The SRS conduct of operations manual establishes a program for strict adherence to procedures and lays out appropriate management expectations regarding preparation and use of procedures. H-Tank Farm technical procedures are generally accurate and complete. With one exception, the procedures were well written and contained the appropriate information and level of detail to safely perform the tasks. In the one exception, an abnormal operating procedure had two conditional step errors and a non-conservative sequence of immediate actions. Facility management took prompt action to initiate a revision to correct the identified deficiencies.

Waste management activities are prevalent for many H-Tank Farm operations, and most waste activity controls were in place and effective. These included the Green is Clean program and control of satellite, mixed, and low-level waste areas. In addition, H-Tank Farm has developed a Waste Handling Guide for Generators that provides easy-to-use instructions and photographs to ensure proper waste management. This guide uses layman terms and photographs to demonstrate what is required and where the waste management areas are located. Applicable procedures are referenced in the guide and examples of forms are provided.

Many activities at H-Tank Farm involve unique and recurring radiological protection challenges, including the potential for both internal and external exposure to ionizing radiation. The radiological organization at H-Tank Farm provides coverage for all activities and is staffed with professional health physicists and radiological planners as well as radiological operations supervisors and radiological control inspectors. Radiological control inspectors in H-Tank Farm were visible and provided job-specific radiological coverage for most observed operation, maintenance, and construction work evolutions, including performance of radiological surveys and assisting workers in proper radiological practices. The Radiation Control Organization (RCO) first-line supervisors were also present during work evolutions to monitor radiological activities and provide direction to their staff.

Some jobs involve the potential for relatively high external dose rates for a short duration. To track worker exposures in these conditions, H-Tank Farm uses electronic pocket dosimeter monitoring software, an innovative and proactive ALARA control that allows RCO support personnel to monitor worker doses in real time while work is being performed. For example, this system was used during construction activities in support of the 3H evaporator modifications. Electronic pocket dosimeters used by the workers are directly linked to a computer stationed outside the work zone, allowing RCO supervisors to track dose rates and accumulated doses in real time and adjust personnel and “stay times” accordingly. While alarming dosimeters are prevalent and widely used, use of this type of technology with real-time monitoring by support personnel constitutes a noteworthy practice.

H-Tank Farm facility management has dedicated significant resources for the control of worker exposures to dimethyl mercury since the initial detection of dimethyl mercury in 2001. For example, in January 2003 a new ventilation system was installed at the 3H evaporator that encloses sample stations and provides local exhaust at emission points within the receiver cell. A comparable modification is planned for the 2H evaporator. An air sampling campaign for the detection of dimethyl mercury continues throughout the 3H and 2H Tank Farms, and local exhaust systems for waste tanks continue to be monitored for dimethyl mercury. Administrative controls, such as barricades and shift orders, have been in place at the H-Area Lift Station, the 2H evaporator, and ETP since the discovery of dimethyl mercury. In addition, a mercury task force was established to coordinate the various ongoing dimethyl mercury analyses and hazard control projects.

As indicated in Core Function #2, the AHA process is a positive and effective hazard identification tool. However, while the AHA process is effective in identifying hazards for a given activity and linking them to a comprehensive set of controls, WSRC does not have processes, accountability mechanisms, or unique responsibility assignments to ensure that each control identified in an AHA is appropriately implemented. The administrative procedure controlling the AHA process gives the workers the responsibility for reviewing and understanding all AHA controls, but does not provide a mechanism to ensure that the workers read and understand the AHA. The procedure also places responsibilities for the adequacy of controls on the lead work group supervisor; however, there is no mechanism to ensure that non-procedure controls, such as engineering controls, training, postings, and other administrative controls, are implemented. Further, there is no mechanism to ensure that controls unique to the task, such as constructing a containment hut, are differentiated from the more routine institutional safety requirements, such as seat belt use and proper ergonomic lifting techniques. Additionally, the AHA process does not always integrate safety controls into the work process used by the workers. Although the AHA is a hazards analysis and identification tool, identified controls are not systematically or consistently integrated into the work instructions for construction or maintenance activities. Instead, the AHA is included in the work package as a separate work instruction document (see Finding #5).

Certain controls, such as some industrial hygiene and radiological controls, are not specified within the AHA but are delegated by reference to the appropriate group responsible for evaluating and implementing the control or permit. For example, industrial hygiene monitoring is often left to the discretion of the Industrial Hygiene organization, and air sampling requirements are left to the discretion of the RCO. In some cases, ES&H personnel did not adequately implement controls in accordance with specific site requirements or procedures as discussed below. The more significant observations in this area contribute to the referenced findings that are listed in Section E.1:

- Industrial Hygiene personnel routinely assess exposures to hazardous chemicals at the H Area Tank Farms, and monitoring and sampling data, when conducted, is documented in an industrial hygiene database. However, in some cases, exposure assessments, such as qualitative risk assessments, have not been performed or documented in accordance with the 4Q Manual, DOE guidance documents, or accepted industry practices. In other cases, the 4Q Manual lacks adequate guidance on initiation and conduct of exposure assessments (see Finding #9).

- During a cell entry at the 3H evaporator using supplied air suits, there was no representative job-specific air sampler in place before the construction workers entered the cell, as required when using respiratory protection. When questioned, the RCO erroneously believed that the sampler was only needed during the line break and not for the entry. Following the questioning, a radiological control inspector began to prepare a sampler to place into the cell; however, at that point, workers had already been in the cell for over one hour (see Finding #6).

- Radiological control inspectors covering the 3H evaporator seal pot work did not initially survey the filter paper of the boundary air samplers with field instruments upon entry into the working platform area to ascertain whether unexpected airborne radioactivity was present at the beginning of the day's work, as required by procedure.

- A job-specific boundary air sampler, used to verify that there is no need for airborne radiation area posting, had been running for several days; however, according to procedure, this type of sample should be changed out at the end of each shift.

- Not all ALARA reviews in H-Tank Farm included all the information or level of detail required by the ALARA review procedure (e.g., descriptions and planning considerations).

- Sanitary waste containers located next to radioactive work areas had no labels for prohibited items, which could result in radioactive material indicators such as radioactive signs or other trash containing radiological markings going into the container.

- Used cotton glove liners were being discarded into small Green is Clean-labeled containers without the required green bags in the containers within the radiological buffer area.

While radiological controls are mostly accurate and clear, a few examples were identified where the controls lacked sufficient technical basis or specificity for proper implementation. For example, the RWP and ALARA review for the 3H evaporator seal pot work did not specify a need for extremity dosimetry or a rationale for not requiring it, despite listed extremity dose rate estimates of 500 millirems per hour (mrem/hr). The 500-mrem/hr value was an error on the RWP, so extremity dosimetry was not required, but the RWP was never corrected. In the DB5 jumper removal work package, work instructions and the RWP placed a restriction on open-cell activities to only those times when wind speeds are less than 8 miles per hour. This statement was highlighted in multiple instances in the work package; however, the wording did not match the RCO intent and interpretation of the requirement, which was for sustained wind speeds rather than gusts.

Summary. H-Tank Farm has been successful in identifying hazard controls through the AHA process as well as established procedures and programs. However, implementation of the AHA process is relatively new and does not have an established method to ensure that all identified controls are properly implemented. Additionally, ES&H personnel sometimes did not adequately implement controls in accordance with site requirements or procedures. Increased management attention is needed to ensure that all controls specified in AHAs and procedures are effectively implemented.

Core Function #4 – Perform Work Within Controls

At H-Tank Farm, readiness to perform work is effectively verified and controlled through plan-of-the-day schedules, morning meetings, shift manager approvals, crew briefings, and pre-job briefs. The published plan of the day is used to authorize the day's work as well as to plan for the next few shifts. The morning meetings were particularly effective for providing first-line supervisors and support organizations management expectations for the day's work. For example, the H-Tank Farm facility manager publishes a daily priority list of activities and communicates these priorities during the morning meeting, thereby clearly and effectively communicating senior management expectations each day to the entire facility. Additionally, pre-job and pre-shift briefings for H-Tank Farm projects involved supervisors and workers and effectively communicated most work hazards and controls to the workers.

H-Tank Farm workers generally performed activities safely and in accordance with established controls. For most observed work, workers performed operations in accordance with the appropriate work packages, procedures, and administrative requirements. In one case, an operator performed appropriate alarm response and abnormal condition actions in accordance with the procedure and demonstrated effective command/control and conservative decision-making characteristics when concurrent high activity storm water alarms and tank leak indications were received during severe weather conditions (freezing conditions, heavy rain, and lightning). In most cases, operators properly completed logs and round sheets. During work observations, workers performed waste activities in accordance with SRS, DOE, and environmental regulations for mixed and radioactive waste, including Green is Clean requirements. Workers interviewed were also fully aware of their stop-work authority and indicated they would use it if an imminent danger situation arose.

Although most observed work was performed safely, construction workers and supervisors failed to follow several established ES&H requirements. During observed 3H evaporator outage work, several workers violated hard-hat posting requirements during times when the overhead crane was in motion, and other workers placed their bodies directly underneath a crane load and failed to follow fall protection requirements while unhooking the crane load. On separate occasions, two different workers removed a rope barricade and entered areas around the portable breathing air compressor without the required hearing protection that is posted on the warning tags. The number of observed safety violations by workers with supervisors present may indicate a growing complacency in attention to detail with regard to safe work practices. Construction management took prompt action to address these immediate observations; however, the SR Facility Representatives have made these types of observations previously on several occasions. For example, SR issued findings in May and July 2003 on similar safety deficiencies observed during tank transfer preparation activities and Tank 41 transfer pump work. This trend of construction deficiencies at H-Tank Farm and other areas discussed in this report may indicate that increased attention by management is warranted in this area (see Finding #7).

The OA team observed other isolated instances of individuals not following established requirements. In one case, a shift supervisor did not implement appropriate log entries and notifications following a decision to approve deviation from an immediate action step in an abnormal operating procedure. The shift supervisor made a conservative and safety-conscious decision to not place a worker in a hazardous condition (icy conditions and lightning) to complete the step. However, the shift supervisor did not document and report the justification for his decision to implement the authority to deviate from procedures, as required by the conduct of operations manual. In another case, RCO personnel issued extremity dosimeters to several workers at 3H evaporator based on a perception that it was needed and past practice for cell activity rather than follow the RWP, which did not require it. In a third case, construction workers at Tank 32 had placed construction debris in a container specifically designated for scrap metal. Finally, a pre-job brief was informative and formal but did not identify all controls associated with the specific work package steps or the specific AHA controls applicable to the work.

Summary. In most cases, readiness to perform work is effectively verified, and with the exception of some construction activities, workers generally performed work in accordance with established controls. The number of instances of construction workers failing to follow safety requirements at tank farms and other areas addressed by this report, coupled with recurring similar findings by the DOE Facility Representatives, indicates that increased management attention is needed to ensure that construction work is performed in a safe manner.

E.2.2 Deactivation and Decommissioning

As SRS continues to be reshaped for future missions, EM and SR have increased their emphasis on D&D of older buildings that are not needed to support these future program activities. Although the D&D program has been in formulation for a number of years, substantial D&D activities did not begin until early calendar year 2003. In March 2003, the site began to infuse D&D expertise, personnel, and lessons learned from the Rocky Flats Plant and other DOE sites undergoing D&D to enhance the SRS D&D program. Currently, over 1,000 structures and buildings at SRS have been scheduled for deactivation and/or decommissioning. A number of these facilities, such as the 246F building, are in the final stages of demolition. Other facilities that contain legacy radiological materials, fissile materials, and hazardous chemical hazards present the greatest challenges to D&D work activities. The 247F building is one such facility that poses legacy hazards and is in the early stages of deactivation, and it serves as an SRS prototype for future D&D activities for facilities with significant hazard potential.

The OA team's observations for this review focused primarily on deactivation work in progress at the 247F building, although some activities were observed at 246F. While D&D work practices are based on sitewide work control systems, such as those established for maintenance and construction, many elements of the current D&D work practices are evolving as WSRC addresses different types of legacy hazards and incorporates lessons learned. The type of activities observed included draining and removal of liquids from process piping; cutting of cable and conduit; processes to immobilize waste; demolition; waste handling; and other such D&D activities.

Core Function #1 – Define the Scope of Work

At the program and facility level, D&D documents provide a comprehensive description of the D&D mission, schedule, work scope, facility condition, and hazards. For example, the Building 247F Deactivation Project Plan adequately defines the project scope, deactivation endpoints, regulatory considerations, and the mechanisms in which the project work will be executed. In addition, the Project 247 Hazardous Waste Management Plan, dated September 2003, provides an effective framework for developing project-specific procedures and work packages for managing potentially hazardous waste within regulatory requirements. Zone characterization reports provide useful information concerning existing facility conditions, zone-specific endpoints, and potential hazards within a zone from which work packages are developed. Facility and zone characterization reports have also been useful in defining the overall levels of contamination and other items of concern such that hazards can be analyzed.

To better manage D&D work at the activity level, facilities are typically subdivided into work planning zones. For example, 247F deactivation work is divided into 100 work planning zones. For each zone, a work package is developed that contains work instructions, the AHA, characterization documents, applicable procedures, and various supporting information in the appendices that further help to define the scope of work and relevant procedures for conducting the work. Work packages are consistent in content and provide a considerable amount of information that is useful to defining and understanding the planned work. D&D work planning teams are also effective in defining a scope of work for each zone through a process of field walkdowns, engineering evaluations, and historical reviews. Once planned, the work scope is communicated and further reinforced through crew briefings, field walkdowns, and pre-job briefs.

While each work package is intended to address a considerable number and variety of work tasks to be conducted within a zone, the level of detail for some work tasks is not sufficient to identify the hazards or the hazard controls. For example, one work activity observed in 247F, Zone 28, involved the solidification of residual process liquids through the mixing of an absorbent. Although the Zone 28 Work Instructions and the 247F Liquid and Solid Handling Procedure addressed an activity for draining lines and systems, neither the work instruction nor the procedure addressed the work activity for solidifying the residual liquids through the use of an absorbent. The AHA for Zone 28 addressed the controls for absorbing drained liquids, but the controls were for a different absorbing media (i.e., cement), which was not used. Upon further review of this activity by D&D line management, the procedure was subsequently revised to include a description of the chemical absorption activities, the potential dust hazard resulting from this activity, and the appropriate controls (i.e., local ventilation, or handling the absorbent materials in a large well-ventilated area). These concerns contribute to Finding #5.

Summary. Work control processes have been established for D&D work, although such processes continue to evolve. A variety of well-constructed, project-level work documents sufficiently describe the overall D&D work plans, scope, schedule, and requirements. However, at the activity level, some work instructions and procedures lack sufficient detail to identify and link to the work scope the hazards or controls described in the AHA or work package procedures.

Core Function #2 – Analyze the Hazards

At the facility level, D&D hazards are addressed in a variety of documents, including deactivation project plans, consolidated hazards analyses, the hazardous waste management plan, hazards assessment documents, and auditable safety analyses for radiological facilities. Collectively, these facility- and program-level documents identify and adequately describe the hazards most likely to be encountered by workers, and the hazards most likely to impact the environment or the general public. Of the facility-level documents, hazard characterization reports, which are prepared for each work zone within the facility, are particularly useful as a planning and information vehicle for developing work packages. For example, the 247F Zone 28 Characterization Report, which is included in the Zone 28 work package, defines the limits of the zone work, identifies zone-specific endpoints, describes the potential hazards and existing conditions in the zone, and identifies reference drawings and documents that would be useful in preparing the work package. Attachments to the 247F Zone 28 Characterization Report provide fissile material holdup information, the results of ultrasonic tests conducted on legacy piping, drawings and photographs, as well as industrial hygiene, radiological control, and waste/environmental information.

At the activity level, D&D management and the ES&H staff at Building 247F have established and implemented several effective programs for the identification and analysis of workplace and legacy hazards. For example, significant resources have been allocated to the identification and characterization of mold within the 247F facility. Mold sampling to determine total mold spore counts is routinely conducted within the 247F facility to support identified controls and to determine whether facility rooms are sufficiently contaminated to require additional controls (e.g., posting, air sampling, and dust masks). In another example, legacy chemical residues within the 247F process lines have been well characterized and documented in work packages. Furthermore, the characterization continues to be refined by zone engineers based on historical data (interviews and drawings). The characterization of the 247F building was sufficiently comprehensive in locating radioactive items such that waste generation amounts could be analyzed. These general characterizations were then used to forecast waste amounts that could be checked as waste was removed and packaged for disposal.

Another positive attribute of the D&D process at the work-activity level is the integration of subject matter experts into the AHA process. The assignment of subject matter experts to field work locations has enabled a greater interaction of subject matter experts, such as the 247F industrial hygienist and radiation protection manager, in the identification and analysis of workplace hazards. Similarly, local Waste Generator Certification Officials at the 247F project are available to review all work packages and perform the AHA for waste management, including adding project-specific controls in the AHA. Resident 247F facility engineers (i.e., zone engineers) have also been effective in characterizing the residual process liquids in piping systems through a review of plant drawings and calculations. The incorporation of facility engineers into the D&D process, and having these engineers located at the job site and readily available to assist the work crews, is a significant improvement in the D&D process.

Although a number of strengths were observed in the D&D hazard identification and analysis process, activity-level hazards in some cases have not been adequately analyzed and/or the analysis has not been documented in accordance with site procedures, DOE orders, guidance documents, and industry good practices.

In some cases, worker exposures to noise and hazardous chemicals have not been adequately analyzed and/or the analysis has not been documented in accordance with site procedures. Noise exposure surveys have not been documented for work activities within the 247F building. Since there are no documented sound-level surveys, there is no clear basis for posting areas as requiring hearing protection. During a work observation of a cable tray cutting operation utilizing a reciprocating saw, the AHA indicated that workers within ten feet of the cutting should use hearing protection. However, documented sound-level surveys do not exist to support this assumption in the AHA, and line management was unclear about where the hearing protection boundaries should be located. Similarly, noise exposures have not been monitored for 247F work groups to identify workers who are likely to receive a daily noise exposure in excess of 85 decibels adjusted (dBA) and who should be placed in the SRS Hearing Conservation Program, as required by the AHA. A review of workers (construction, RCO, and line managers) supporting one 247F work activity involving high noise levels indicated that only half of the workers in an area posted as requiring hearing protection were in the Hearing Conservation Program or had received associated training. Without documented sound-level measurements and noise dosimetry, there is no clear basis for establishing hearing protection boundaries or ensuring that workers are appropriately enrolled in the program. During the OA inspection, D&D management at 247F in conjunction with the area industrial hygienist initiated a corrective action plan to address this concern (see Finding #9).

Worker exposures to legacy residual chemicals contained in some 247F process piping systems have not been evaluated qualitatively (i.e., documented exposure evaluation) or quantitatively (air sampling and/or monitoring) as required by DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, and as recommended in DOE guidance documents and industry standards. Neither qualitative estimates nor quantitative measurements of airborne chemical contaminants has been documented for 247F work activities. As a result, there is no documented basis to infer that the hazard controls identified in work packages are adequate, or to estimate a worker's exposure if one or more of the controls is not functioning appropriately.

In some cases, work activities (e.g., cutting into a process line that is known to contain residuals of hazardous chemicals) may result in measurable concentrations of airborne chemical contaminants. For example, the Zone 28 characterization documents indicate that one process pipeline in the zone is filled with sulfuric acid, a suspected thoracic carcinogen according to the American Conference of Governmental Industrial Hygienists. The respiratory protection requirements in the AHA for draining this pipe default to the RWP, which requires only a full face-piece respirator with a high efficiency particulate air cartridge. According to the National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, the material safety data sheet, and the respirator manufacturer, an acid gas cartridge should be used in combination with the high efficiency particulate air cartridge for protection against sulfuric acid fumes. In addition, the hazard controls for a carcinogen, as defined in Procedure 4Q-302, such as posting of the area and performing a qualitative risk assessment, were not incorporated into the work package, and an exposure assessment was not documented to justify the lack of controls. At 247F, the level of controls associated with such an activity (i.e., local ventilation, respiratory protection, limited "stay time," etc.) is assumed to adequately protect the worker, although these assumptions and their bases are seldom documented. However, without a documented exposure assessment, there is no basis to assume that the specified personal protective equipment (PPE) is adequate.

This informal approach to exposure assessment is not in accordance with the intent of DOE 440.1A and is contrary to exposure assessment guidance provided in DOE Implementation Guide 440.1-3, *Occupational Exposure Assessment*, the *DOE Standard for Industrial Hygiene Practices* (DOE-STD-6005-2001), and the American Industrial Hygiene Association's *A Strategy for Assessing and Managing Occupational Exposures*. These documents emphasize the importance of performing and documenting exposure assessments, estimating potential exposures prior to the attenuation by respirators and other controls, establishing occupational exposure limits, identifying risks and exposure groups, and establishing triggers for performing quantitative exposure measurements (i.e., breathing zone sampling). SRS exposure assessment procedures in the 4Q Manual do not provide sufficient or clear guidance for initiating, performing, and documenting exposure assessments (see Finding #9).

On a sitewide basis, the lack of historical exposure data has increased the difficulty in reconstructing histories of worker exposure to hazardous chemicals in the workplace. According to WSRC Industrial Hygiene, SRS receives over forty inquiries per week from former workers through the Office of Worker Advocacy Program requesting such information, which is difficult, if not impossible, to reconstruct without exposure data. However, SRS exposure assessment programs are being revised to incorporate the lessons learned from the Office of Worker Advocacy to improve the site's ability to reconstruct exposure histories in the future.

Summary. Overall, the D&D process has incorporated a number of useful processes for the identification and analysis of hazards, including the AHA process, the integration of subject matter experts into the work process, and the use of hazards analysis teams to identify hazards. The ongoing analysis of the mold contamination in 247F has resulted in the development of innovative hazard controls for mold. Characterization of chemicals and fissile materials in process lines are well documented, and characterization documents are used by work planners and safety professionals in establishing work controls. A change management process that is normally applied to Category II-type nuclear facilities is being used to identify and evaluate the introduction of new hazards into the D&D process. However, a few concerns remain that need management attention, particularly with respect to exposure assessments of noise and hazardous chemicals. Although workers typically wear PPE, some exposure assessments are not rigorously conducted, analyzed, and/or documented to verify that the PPE used by the workers is suitable for the full range of potential hazards.

Core Function #3 – Develop and Implement Hazard Controls

At the facility and program level, a number of innovative D&D initiatives and programs are being implemented to control hazards within facilities that are being deactivated or undergoing demolition. For example, the D&D "Cold and Dark" implementing procedure has focused resources on identifying and controlling the dominant mechanical and electrical hazards associated with D&D work. In addition, WSRC institutional programs in work control and contractor control are being tailored to address approaches to D&D hazard control that have been effective at other D&D sites conducting similar D&D operations. In 247F, innovative mold identification and abatement programs have reduced worker exposures to airborne mold spores throughout the building. Environmental programs, such as the Green is Clean program, have provided 247F workers with an easy process for keeping non-radioactive sanitary waste segregated from low-level radioactive waste. Engineered controls have also improved the safety and security of D&D workers within the 247F building. Ventilation and lighting systems have been installed and/or retrofitted to improve the overall working environment while enabling the facility to remain electrically isolated. A 247F Control Room has also been established for tracking all D&D operations conducted within the facility as well as for personnel accountability.

Facility administrative controls, such as postings and signs for some hazards, have been innovative and effective in communicating the nature of the hazard and the expected means of control. For example, chemical glove charts, along with samples of chemical gloves, are posted in the changing areas to help workers identify the appropriate PPE. Rooms that are contaminated with mold are posted with red signs indicating that dust masks are required, and those rooms in which the mold has been encapsulated are posted with green signs. Signs also provide information about the proper management of waste. These signs clearly describe what items are prohibited from going into low-level waste and what can and cannot go into the Green is Clean containers. These signs were present on all low-level waste and Green is Clean containers. As an additional control, a small card that can be worn with the employee's' badge also contains this information for waste generators and waste verifiers.

At the work-activity level, the AHA tool is the primary mechanism for identifying and documenting hazard controls. When required, the AHA also drives the preparation of the technical D&D work documents (i.e., work package, procedure, or both). Hazard controls described in site-level manuals are incorporated into the AHA process and are applied to work activities through implementation of the D&D work control process. Subject matter experts, such as industrial hygienists, radiation control managers, zone engineers, and Waste Generator Certification Officials, have been effectively integrated into the AHA process.

Although innovations in hazard controls at 247F are evident at program, facility, and work-activity levels, some concerns and challenges in hazard controls were observed, particularly in the areas of radiological air monitoring and work control processes as explained in the following paragraphs.

A number of deficiencies associated with the implementation of radiological air monitoring requirements were observed during work at 247F. A review of D&D work in Zones 28 and 30 at 247F identified that job-specific air sampling and boundary air sampling were not sufficient to meet site requirements. Although one continuous air monitor was running in each zone, the quantity and placement of these samplers was not sufficient to meet the job-specific air sampling requirements, including verification of respiratory protection factors and airborne radioactivity area boundaries. Placement of continuous air monitors was also not representative of either the worker's breathing zone or the delineated airborne radiation area rope boundaries. Procedure 5Q1.2-137 states that if a continuous air monitor is not representative of the air the worker is breathing, then use of the continuous air monitor for job coverage is not appropriate. Similarly, in Zone 28, the roped airborne radiation area boundary was located at the doorway to the Zone 28 corridor, immediately adjacent to the radiation buffer area. However, no air sampling was being performed at this boundary, and the closest continuous air monitor was at the center of the Zone 28 corridor, at least 20 feet away from the airborne radiation area boundary and the work location. When advised of these concerns, RCO management took interim compensatory actions to temporarily address some of the deficiencies, including directing the facility to procure and utilize personal air samplers to monitor workers.

In response to another OA concern, the Zone 28 airborne radiation area boundary was later removed (down-posted) based on the lack of visual indication on the continuous air monitor of any increased air activity. A WSRC procedure contains a generic protocol that allows for the use of this type of method, but prior to doing so, each facility desiring to implement the protocol must prepare specific instructions for using the continuous air monitor to de-post airborne radiation areas. These instructions are to be documented in a facility-specific standing order or procedure. 247F had no such procedure, as required, to guide down-posting actions.

Work instructions, AHAs, and ALARA reviews included for these jobs did not provide any information on air sampling requirements for planned work packages, and implementation of the required controls was left to the discretion of the radiation control inspectors covering the jobs. Interviews with RCO supervisory personnel indicated that air sampling requirements are not normally included in work planning documentation and that it is management's expectation that the training and qualification requirements for radiation control inspectors, coupled with the RCO reference procedures, should be sufficient to ensure that radiological air sampling requirements are implemented correctly. However, failures in this area also have the potential to affect other important aspects of the SRS Radiological Protection Program. For example, the site's internal dosimetry program technical basis, including the current annual bioassay sampling frequency for all workers and isotopes, relies in part on proper and rigorous implementation of the sites' air monitoring requirements to justify a relatively long routine sampling frequency (annual). An expectation is that air monitoring results will be used as a key indicator and, if unexpected elevated air samples are detected, workers will be immediately placed on a more sensitive special bioassay program to quantify any intakes. Bioassay results are normally the only method by which internal doses are recorded and reported. Shorter sampling frequencies (e.g., monthly or quarterly) for routine bioassays are often utilized in industry, including at SRS prior to 1999, to obtain better sensitivity to detect and quantify intakes and reduce the minimum detectable dose to less than the routine bioassay performance objective (100 mrem committed effective dose equivalent). For Class Y uranium, the current minimum detectable dose for a routine annual bioassay at SRS is approximately 200 mrem committed effective dose equivalent. However, special bioassays can achieve much better sensitivity if they are implemented shortly after an intake occurred, based on other workplace indications, such as the availability of required job-specific air sample results (see Finding #6).

At 247F, some radiological work has not been subjected to formal ALARA reviews as required by the site procedures. Radiological ALARA reviews are required for certain work evolutions that exceed predefined radiological thresholds. The site ALARA review procedure provides the requirements for performing ALARA reviews, which are intended to ensure that radiation exposure and contamination controls are appropriately incorporated as part of the work planning process to ensure radiological safety and maintain all exposures ALARA. For Zone 30 D&D work, trigger levels were not properly recognized, and the radiological hazards were therefore not subjected to the required radiological planning scrutiny. In this case, the AHA for work in Zone 30 failed to account for High Contamination Area thresholds that existed within the zone and, as a result, the associated RWP did not undergo the required ALARA review.

In a related concern, ALARA reviews that have been performed in 247F contained insufficient detail regarding the proposed work, thereby diminishing the utility and effectiveness of these reviews in identifying needed controls. Specifically, ALARA review documentation did not demonstrate that the required systematic review of the work had been performed, including evaluation of the specific radiological conditions of concern and associated contamination controls to be used. For example, the ALARA review for Zone 2 D&D states that "RCO procedures and good ALARA practices will be utilized to minimize time spent in radiological areas" but provides no details on what these good practices are, such as specific cutting procedures to be followed and how the potential generation of airborne radioactivity is to be minimized. Other ALARA reviews from 247F contained similar deficiencies, including vague and generic language in the description of work controls, most of which would apply to any type of radiological work (see Finding #10).

WSRC has not implemented a mechanism or process to ensure that appropriate AHA hazard controls are implemented for all work activities in 247F. For example, in several of the 247F D&D work packages reviewed by the OA team, some hazard controls documented in the AHA could not be linked to the work activities described in the maintenance instructions contained in the work package. Although the pre-job briefing may be intended to link controls in the AHA to work steps, the pre-job briefings attended by OA do not consistently achieve this linkage for all hazard controls. As previously described in Core Function #1, the work instructions within 247F work packages do not typically identify either the hazard or the hazard control(s) applicable to specific work steps. For those work instructions for which there is a task-specific AHA, or a task-specific section of the AHA, the linkage between work activities and hazard controls is generally clear (e.g., draining and removal of fissile bearing lines). However, when multiple work instructions are linked to one set of generic controls identified in the AHA, some of which do not apply to the work being performed, the linkage of work activities to hazard controls is not clear, and there is no formal mechanism to achieve this linkage.

For example, the Zone 28 work package includes a step for draining and disposition of the oil contained in wall-mounted barometers into a designated container, but the hazards and controls are not addressed in the work instructions. The section of the AHA referenced for this activity is the "main task" section, which contains 16 pages of hazards and controls, a few of which may apply to this activity, but most do not. Furthermore, there is no "identified hazard" in the AHA for draining oil and therefore no clearly defined controls. The closest applicable "identified hazard" in the AHA would appear to be "tanks, lines, vessels, opened or breached." However, a number of the controls listed in this identified hazard, such as installing a lockout, are most likely not applicable.

In another example, the Zone 28 AHA lists a number of controls under the category of "other hazards." One such control is to "monitor weather forecast and conditions for severe weather." Based on interviews with selected 247F line managers, line management could not identify the work instruction(s) or work step(s) for which this control was intended. In addition, there is no evidence in work package sign-offs to indicate that this control is ever implemented. In these cases, there is no defined mechanism or process to ensure that the appropriate AHA hazard controls are implemented for all work activities. D&D management has recognized some of these shortcomings in the D&D work control process and is currently developing work control initiatives to improve the D&D work control processes (see Finding #5).

Summary. D&D line management, ES&H subject matter experts, and workers have initiated a number of innovative hazard control programs, which have been effective at reducing the hazards associated with D&D work activities. The D&D work control system is evolving into a process that integrates SRS site work control systems, such as the AHA, into processes that are tailored to accommodate the unique environment of D&D work. However, the D&D work control process development is not complete, and a number of challenges remain, especially with respect to ensuring that procedurally driven radiological controls, such as air monitoring and ALARA reviews, are properly implemented, linking hazard controls to work activities, and improving work control processes to ensure that appropriate AHA hazard controls are implemented for all work activities in 247F.

Core Function #4 – Perform Work Within Controls

Most D&D work is performed safely by trained workers and in compliance with approved work control documents. A significant amount of work is being performed safely and within the hazard controls identified in project-level work documents and work packages. For example, the low-level waste operations in 247 F were being performed within requirements of the D&D project plan. Containers located outdoors were covered to prevent the introduction of rainwater, bags were used to control contamination within the roll-off containers, and signs were appropriately placed on the low-level waste containers.

Although most work is performed safely, several opportunities for improvement were observed. For example, proper radiological PPE doffing and contamination control practices were not always followed in 247F. On two occasions, workers exiting the personnel contamination monitors placed hard hats on the floor of the radiological buffer area before self-monitoring, and then picked up the hard hats and exited the radiological buffer area without monitoring the hard hats. In another example, a worker, after removing his outer boots and while doffing his protective clothing, stepped into the contamination area rather than the step-off pad and then proceeded with the doffing practice inside the contamination area. In Zone 28, the doffing instructions were for a single set of protective clothes. However, workers were in two sets of protective clothing because of the use of outer chemical suits, resulting in confusion as to the correct doffing practices. In a number of cases, the proper use of multiple step-off pads, including one at the airborne radiation area exit and again at the contamination area exit, was not clear.

In a few cases, hazard controls identified in work packages were not followed. In Zone 28, initially workers were within 10 feet of a reciprocating saw and did not have hearing protection as required by the AHA. At 247F, one of the three boxes of florescent lamps in the universal waste storage area was not labeled with a universal waste sticker and an accumulation date as required by procedures. When this concern was brought to the attention of the Waste Generator Certification Officials, immediate action was taken to label and date the box. In another example, burning activities were performed at the 246F demolition project for a brief period of time without a fire watch present in the vicinity of the burning activity as required by WSRC hot work procedures. In this example, since the burning was conducted over the sub-basement (i.e., at elevated heights) and without other workers in the vicinity, the fire watch would also have served as the emergency responder.

Workers and their supervisors were not always effective in recognizing stop-work conditions when operating outside an approved work package, or when the hazards and or controls within a work package were unclear. For example, during a work evolution at Zone 28, a concern was raised that the pouring and mixing of absorbent material to solidify process liquids might create a potential dust hazard to which workers would be exposed. The initial reaction of line management to this event was not to stop work or to consult the AHA, but rather to have workers put on dust masks and continue working. The foreman and his supervisor later reviewed the work package, including the AHA and the liquid handling procedure, and concluded that neither the hazard nor the control had been addressed in the work package. However, work continued until the activity was brought to the attention of the facility manager, who stopped the activity and initiated changes to the procedure. In a second example, the foreman supervising the cutting of overhead conduit was uncertain of the hearing protection requirements for workers in the vicinity of the reciprocating saw. Rather than pause the work or consult the AHA, the initial reaction of the foreman was to dispense hearing protection for all that were in the work zone, and to change the zone posting to indicate that hearing protection was required. However, these additional new changes in controls were not consistent with the guidance provided in the AHA.

A number of D&D procedures inform workers of their right and obligation to stop work. Most workers are aware of their stop-work authority, and the 247F work packages reiterate management's expectations to stop work. In all likelihood, if an imminent danger situation arose, workers and their supervisors would most likely stop the work activity. However, it is less clear to workers and their supervisors when other conditions, such as working outside of controls established in a work package, should also require work to be stopped. Furthermore, the difficulty in ensuring that hazard controls are implemented for specific work activities, as previously discussed in Core Function #3, has increased the difficulty of knowing when to stop work. D&D management is aware of the need to reinforce their expectations on stopping work, and stop-work briefings are currently being provided to the workforce (see Finding #8).

Summary. D&D work is well planned, formally authorized, and usually executed in accordance with established work packages, permits, and procedures. Although a few examples were identified when work was not being performed within established controls, most work was performed safely and within the prescribed controls. However, some workers and first-line supervisors did not have sufficient training and knowledge to evaluate new or undefined hazards against the AHA and to stop work if sufficient unknowns exist. For D&D, which is a process of working in unknowns, this ability is critical.

E.2.3 Tritium Facilities

The review of the Tritium Facilities evaluated activities in Buildings 232H, 233H, 234H, and 238H, which are operating facilities, and Building 264H, the new Tritium Extraction Facility and support building, which is under construction. Activities within the Tritium Facilities include extracting tritium from irradiated reactor rods (upon startup of 264H), recycling and purifying tritium, loading tritium into new and recycled reservoirs, unloading tritium from returned reservoirs, and reservoir shipping and receiving functions. The OA team observed a number of operations, maintenance, construction, waste management, and radiological work activities in various buildings at the Tritium Facilities. For operations, work activities inside and outside gloveboxes were observed, including the safety, industrial hygiene, radiological, and environmental aspects of all tasks. Control Room activities, operator rounds, production operations, and surveillance activities were selectively observed and reviewed. Corrective and preventive maintenance activities by several types of craft personnel were also observed. Observation of construction work included detailed walkdowns of the new Tritium Extraction Facility, which focused on construction safety during work activities for both Bechtel Savannah River, Incorporated (Bechtel), which is a WSRC teaming partner that performs some of the SRS construction and maintenance activities, and subcontractor construction organizations. Associated radiological work, waste management, and support activities associated with operations, maintenance, and construction were observed where feasible.

Core Function #1 – Define the Scope of Work

The scope of work at the Tritium Facilities is adequately defined by technical specifications, quality requirements, project schedules, operating procedures, work packages, and associated documentation. Because the quality of most processes and products is mission critical, specifications and procedures are rigorous, with multiple layers of procedural protection and verification. Operating procedures are detailed, written in step-by-step checklist format, and describe both the overall task and task sequences that define each operation.

The Tritium Facilities have a rigorous work planning process (site process) and procedures that provide for classification of work, prioritization based on risk, allocation of resources, and extensive preplanning and scheduling using a rolling 8-week "open work window" process. This process treats each week separately using individual work window managers, who are responsible for ensuring that all work within their assigned week is properly planned and defined. Definition of work starts several weeks in advance of the work window, with frequent mandatory planning meetings to identify and allocate resources and keep work on track.

The work planning process appropriately defines minor maintenance, expedited maintenance, planned work, and high-risk work in formal Passport work packages. A fix-it-now process is in place, with predefined and approved facility lists for routine, low-risk activities. More complex work activities are defined using an enveloping main task work order, and separate Passport work orders for subtasks are linked to the main work order. Subtasks provide for additional work breakdown that improves the span of control and appropriately divides and defines tasks for the craft, location, and elements of the work activity.

The work reviewed by the OA team was appropriately prioritized based on mission, risk, and the importance of the systems and equipment. Work is further prioritized and resources are allocated through well-managed plan-of-the-day, plan-of-the-week, and numerous other scheduling meetings (see Core Function #4).

Although most work was adequately defined, a few Tritium Facilities maintenance work activities did not clearly define the scope of work to be performed under the specific work orders. Generic predictive maintenance work orders listed several possible predictive maintenance activities without listing the specific maintenance activity to be performed. The generic work order allowed a broad range of work on all Building 233H equipment, such as vibration analysis, motor current analysis, ultrasonic testing, thermography, and oil analysis. However, the work order did not specify allowable uses of the generic work order, and thus the work definition did not facilitate easy identification of hazards associated with each specific job.

Summary. With few exceptions, operations, maintenance, and construction work is well defined and broken down to a level that allows a reasonable span of control and can be understood by workers. Allocation of resources is well controlled using a rolling 8-week schedule and numerous mandatory planning and scheduling meetings for operations and maintenance activities. Individual predictive maintenance activities were not clearly defined in Passport work orders in a few cases.

Core Function #2 – Analyze the Hazards

With few exceptions, the hazards for all observed work were adequately identified and analyzed such that appropriate controls could be developed. Hazards analysis documents for work activities included work order packages, the work clearance permit, job safety analyses, health and safety plans (subcontractors), and the AHA process, which was in the early stages of implementation. These documents, in conjunction with preplanning walkdowns and meetings, resulted in an adequate level of hazard identification and analysis for most tritium work activities. It was evident, during observation of work, that safety, radiation protection, and other subject matter experts were available and supporting workers with hazard identification and analysis. The new AHA program has the potential to improve the hazards analysis process as it become fully implemented and mature.

For new processes and equipment, the preliminary hazards analysis, preoperational process hazard reviews, and process hazard screenings are effectively used to evaluate the risk and hazards for new installations. The preliminary hazards analysis for the hot calibration laboratory was detailed and comprehensive. The Tritium Facilities also use technical review packages for changes and projects. The packages include a final acceptance inspection and a safety/safe operation hazard screening that considers the preliminary hazards analysis and ensures that changes and projects receive unreviewed safety question screenings or determinations.

The AHA process and procedures, when fully implemented, should provide sound requirements and methodology for the identification and analysis of workplace hazards (and thus corresponding controls). The OA team observed an in-process AHA with involvement of the Tritium Facilities safety representative. The review and approval process was interactive, good involvement was evident, and the process resulted in a better AHA. AHAs for high-risk and more complex tasks involve teams of workers, including planners; safety, radiological controls, waste management, and operations personnel; and other subject matter experts. The level of review is appropriately based on the risk and complexity of the activity.

To improve hazard awareness and task communication for construction work at the Tritium Facilities, Bechtel is implementing a Safety Task Assignment Risk Reduction Talk card system, whereby the foreman will assign each worker or worker group a specific task on a card that contains the equipment, specific hazard blocks, and PPE to be used to better tailor the hazards and controls to the job task. This process can improve the work breakdown by reducing the reliance on portions of larger, generic health and safety plans. The supervisor will assign a task daily for one or more workers. The workers will sign acceptance of the task and concur with the hazards and PPE. The system will get both the foreman and workers more involved with the hazards and PPE associated with specific tasks.

Although most job-specific and workplace hazards were identified, OA identified a few hazards that were not recognized or sufficiently analyzed and documented. Those hazards included accumulation of contaminated ethyl alcohol laden rags, the potential for contamination from beryllium, and oxidized lead shims on some Building 234H water lines.

For ethyl alcohol rags, there was potential for accumulation of flammable materials outside of approved flammable storage containers in contamination areas. Although ethyl alcohol-dampened clean rags and the ethyl alcohol are stored in approved flammable containers, potentially contaminated “wet” rags are stored in a plastic, radioactive waste bag in a yellow drum within the room. A significant accumulation of flammable material could exist between disposal intervals.

The current job hazards analysis and the WSRC procedure for control of flammables focus on the transfer of alcohol liquids and do not fully address the control or accumulation of alcohol-laden rags, or the cleanup and proper storage of flammable material during breaks or upon completion of work. Additionally, the standard operating procedure does not address controls for accumulation of these materials, or precautions for worker safety. A previous review by fire protection engineering provided guidance on the use and storage of liquid ethyl alcohol, but did not address generation of secondary flammables. In response to the OA concern, fire protection engineering provided additional guidance to minimize accumulation. These actions included decontamination methods to minimize rag generation and allowing the rags to evaporate prior to storage. These actions are not addressed in the standard operating procedure and were not used during the work activity observed.

Both the WSRC Industrial Hygiene manager and the deployed industrial hygiene professional had previously identified a concern that potential sources and locations of beryllium at the Tritium Facilities had not been characterized. However, formal planning documents or actions to resolve those issues had not been developed. In response to OA questions in this area, WSRC Defense Programs generated a February 3, 2004, commitment data action item to develop a process to map additional potential sources and locations of beryllium at the Tritium Facilities. Upon further questioning it was determined that a sitewide chronic beryllium disease protection program assessment performed by SR in February 2003 had not been transmitted to WSRC Defense Programs personnel or WSRC Tritium Facilities management for information and action. As a result of the OA concerns, SRSO issued a tasking letter to WSRC Defense Programs requesting an action plan to address the need to provide appropriate documentation and analysis to confirm decisions made concerning the Tritium Facilities beryllium inventory, potential areas and sources of contamination, and any additional sampling or investigation necessary to address the Nevada Test Site beryllium investigation report and resulting lessons learned (see Finding #9).

Small amounts of oxidized lead were identified that had been used as shims between copper pipes and clamping bolts on some Tritium Facilities water lines. The shims were located in close proximity to personnel who frequented the areas. It was not evident that this hazard had been identified and analyzed such that it could be controlled in accordance with the WSRC lead control program.

Summary. Most common hazards were effectively identified and addressed. Radiation hazards associated with tritium operations were effectively analyzed through technical review packages and other such processes. However, there were a few hazards that had not been fully identified and analyzed. Implementation of the new AHA process is a strength, and proper implementation should improve the integration of hazard and control information into operating and maintenance procedures.

Core Function #3 – Develop and Implement Hazard Controls

Engineering controls are used extensively and provide a high degree of protection for workers, thereby reducing reliance on PPE or administrative controls. By design, most tritium production work involves a number of maintenance activities that are performed in atmosphere-controlled gloveboxes. Ventilation envelopes are well controlled, and pressure, temperature, and flow instruments are verified through operating surveillance and maintenance procedures. The use of PPE is well controlled by work packages, RWPs, AHAs, and well-placed postings within the facilities. To control contamination and reduce waste, the Tritium Facilities established a contaminated calibration capability and earned a DOE award for pollution prevention.

Many of the work activities observed at the Tritium Facilities require management/supervisory sign-off and Quality Assurance hold or witness points. These practices provide additional barriers against errors. For example, the Building 238H facility manager must personally approve all welding operations or hot work, a Quality Assurance representative and the senior technician observe hot calibration laboratory calibration sequences, and a Quality Assurance representative witnesses and verifies oxygen sensor calibration steps.

The technical content of operating procedures, maintenance procedures, and work instructions is good. The procedures are well written, detailed, and maintained current. Revision histories indicate that operating and maintenance procedures are being improved as they are being used. Although some preventive maintenance procedures are generic, the content and specificity allow easy performance of the tasks. The site work control system used for tritium maintenance work is robust and includes appropriate controls for the various types of maintenance work (i.e., fix-it-now, minor maintenance, expedited maintenance, and planned work). Several safety and other supporting procedures and manuals, such as the troubleshooting, suspect/counterfeit parts, and lockout/tagout procedures, the Radiological Control Manual, and the preventive maintenance program, provide more detailed requirements and guidance to support work package preparation.

The controls for lockout/tagout at the Tritium Facilities are comprehensive, and additional verifications are used for maintenance lockout/tagouts. The procedural and engineering controls for lockout/tagout of valves and equipment operated by Control Room computer distributed control systems are well engineered. The additional verification step, using lockout/tagout maintenance "determinators," provides an extra layer of worker protection for the numerous maintenance activities performed in the facilities.

An appropriate level of radiological coverage was provided for several work activities performed under job-specific RWPs. RCO inspectors provided nearly continuous radiological job coverage for those operations and maintenance activities requiring job-specific RWPs. RCO inspectors provided direction and support to operators and maintenance workers for contamination control, direct monitoring with the Tritium-In-Air Monitor, and collecting swipes for analysis of removable contamination via liquid scintillation counting. For example, operations conducted in accordance with the *Glovebox Airlock and Bag Out Bag Operations* standard operating procedure followed requirements and established the radiological control requirements. The procedure and job-specific RWP provided appropriate levels of operational and radiological controls to ensure that glovebox integrity was maintained and that spread of radiological contamination was minimized. These controls included Control Room notification (ventilation line up), establishing purge requirements for transfer airlock, using PPE, establishing a contamination area, and maintaining RCO coverage.

WSRC has developed procedures that provide for specific tailored controls for waste management at the Tritium Facilities. Trained Waste Generator Certification Officials have been appropriately assigned to provide waste management support for operations, maintenance, and construction work, and most operations personnel receive training as waste handlers. Waste Generator Certification Officials, responsible for operation of the satellite accumulation areas and management of waste staging areas, provide effective controls for ensuring compliance with the requirements of Federal and state regulations, and DOE Order 435.1 Chg 1, *Radioactive Waste Management*. WSRC has assigned a waste specialist to monitor waste management operations performed by the Waste Generator Certification Officials and waste handlers and to develop procedures and plans for proper management of the waste streams.

The Green is Clean program at the Tritium Facilities provides an effective means to reduce the volume of low-level waste by controlling the introduction of non-contaminated waste into low-level waste containers. In the radioactive buffer areas, containers are provided with green bags for clean waste, which reduces low-level waste because clean material (e.g., packing material and clean gloves) is not mixed with contaminated material. This practice allows clean items to be disposed of as sanitary waste in a public landfill.

The process for hazard identification and analysis had several strengths, including an experienced and knowledgeable workforce with years of experience at SRS facilities. However, OA identified some areas for improvement in hazards analysis processes. There are weaknesses in the implementation of the AHA process for operating procedures that may result in delayed or inadequate hazards analysis. The current plan for preparing AHAs for operating procedures does not have milestones for completing all procedures in a structured manner based on the importance of the procedures and the risk of the operation being performed. AHAs are currently required to be prepared only for newly developed procedures or complete procedure revisions. AHAs are not currently required for partial revisions, or as part of the periodic review of procedures conducted every few years. As a result, a procedure could be left in place for several years without the benefit of the new AHA process. Thus, the controls resulting from improved hazard identification and analysis may not be integrated into some operating procedures (see Finding #5).

Although controls for most activities had been adequately developed and implemented, a few weaknesses were identified in the implementation of some controls. Task-specific hazard controls are not well implemented into some operating procedures and maintenance work instructions. Though the technical content is good, many operating procedures reference manuals or entire procedures for hazard control information rather than having tailored hazard control information integrated into the body of the procedure and procedural steps. For example, the employee safety sections of many operating procedures reference the entire procedure rather than specific sections or requirements of the procedure that apply to the specific task. Information in the employee safety section is not always integrated into the work steps where the worker encounters the hazard. Similarly, hazard control information from work clearance permits is not always well integrated into some maintenance procedures and work instructions, which may require workers to follow multiple control sets (see Finding #5).

Standing RWPs at the Tritium Facilities span a large range of operational and maintenance activities. Workers are allowed to concurrently sign in on multiple standing RWPs, which has resulted in some worker confusion. These standing RWPs are not clearly tailored to work activities with job-specific information that ensures that consistent controls are implemented. Standing and job-specific RWPs contain "suspension guides" (primarily removable or airborne contamination levels), and most standard operating procedures make reference to the need for compliance with RWPs. However, the RWPs reviewed were found to contain no voiding conditions (e.g., glove puncture) for some situations that could lead to increased contamination, or other activity-tailored requirements. This tailoring can assist workers in assessing precursors or situations where RCO guidance should be requested. Because these types of situations are not routinely addressed in standard operating procedures, workers may need to interpret the intent of the RWP, which could result in the improper use of PPE or other less effective controls for radiological work.

Standing RWPs were not clear with regard to welding, grinding, cutting, burning, or drilling on contaminated materials within and outside gloveboxes. The RWPs contained some prohibitions for those activities, but were routinely used for evolutions that involved welding, grinding, and cutting on contaminated materials inside gloveboxes. When questioned by OA, workers were unsure about when the provisions were applicable. In the situations observed, the RWPs were unclear and workers were not following the procedure as written. The RWPs were subsequently revised to clarify the intent of the prohibitions related to activities conducted outside of gloveboxes or hoods.

Dumpsters in the Tritium Facilities are being re-labeled for cardboard, paper, and other recyclable waste; however, the dumpsters are being incorrectly used for all sanitary waste. WSRC has initiated a new program to segregate recyclable waste at the source, rather than sending all sanitary waste to a sorting facility. As part of this new program, dumpsters are being re-labeled, but the requirement has not been implemented within secured facilities. Therefore, the labels do not apply at the Tritium Facilities. As a result, workers may not be able to readily determine where to dispose of sanitary waste. Also, one dumpster in the Tritium Facilities had no cover and was full of water.

Summary. The procedure and document control set at the Tritium Facilities is generally rigorous and detailed. A multitude of well-written site and facility procedures and instructions provide adequate safety and technical guidance for operations, maintenance, and construction work activities. With some exceptions, the controls are tailored to the specific hazards and work activities performed in the field. The new AHA process should improve integration of job-specific hazards into work instructions used by workers.

Core Function #4 – Perform Work Within Controls

With few exceptions, operations and maintenance work that was observed was performed safely and in accordance with approved operating procedures and work packages. Procedures were appropriately available at the job site, were being used, and were followed in a step-by-step manner. Operations activities to prepare for reservoir loading were conducted in accordance with the *Loading Fixture Assembly, Installation, and Removal* standard operating procedure. Technical (in hand) procedures were followed verbatim and in a step-by-step manner, and reference procedures (not required to be in hand) were also utilized extensively, with many being followed in a step-by-step manner. Multiple verifications were conducted at each step of operations processes and, in one instance, a defective reservoir fixture component was identified on a final verification, prior to acceptance for loading. For maintenance work, workers effectively used Passport work order packages containing preventive maintenance procedures, troubleshooting plans, and maintenance instructions. All workers exhibited a high regard for procedural adherence and safety.

With several exceptions discussed below, the construction contractor and subcontractors were safely performing construction work at the new Tritium Extraction Facility. A workforce of over 300 workers was performing a variety of mechanical, electrical, electronics and instrumentation, and carpentry tasks, both on the ground and on multilevel scaffolds within the facility. There was significant rigging to move many different types of loads, including critical lifts of large modular units. During walkdowns it was evident that the WSRC construction contractor teaming partner safety officer and DOE facility manager spend a lot of time in the project and were familiar with equipment, locations, conditions, work in progress, and subcontractor tasks.

Management and workers at the Tritium Facilities have a strong commitment to following established requirements and performing work safely. Stop-work responsibilities and authorities are reinforced by management and integrated into work documents and procedures. When questioned, workers stated that they would stop work for safety concerns and did not feel production over safety was an issue.

Readiness to perform work and work authorization is ensured by the rigorous implementation of long-range planning, detailed daily and weekly meetings, and extensive pre-planning (pre-job) briefings. Safety and radiological protection personnel attended many pre-planning meetings in order to reinforce controls, provide suggestions, and understand the complexities of assigned tasks. The rolling 8-week planning schedule, supported by operations, radiation protection, and safety personnel, was effectively used and ensured numerous opportunities for planning input, which ensured readiness to perform work.

Several operations and maintenance lockout/tagouts, including independent verification, were properly performed in accordance with procedures. Breaker and valve positions were verified, tags were properly filled out and attached, and locks were securely attached. For remotely operated components on Control Room distributed control systems panels, positions were verified by distributed control systems readouts and by associated parameters (e.g., temperature, pressure, and flow).

Waste staging areas and satellite accumulation areas are effectively operated at the Tritium Facilities. The satellite accumulation areas were properly posted and containers were closed. The low-level waste staging area was tightly controlled so that only Waste Generator Certification Officials added waste to the containers. The two radioactive waste streams were kept separated, and each stream had its own type of container. All boxes were labeled as to waste type and accumulation start date to ensure compliance with DOE Order 435.1 Chg 1 requirements.

Although most work at the Tritium Facilities is being conducted safely, there were some areas that would benefit from additional management attention. Many of the identified deficiencies resulted from failures to follow well-established site and facility requirements.

Roll-off containers placarded for construction debris were not being used appropriately. Construction debris landfills are used for concrete rubble and other solid, non-polluting items that would have minimal impact on the environment. Roll-off containers are also used to collect construction waste items, such as metals and scrap woods, for recycling or reuse. In one case, a bag of food waste and wire were discovered in a roll-off container labeled for debris. In a second case, laborers were in a roll-off container removing plastic because wood wrapped in plastic had been dumped in the container. The roll-off container was labeled wood, but the label was not visible because the container was positioned such that the sign was only visible from the backside facing the fence. Having workers in a roll-off container (potential hazard) because it was not properly labeled increases risk to workers.

One case was identified where readiness to perform work was not assured. Delays in performing a safety-significant calibration of an oxygen analyzer resulted in the facility entering into a limiting conditions of operation. Deficiencies in readiness to perform work, which contributed to exceeding the one-hour time duration for entering the limiting conditions of operation, included a delay caused by Quality Assurance having to obtain an additional procedure from the document control center, not having two regulators for gas bottles even though the procedure required two calibration gases to be utilized, and an evacuation caused by a spurious alarm (caused by opening an instrumentation cabinet) and subsequent RCO evaluation prior to resumption of calibration activities.

A number of readily observable worker and facility safety deficiencies were identified in various tritium operating facilities and spaces. These deficiencies included inadequate extension ladder tie-offs, unapproved operator aids, combustibles in a switchgear room, safety chains not in place, scaffolds left in place for an extended period, obstructed power panels, and improperly routed extension cords. Most of these deficiencies were promptly corrected as they were identified.

At the new Tritium Extraction Facility, there were several weaknesses in the implementation of the WSRC construction safety program and Occupational Safety and Health Administration (OSHA) industrial safety requirements related to construction activities.

- A truck brushed a rack of gas bottles as it swung out from the tubing shop.

- Numerous deficiencies were identified with rigging equipment for both Bechtel and subcontractors. Frayed slings were found in both Bechtel and subcontractor spaces mixed with inspected, ready-to-use equipment. Numerous slings and safety harnesses that were inspected in 2003 and 2004 were found commingled next to job sites, in construction gang boxes, and in shop areas, readily available for use.

- There were some cases where materials, including soda cans, were found on top of power panels and electrical enclosures, some of which were energized. Because many of the electrical tie-ins are being completed, more of the power panels will be energized in the near future, so storing materials on the un-energized panels is a concern.

- There were several cases where power panels were encumbered by stored material in front of the panels. For example, in the chiller building, two energized motor control centers panels were partially obstructed by a mobile scaffold and other material being stored.

- In the tubing shop, one of the wire ropes that supported a large counterweight for a large fabric door had been replaced with fabric cord. The fabric cord was frayed to a point where it could have broken and caused injury.

- Personnel were working on scaffolds with safety chains unhooked and/or missing, and in one case were on a scaffold where scaffold inspectors had removed the inspection tag. One scaffold had the safety chain wrapped around a scaffold member, indicating that it may have been routine to work on the scaffold without the safety chain in place. On one scaffold, a ladder had been put back in place without the knowledge of scaffold erectors or inspectors and had not been inspected.

- Some scaffolds were missing toe boards adjacent to ladder accesses, and a few toe boards were missing on the ends of the scaffold. The site has accepted these conditions in an attempt to prevent tripping hazards.

- Some deficiencies were identified with portable tools, including a bench grinder with an unsafe tool-rest clearance, aluminum grinding on wheels, and a drill with a frayed cord.

- A subcontractor had flammable material (paint) improperly stored, contrary to health and safety plan requirements.

- Many (about 100) daisy-chained extension cords were identified, in some cases with three or more cords linked together. Site instructions require following manufacturers' instructions, and the manufacturers' instructions label on most cords cautions against plugging one cord into another.

- There were several working and passage areas in the process building that did not have adequate lighting. Some areas were dark because temporary lighting was not properly maintained (many bulbs were out) and other dark areas needed additional lighting strips. Several unprotected bare light sockets were identified.

- There were several discrepancies in gas bottle storage. The tie-down on one bottle was below the center of gravity, one bottle was stored without a cap, and the cap on one bottle was sitting on the bottle instead of being screwed down. Although many gas bottles were appropriately maintained, this is a recurring deficiency that has been identified in many recent SRSO and contractor walkdown inspections.

- A Unistrut assembly was stored on top of several conduits, adjacent to a mezzanine area, and could have fallen to the level below. A ladder on the same mezzanine did not extend 36 inches above a false roof as required by OSHA.

- In the area where the modules were being slid into the building, the demarcation/safety railing for the unprotected edge (about a 20-foot fall) was inadequate. The construction safety railing had been removed for moving the modules in, and been replaced by a warning line set at the unprotected edge instead of back from the edge. Personnel observing the operation were standing near the unprotected edge. In the same area during a critical lift (over 10,000 lbs), one worker hand-tended the load above his head as it swung back toward him, and his body was nearly under the plane of the load.

- Access to eyewash stations was blocked in some cases.

Based on the severity and number of deficiencies, Construction management and supervisors immediately started correcting items and initiated corrective actions to prevent recurrence. Most of the items were corrected during the inspection period. However, the numerous deficiencies in construction areas indicate insufficient attention to safety requirements (see Finding #7).

OA observed some weaknesses and some complacency in implementing good radiological contamination control techniques during some work activities.

- Observation of a work package for welder alignment in hoods/gloveboxes located in Building 238H was conducted under a preventive maintenance work package containing a work clearance permit and permitted by a standing RWP. The worker did not inspect the glovebox gloves for potential degradation prior to use. While performing the preventive maintenance, the worker removed his hands from the glovebox gloves (still wearing cotton liner gloves) to annotate a completion step on the procedure, and used his teeth to pull the glove back on to his hand.

- Operators and maintenance personnel do not routinely check glovebox gloves for degradation prior to use, consistent with training and RCO expectations. OA observations also included operations personnel not wearing gloves or handling waste container lids prior to survey.

- Operations personnel failed to follow a standard operating procedure/RWP procedural step, which could have resulted in an unmonitored spread of contamination outside the glovebox. The test weld RWP/standard operating procedures require notification of RCO following loading of material into the glovebox through the airlock. This notification was not made initially but was made upon prompting by OA after the completion of the work evolution.

- In some cases, workers were unaware of which RWP they were working under. In one example, when asked which RWP applied to the work currently being conducted, workers stated standing RWP 04-TRI-002, when in fact another less stringent RWP actually applied to these actions. Although the individuals believed that RWP 04-TRI-002 applied, their PPE did not meet the requirements of this RWP, a further indication of the potential for worker confusion when conducting some evolutions under multiple standing and job-specific RWPs, sometimes simultaneously. Other examples included workers who indicated that they were signed in on all three standing RWPs, and when questioned were unsure which one specifically applied to the current assigned task.

Summary. The OA team observed many operations, maintenance, and construction activities that were being safely performed. Supervisors and workers ensured that procedures were at the job site and being carefully followed. The conduct of operations at the Tritium Facilities is good. However, weaknesses were noted in construction safety and, to a lesser extent, radiological practices. There were also weaknesses in the implementation of construction safety requirements at the Tritium Extraction Facility.

E.2.4 Electrical Intrusions

A review of hazard controls for electrical intrusion indicated some weaknesses in implementing procedures for upper-tier requirements. Controls at SRS include requirements in the Electrical Safety Program and Responsibilities document, the WSRC 8Q Employee Safety Manual, a procedure on excavation and trenches, and the engineering standard requirements for coring, chipping, and drilling in hardened concrete. The upper-tier requirements are fragmented in several documents but have been adequately flowed down to the excavation procedure. However, the blind ceiling, wall, and floor penetration requirements (drill stops, restricting penetration depth, drawing reviews, non-obtrusive surveys) are not addressed in a working-level procedure that would facilitate implementing controls into work instructions. The AHA process contains a line item that asks about penetration of floors, walls, or ceilings. However, a positive response does not drive mandatory controls required by upper-tier procedures. Additionally, the term "custodian" is well defined for excavations, but not as well defined for routine floor, ceiling, and wall penetrations; however, the site electrical safety program assigns mandatory responsibilities to the custodian for penetration work activities. One maintenance instruction indicated that planners are assigning some mandatory controls for penetration, but the process is not formalized to the extent necessary to maintain consistency and minimize risk to workers (see Finding #5).

E.3 CONCLUSIONS

As discussed below, many aspects of the ISM core functions are effectively implemented by WSRC in the three areas reviewed. However, some weaknesses were noted in all four core functions evaluated by OA. The weaknesses in Core Functions #3 and #4 were more significant and contributed to a number of deficiencies in controls, including a number of construction safety deficiencies.

Core Function #1. Work at SRS is generally well defined and broken down to a level that allows a reasonable span of control and can be understood by workers. Allocation of resources is well controlled using rolling schedules and numerous planning and scheduling meetings. In some cases, particularly in D&D projects and modification projects at H-Tank Farm, some work instructions are not described in sufficient detail in work packages so that either the hazards or controls described in the AHA or work package procedures can be identified and linked to the work scope.

Core Function #2. Most SRS facility hazards had been effectively identified and analyzed, such that effective controls could be implemented. Actions taken to identify and analyze the dimethyl mercury hazard in the tank farms and mold contamination in 247F were particularly rigorous. The new AHA process, including integration of subject matter experts and the use of hazards analysis teams to identify hazards, provides a comprehensive method of performing activity-level hazard analyses. Proper implementation of the AHA process should improve the integration of hazard and control information into operating and maintenance procedures. A few hazards require additional attention by management to ensure further definition and adequate analysis. Some improvements in the hazards analysis process are needed, particularly in the analysis and documentation of exposures to noise, hazardous chemicals, and beryllium, to ensure that PPE worn by workers is suitable for the full range of expected hazards.

Core Function #3. While hazard identification and analysis were generally effective, identified controls were not always reliably implemented prior to and during work. The procedure and the document control set at the Tritium Facilities are generally rigorous and detailed. A multitude of well-written site and facility procedures and instructions provide adequate safety and technical guidance for operations, maintenance, and construction work activities. With some exceptions, the controls are tailored to the specific hazards and work activities performed in the field. D&D line management, ES&H subject matter experts, and workers have initiated a number of innovative hazard control programs, which have been effective at reducing the hazards associated with D&D work activities. The D&D work control system is evolving into a process that integrates SRS site work control systems, such as the AHA, into processes that are tailored to accommodate the unique environment of D&D work. However, the D&D work control process development is not complete, and a number of challenges remain, especially with respect to ensuring that procedurally driven radiological controls, such as air monitoring, are properly implemented, and linking hazard controls to work activities. H-Tank Farm has been successful in identification of hazard controls through the AHA process as well as established procedures and programs. Implementation of the AHA process is relatively new and does not have an established method to ensure that all identified controls are properly implemented. Additionally, ES&H personnel sometimes did not adequately implement controls in accordance with site requirements or procedures. Increased management attention is needed to ensure that all controls specified in AHAs and procedures are effectively implemented.

Core Function #4. With some exceptions, the OA team observed many operations, maintenance, construction, and D&D activities that were being safely performed. Supervisors and workers ensured that procedures were at the job site and being carefully followed. However, weaknesses were noted in radiological control practices and to a greater extent in construction safety. At the D&D project, workers and first-line supervisors did not effectively recognize when new or undefined hazards were not clearly included in the AHA, and did take action to ensure that existing controls were adequate prior to continuing work. For D&D, which inherently involves the potential for working with hazards that are not recognized or fully characterized, the ability to recognize new or undefined hazards is critical. There were numerous weaknesses in the implementation of construction safety requirements at the Tritium Extraction Facility, which is under construction. The number of instances of construction workers failing to follow safety requirements, coupled with recurring similar findings by the SRSO Facility Manager, indicates that significant management attention is needed to ensure that construction work is performed in a safe manner.

E.4 RATINGS

The ratings of the first four core functions reflect the status of the reviewed elements of ISM program elements at SRS facilities.

Core Function #1 – Define the Scope of Work..EFFECTIVE PERFORMANCE
Core Function #2 – Analyze the Hazards..EFFECTIVE PERFORMANCE
Core Function #3 – Develop and Implement Hazard Controls..........................NEEDS IMPROVEMENT
Core Function #4 – Perform Work Within Controls ....NEEDS IMPROVEMENT

E.5 OPPORTUNITIES FOR IMPROVEMENT

This OA inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are intended to be reviewed and evaluated by the responsible line management, and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

1. **Conduct a review of radiological control requirements for current and planned RWPs within the Tritium Facilities.** Specific actions to consider include:

   - Develop radiological controls that are more tailored to specific work tasks.

   - Ensure that standing RWPs for operating procedures or maintenance activities are consistent with routine expectations and that response actions for conditions that could void the RWP are clear to workers.

   - Ensure that job-specific RWPs are developed for those tasks that, even though considered routine, require aggressive job coverage and radiological survey performance as work tasks become more invasive or where extensive use of administrative controls and PPE is needed.

2. **Include additional information in WSRC procedure 8Q-8, *Reporting Unsafe Conditions*.** Specific actions to consider include:

   - Add information about pausing or stopping work when procedural or work package instructions cannot be implemented as written.

- Add guidance on stopping activities that are being conducted in conditions that are unsafe but less than “imminent danger” conditions (e.g., workers on non-inspected scaffolds).

- Add information about reporting potential or actual non-compliances that have regulatory or safety impact.

3. **Enhance worker awareness and training.** Specific actions to consider include:

   - Perform additional training for construction management, supervisors, workers, and subcontractors to reinforce understanding and recognition of construction safety deficiencies, and perform mentored walkdowns to verify and maintain safe workplaces.

   - Conduct worker awareness reviews and perform corrective actions to address complacency about contamination control and good radiological practices.

   - Enhance the existing stop-work training being conducted for D&D workers to include management expectations for stopping work when the work is not adequately described in work documents, or when the hazards and controls are not sufficiently identified or analyzed.

4. **Develop and implement a work control mechanism or process to ensure that hazard controls identified in the AHA are appropriate and implemented for all work activities.** Specific actions to consider include:

   - Improve work control processes to ensure that for any work activity the appropriate hazard controls in work packages can be easily and consistently identified by workers.

   - Formalize the mechanism by which hazard controls are communicated to workers to ensure that the appropriate controls are implemented.

   - Periodically assess the effectiveness with which workers have implemented the appropriate hazard controls as identified in work packages.

   - Subdivide job work scopes into separate tasks when preparing AHAs such that hazards and controls are tailored to individual work activities rather than to the entire job. Use AHA subtask fields for this purpose.

   - Increase the level of detail in work instructions to a point where it is clear which hazards and controls apply to which work evolutions.

   - Where possible, incorporate controls directly into individual work instructions.

5. **Consider establishing thresholds and guidelines addressing how controls in the AHA are going to be integrated into procedures, work packages, and work instructions.** Specific actions to consider include:

   - Establish a baseline set of common industrial controls (hard hats, safety glasses, safety shoes, etc.) that would be required for the work location (even if no work were performed).

   - Determine whether those controls are adequately addressed by training, posting, and existing procedures to ensure that only task-specific and “special” controls would be integrated into the work package.

- Assign implementing responsibility for individual controls in the AHA.

- Differentiate types of controls in the AHA.

- Delineate the method of implementation for each control in the AHA.

6. **Increase the emphasis on rigor and formality associated with hazard characterization at the Tritium Facilities, especially concerning such mission-sensitive analyses as those associated with the Chronic Beryllium Disease Prevention Program.** Specific actions to consider include:

   - Formalize processes and documentation to support data collection and decision logic associated with the Chronic Beryllium Disease Prevention Program for WSRC, SR, and SRSO.

   - Improve the mechanism that is used to distribute assessments to line organizations and lessons-learned information to WSRC, SR, and SRSO managers.

7. **Consider improvements to enhance sanitary and universal waste management activities.** Specific actions to consider include:

   - Provide green bags for use in the small Green is Clean containers located in radiological buffer areas for collection of cotton gloves worn under Anti-C outer gloves.

   - Ensure that sanitary waste dumpsters are maintained in a condition that prevents the introduction of rainwater and that dumpster labels reflect the intended type of waste (recyclables or landfill disposal).

   - Use signage and waste generator training to improve management of roll-off and open containers used for scrap metal, construction debris, and scrap wood to prevent mixing of these waste streams in the same container.

   - Ensure that containers used for holding universal waste items are properly labeled.

8. **Improve processes to revise the AHA program to include specific site hazards, such as mold, dimethyl mercury, and beryllium.** Specific actions to consider include:

   - Revise software to capture specific hazards identified by AHA review teams that are not specifically identified in the question set.

   - Conduct periodic reviews of completed AHAs to determine whether specific hazards are being identified that could be included in the question set.

   - Encourage additional feedback from program users regarding specific hazards that could be included.

9. **Improve the processes for chemical exposure assessments to ensure consistency with DOE requirements and guidance documents, and industry good practices.** Specific actions to consider include:

   - Evaluate and revise, as necessary, the exposure assessment procedures in the 4Q Manual for consistency with industry standards, and clarify the purpose, use, and integration of these procedures.

- To achieve consistency in implementation, provide guidance and training to industrial hygienists on exposure assessment protocols.

- Integrate into the exposure assessment program lessons learned from the exposure history requests of former workers that are received from the Office of Worker Advocacy Programs.

- Conduct periodic assessments on the exposure assessment program to determine the extent to which program implementation meets management expectations.

- Evaluate the resources required to implement an effective exposure assessment program.

10. **At 247F, establish a program for conducting and documenting sound-level surveys and noise dosimetry to support the application of hazard controls (i.e., postings, hearing protection, and administrative controls in AHAs).** Specific actions to consider include:

    - Establish noise exposure groups, and determine through noise dosimetry which workers and/or work groups should be in the site Hearing Conservation Program.

    - Ensure that first-line supervisors are knowledgeable of the requirements for hearing protection, posting of high-noise areas, and enrollment of workers into the Hearing Conservation Program.

11. **Increase efforts to improve radiological ALARA reviews, including provision of specific details concerning the proposed work and intended controls, ensuring compliance with ALARA procedure requirements, and demonstrating through ALARA documentation that a systematic approach has been followed during performance of the review.** Specific actions to consider include:

    - Conduct additional training for RCO staff on expectations concerning ALARA reviews.

    - Procure and review a sampling of documented ALARA reviews from other SRS facilities and DOE sites to locate weaknesses and evaluate areas for improvement.

    - Periodically audit ALARA review records to ensure that format and content match procedure requirements.

    - Provide specific details regarding the radiological concerns of the proposed work and the intended controls. Avoid the use of generic terminology, such as "good practices," which is of limited value since it applies to all work, even that which does not require formal review.

    - When completing the ALARA review checklist, ensure that a narrative description showing how each of the asterisked items has been incorporated into the proposed work is included. Ideally, the ALARA review will provide this level of detail for all checklist items.

12. **Increase rigor associated with evaluation and implementation of radiological air monitoring controls to ensure that representative sampling is conducted for jobs that involve respiratory protection and/or airborne radioactive areas (ARAs).** Specific actions to consider include:

    - Evaluate current radiation control inspector training and its frequency to determine whether it is adequate to ensure that radiation control inspectors have the knowledge and skills necessary to consistently evaluate and implement the myriad of requirements contained in the workplace air sampling procedure.

- Provide special refresher training to RCO staff on expectations concerning implementation of job-specific air sampling requirements.

- Consider a requirement to integrate workplace air sampling expectations into the RWP and ALARA review processes as mechanisms to define job-specific expectations.

- Improve the guidance and expectations concerning down-posting of ARAs based on continuous air monitor data. Specifically, define expectations as to the content of the required facility-specific procedures or standing orders for use of the generic down-posting protocol as well as documentation requirements for demonstrating compliance with ARA posting thresholds.

- When administratively feasible, consider shorter bioassay frequencies for those isotopes that have a minimum detectable dose greater than the bioassay performance objective of 100 mrem, particularly for short-duration work, such as D&D, where retrospective determination of when and where an intake may have occurred may be difficult.

13. **Improve the clarity of meteorological controls for outdoor radiological work that are presented in the AHA and work documents to ensure proper implementation and procedural compliance.** Specific actions to consider include:

    - When preparing written controls, ensure that they reflect an assumption and expectation that they will be implemented verbatim, so that interpretation is not required.

    - When setting conditional limits, such as wind speeds, ensure that appropriate detail is provided on expectations for the data source and the proper method for determining compliance.

    - When used as a radiological control, ensure that meteorological data used in support of decision-making is appropriately documented to ensure compliance with regulatory requirements.

    - When work may be both indoor and outdoors, such as during D&D, ensure that the AHA clarifies expectations as to when implementation of meteorological controls provided in the AHA are to be followed.

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APPENDIX F
Essential System Functionality

F.1 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) evaluated essential system functionality at the Savannah River Site (SRS). The purpose of an essential system functionality assessment is to evaluate the functionality and operability of selected system(s) and subsystem(s) that are essential to safe operation. The review criteria are similar to the criteria for the Defense Nuclear Facilities Safety Board Recommendation 2000-2 implementation plan reviews; however, OA reviews also include an evaluation of selected portions of system design and operation.

This assessment addressed five safety systems in two facilities:

- Safety systems that were evaluated in the Defense Waste Processing Facility (DWPF) included: the safety-significant Zone 1 Ventilation Exhaust System, the safety-class Melter Off-Gas System Instrumentation and Associated Interlocks, and the safety-class Chemical Processing Cell (CPC) Safety Grade Nitrogen System.

- Safety systems that were evaluated in the tritium processing facility building (233H) included: the safety-class Fire Suppression System and the safety-significant Exhaust Ventilation System.

The reviews addressed the conformance of these systems with the documented safety analysis (DSA) and the technical safety requirements (TSRs), and the translation of their designs into the associated procedures and practices. The reviews addressed design, configuration management (including the unreviewed safety question [USQ] program), surveillances and testing, maintenance, operations, and parameters and assumptions made in the DSA. The reviews included analysis of system calculations, drawings and specifications, vendor documents, facility-specific technical procedures, walkdowns, and interviews with system engineers, design engineers, maintenance and testing engineers, operators, technical managers, and other technical support personnel.

F.2 RESULTS

F.2.1 Engineering/Configuration Management

Engineering

Defense Waste Processing Facility. The DWPF was designed, constructed, and commissioned in the 1980s and 1990s and was subsequently modified and upgraded to meet revised safety requirements in accordance with applicable design and safety standards. Line management responsibility for activities at the DWPF falls under the Manager of the Savannah River Operations Office (SR). The engineers, technical personnel, and managers who were interviewed were technically qualified, knowledgeable of the facility and the safety-class systems, highly motivated, and possessed a very strong sense of ownership of the DWPF safety systems. Based on a review of the design and DSA/TSR documents, the engineering documents generally had a good degree of rigor and formality for those functions identified as TSR-required. These documents included detailed technical analyses and the instrument uncertainty calculations.

The following paragraphs address the three DWPF systems evaluated on this OA inspection, including observations specific to engineering.

Zone 1 Ventilation Exhaust System. The Zone 1 Ventilation Exhaust System's design functions are (1) providing heat-removal ventilation for the potentially highly-contaminated Zone 1 process areas, and (2) preventing the spread of airborne contamination from Zone 1 to other lower, potentially contaminated areas, including the outside environment, by maintaining Zone 1 pressures lower than atmospheric pressure and the surrounding zones, and by directing the Zone 1 exhaust through the sand filters (99.5 percent efficiency) before release through the stack to the environment. It was originally classified as safety-class because of its function to prevent benzene explosions in the salt cell. The system was subsequently downgraded to safety-significant when facility processes were changed; the process changes resulted in reduced system performance requirements in some functions, such as maintaining explosive gas concentrations below safe limits for some accident scenarios.

No significant technical discrepancies or weaknesses were identified in this system. In fact, several aspects of the design have large performance margins when compared to the safety-significant functional requirements. These margins are attributable partly to the system's original design as safety-class, and partly to the high degree of rigor and attention to detail in the system's design and related technical functions.

CPC Safety Grade Nitrogen System. The CPC Safety Grade Nitrogen System provides the safety-class source of nitrogen to purge the CPC vessels and the connected vent piping to maintain the vessels' vapor spaces below the lower flammability limit (LFL). The system was designed to perform this function for a minimum of four days.

To ensure that sufficient inventory is available, this system is isolated from the non-safety-class purge system by two 3-inch safety-class swing check valves. These valves provide the required reverse-flow prevention function, and are arranged in series to provide protection in the event of a single active failure of one of the valves. The design also affords the capability to test each of these valves.

These valves were first leak-tested by the vendor and then by the SRS contractor during the system commissioning in 1995. The normal system alignment is such that they are open, providing a flow path for the non-safety-class purge system; therefore, their reverse-flow safety function is not verified by normal operation. Additionally, they are not verified to be closed during the annual test of the Safety Grade Nitrogen System. Since the initial testing, there has been no recorded demonstration that these valves could close and preserve the DSA-credited inventory.

The initial commissioning test documented a small leakage across the check valves. The design calculation that established the required nitrogen inventory to meet the four-day-minimum requirement did not account for valve leakage. Although the inventory margin between the TSR-required 775 inches of water column and the calculated required inventory is 2.5 percent, accounting for instrument uncertainty, this margin does not assume any back leakage, and is not verified as adequate by testing.

During the OA inspection, Westinghouse Savannah River Company (WSRC), which manages and operates SRS under contract to DOE, initiated a nonconformance report (NCR) to address the lack of valve testing. This NCR addressed the two check valves and other similar valves that were identified by WSRC. As part of the NCR process disposition, WSRC is preparing a test procedure that will have a leakage acceptance criterion, procurement and dedication requirements for replacement valves (in case of unacceptable test results), and justification for conditional release of the nonconformance until the testing can be performed. The NCR process will also address any notification requirements.

Although WSRC is taking action, SRS has not tested the isolation check valves for the CPC Safety Grade Nitrogen System since the initial system test and has not accounted for their back-leakage in system design analyses (which would need to be translated into system testing procedures). Therefore, the testing and design analyses are not adequate to periodically demonstrate operability of the check valves to be consistent with the safety-class surveillance required in the DSA.

Melter Off-Gas System Instrumentation and Associated Interlocks. The Melter Off-Gas System Instrumentation and Associated Interlocks provide indication and interlocks for film cooler steam supply pressure, combustion and dilution airflow, and air pressure to the primary and backup off-gas film coolers. The purpose of the interlocks is to ensure that a flammable mixture is not formed in the off-gas system. The interlocks shut off both of the melter feed pumps if the combustion or dilution airflow or the film cooler steam supply pressure is low. The DSA requires safety-class structures, systems, or components (SSCs) to be designed to withstand a single failure. However, the DSA exempts those interlocks and provides three arguments for the exemption:

- The interlocks are very reliable.
- Interlock action is not required on loss of power.
- Operator action is credited in mitigation of the failure of the interlocks.

The first two arguments, individually or in combination, do not provide an adequate justification for an exemption for the following reasons:

- Both reliability and single-failure capability are required for all safety-class equipment. One is not a substitute for the other; both requirements must be met for all safety-class SSCs.
- The interlocks have a safety function only when the feed pump is powered; therefore, the second reason is not relevant.

With regard to the third argument, credit for operator actions is at times accepted in a backfit situation where (1) the actions are based on analysis/evaluations that demonstrate that they can be performed, and (2) procedures for those actions are developed and are validated that they can be implemented under adverse conditions within the analyzed timeframe. For the design basis scenario, the minimum operator response time would have to be less than 1.5 minutes, based on the results of calculations supporting the DSA. During the OA inspection, WSRC and SR indicated that credit for the operator actions referenced in the DSA only applied to non-design-basis events. Thus, the DSA exception from the single-failure requirement during the design basis event is not supported by the arguments in the DSA or the reference document.

The OA team's concern with inadequate justification for the deviation from the single active failure requirements was previously identified by SR as an open issue in 1997. As the following information indicates, the issue may have been closed without adequate documentation.

- SR documented the single-failure issue in Safety Evaluation Report (SER) Supplement 17, and tracked it as Open Issue S17-4-1. This issue was related to "inadequate justification provided for accepting these vulnerabilities given that several components are involved (the failure of any one of which could defeat the safety function) and the large consequences of such a failure while operating in design basis coupled operations…"

- SR imposed the following requirement for documentation to close this issue: "…include documented evidence that, should operator action be credited, the need for operator actions will be evident in failure scenarios in time to ensure those actions will prevent reaching LFL in the melter off-gas system…"

- This issue was closed by DOE in 1998 by SER Supplement 18, which determined that "adequate justification for accepting these conditions was provided."

- SER Supplement 18 and the contractor's response referenced in SER Supplement 18 did not include "documented evidence" that the DSA-credited operator action could be performed in sufficient time to prevent reaching the LFL in the melter off-gas system.

- The WSRC response included a risk-based argument that was based on a qualitative evaluation of the low probability and reduced consequences of the event, challenging the need for the single active failure mitigation. However, the evaluation was decoupled from the DSA analysis and poorly documented.

Also, the analysis referenced in the contractor's response to the open issue relied on a "maximum flammable concentration of 10 % LFL for the 3X off-gas surge" versus the maximum allowable 95 percent of the LFL. This prediction was based on an old operating condition with the melter feed of less than 1 gallon per minute (gpm). Following a change in the operating parameters (increase in melter feed up to 1.5 gpm, decrease in combustion airflow and lower vapor space temperature), a new analysis was generated. This later analysis predicted a maximum flammable concentration of 75 percent LFL for the 3X off-gas surge. Although the later analysis is discussed in SER Supplement 18, there is no documented evidence that the effect of the change in the predicted LFL values was reconsidered for impact on the risk for operation without single active failure capability.

After completion of the OA inspection, SR indicated that they will re-perform the SER Supplement 18, and requested that WSRC provide additional analysis or justification. SR directed WSRC to complete this effort by March 19, 2004.

Therefore, neither the DSA nor any supporting documents adequately demonstrated the basis for the deviation from the single active failure requirement for the Melter Off-Gas System Instrumentation and Associated Interlocks.

Based on the above information, the two evaluated DWPF safety-class systems—the CPC Safety Grade Nitrogen System and the Melter Off-Gas System Instrumentation and Associated Interlocks—have a generally robust design. However, two fundamental weaknesses could prevent them from performing their design safety functions:

1. The check valves that separate the CPC Safety Grade Nitrogen System from the non-safety-class purge system have not been tested since plant commissioning, which has resulted in the operability of this system being indeterminate. Additionally, no allowable leakage surveillance requirements have been defined in formal analyses.

2. The Melter Off-Gas System Instrumentation and Associated Interlocks do not meet the single-failure criterion requirement for safety-class SSCs, which challenges the system's operability. Existing documentation does not adequately justify exemption from this requirement.

In addition, the SRS engineering staff has not documented the safety basis of the reviewed safety-class systems with the appropriate level of rigor and attention to detail. Specific weaknesses include: the design requirements are not consistently translated correctly into system procedures; insufficient DSA/TSR documentation; and insufficient rigor applied to documentation of technical issue evaluations. The engineering deficiencies in two safety-class systems indicate insufficient rigor in the WSRC analysis, testing, and quality assurance processes for these two safety systems.

Finding #11: WSRC has not fully demonstrated through rigorous analysis and/or testing that two safety-class systems at DWPF will perform their design safety function.

SR performs effective technical reviews of DSAs and design issues in many cases. However, SR reviews did not identify implementation deficiencies in the DSA and TSRs for the two safety-class systems.

Finding #12: SR technical reviews were not sufficient to identify deficiencies with implementing the DSA and TSRs for two DWPF safety-class systems.

Tritium Processing Facility (Building 233H). The tritium processing building (233H) was designed and constructed in the late 1980s and early 1990s. OA evaluated two systems in the facility: the safety-class Fire Suppression System and the safety-significant Exhaust Ventilation System. The reviews addressed the conformance of these systems with the DSA and the TSRs, and the translation of their designs into the associated procedures and practices. The following paragraphs address engineering observations for these systems.

Fire Suppression System. The Building 233H Fire Suppression System is a wet-pipe sprinkler system that is filled with water up to the sprinkler heads in the process rooms, except for the Environmental Conditioning Area, Room 54. Room 54 contains a dry-pipe system; a thermal control valve actuated by a fusable link must open to fill the sprinkler piping with water to control fires in this area.

Generally, the suppression system has a robust design. The sprinkler system for Building 233H was designed and installed in accordance with applicable National Fire Protection Association (NFPA) standards. All devices, components, and equipment comprising the system are listed by Underwriters Laboratories Inc. and/or approved by Factory Mutual. Pipes and pipe fittings meet other national standards as permitted by NFPA. No significant technical discrepancies were identified in this system; however, some weaknesses in configuration management were identified and are discussed later in this section.

Exhaust Ventilation System. The Building 233H Exhaust Ventilation System, located in the west side of the building, consists of three exhaust fans (each able to provide 50 percent of the required ventilation load), two air monitoring blowers, the stack, and air monitoring instrumentation. The airflow system consists of separate supply air and exhaust air ductwork that directs the airflow throughout the entire building. The exhaust fans are located below ground to ensure their operation during and after a design basis tornado. The exhaust duct is also equipped with a tornado damper, which is located at the penetration of the building structure of the exhaust stack. Exhaust fans are supplied with standby power from a diesel generator housed within a reinforced concrete structure located on the building roof.

No significant technical discrepancies or weaknesses were identified in this system. Several aspects of the design were found to contain large performance margins compared to the safety-significant functional requirements. These margins are partly attributable to the system's original safety-class design. Also, a high degree of rigor and attention to detail was evident in the system's design, analyses, and related technical functions.

Configuration Management. Three aspects of configuration management were reviewed: the sitewide USQ program, the DWPF configuration management program, and the 233H tritium configuration management program.

SiteWide Unreviewed Safety Question Program. Conformance with 10 CFR 830 requires the performance of two basic processes for proposed activities or discoveries to determine whether they involve a USQ: (1) determining whether the proposed activity or discovery is required to be evaluated to determine whether it constitutes a USQ (commonly referred to as a "screening"), and (2) performing the USQ evaluation itself, if it is determined to be required during screening. Of 32 USQ screenings and/or evaluations reviewed, 12 did not comply with the CFR screening requirements, and 4 were incorrect evaluations (3 were inappropriate USQ evaluations to establish categorical exclusions, and one USQ evaluation did not comply with the CFR evaluation requirements).

All 12 incorrect screenings determined that USQ evaluations were not required for the proposed changes to SSCs or procedures because the SSCs or procedures were not described in the DSA. However, in every case, the changes involved SSCs or procedures that were either a part of an SSC or a procedure type described in the DSA, and thus should have been evaluated. The screening conclusions were all based on the fact that the specific item being changed was not explicitly described in the DSA. This practice is contrary to the literal direction of the CFR and also to its intent, as described in several locations in DOE Guide 424.1–1, *Implementation Guide For Use In Addressing Unreviewed Safety Question Requirements*, including:

- Section 2.1, which states, "Changes to SSCs that are not explicitly discussed in the safety analyses should not be excluded from the USQ process…"
- Section 2.2, which states, "The identification of procedures may be explicit or implicit in the facility DSA. If the procedure is implied directly by the nature of a topic in the safety basis (including the operational safety requirements or TSRs), that change should be considered to be to a procedure described in the DSA…"
- Appendix B, Section B.11, which states "USQ screening is intended to be a simple go/no-go decision-making step…Screening to determine whether an SSC is described in the safety analyses (safety basis) should consider only whether the equipment is identified anywhere in the safety basis."

The above three bulleted quotations from DOE Guide 424.1-1 clearly specify that changes to SSCs or procedures that are described *or implied* in the DSA require USQ evaluation, simply because they are *described or implied* in the DSA. In addition, there are some ambiguities in the DOE Guide that are also contributing to improper implementation of the USQ process. In Section 2.1, the guide includes two sentences that address considering the *effects* of the change as well to determine if a USQ determination is required. These two sentences are not consistent with the CFR. Per 10 CFR 830.203(D)(1) and (2), for changes to SSCs and procedures, the decision as to whether or not a USQ determination is to be performed rests solely on whether or not the SSC or procedure being changed is described in the DSA. The CFR attaches no qualifiers to this criterion. The *effects* of the change are not relevant in determining whether a USQ determination is required. If a USQ determination is required per the criterion, evaluation of the *effects* is required to be performed *in the USQ determination itself*, not when deciding whether the USQ determination is required. This specific weakness and others in the Guide have been formally transmitted in a September 2003 memorandum to the Office of Environment, Safety and Health, who concurred with OA's interpretation of the CFR and the DOE Guide regarding the intent of USQ screening, and that additional clarification and guidance is warranted to improve effective implementation of the USQ process. However, actions to strengthen the DOE Guide and provide additional USQ process clarifications to the field have not yet been taken by the Office of Environment, Safety and Health.

Three inappropriate USQ evaluations were based on categorical exclusions for non-specific, future changes to technical procedures applicable to SSCs that were described in the DSA. These future procedure changes were not specified in the evaluations and were not fully defined. Therefore, the evaluations could not make valid determinations of the potential for such changes to remain inside the existing safety basis. These categorical exclusions were also outside the guidelines provided by the contractor's procedure, which provided such examples as non-technical administrative, financial, and human resources procedures.

The incorrect USQ evaluation that OA reviewed involved a potential inadequacy in the safety analysis for the tritium processing facility. This evaluation addressed a discovery that a portion of the safety-class Fire Suppression System provided less sprinkler coverage than was described in the DSA. In performing the evaluation, the USQ reviewer incorrectly answered two questions, resulting in an incorrect evaluation:

- The reviewer incorrectly answered no to the evaluation question: "Could the Proposed Activity increase the frequency of occurrence of an accident previously evaluated in the facility Authorization Basis?" However, the discovered condition increased the frequency by about a factor of five, according to the SRS evaluation.

- The reviewer incorrectly answered no to the evaluation question: "Could the Proposed Activity increase the frequency of occurrence of a malfunction of equipment important to safety previously evaluated in the facility Authorization Basis?" The reviewer used the incorrect criteria and indicated that the increase was "below the threshold of concern per the USQ criteria [in the procedure]."

The "no" answers to the above two questions were incorrect. The CFR requires a change to be identified as a USQ if there is any increase in probability of occurrence of an accident or malfunction of equipment important to safety. There are no qualifications on the amount of the increase. The absence of a magnitude threshold is reinforced by DOE Guide 424.1-1, which states in Section 3.3, "It is the direction that the change has on probability or consequences that is important, not the magnitude that is important."

Discussions with persons who performed some of these reviews indicated that they had based their reviews on the USQ procedure and the procedure-based USQ training. However, the USQ procedure is deficient with respect to the CFR requirements.

- Section A, "General," paragraph 4, addresses defense-in-depth systems and states that changes to such systems that would not affect DSA-defined, defense-in-depth functions would *not* require USQ consideration. This is contrary to the CFR, which requires a USQ evaluation for *any* change to the facility, as described in the DSA, regardless of the safety classification (or lack thereof) of the SSC being changed.

- Attachment 5, "Instructions for USQ Form Completion," contains screening form directions for determining whether a proposed activity is a change to the facility as described in the DSA (Block 2.a.). If the answer is yes to any of the questions, then a USQ evaluation must be performed. The procedure criterion is whether the change "…alters the design, function, or method of performing the function of a structure, system, or component (SSC)…" described in the DSA. Per the directions, making this determination requires that, "…an engineering evaluation and a thorough understanding of the design basis of the system are essential." These directions place non-conservative qualifications on the straightforward criterion in the CFR, which requires only determining whether the change is to an SSC as described (or implied) in the DSA, not what the SSC functions are or how they may be affected. The screening criteria in the procedure can induce the screener to perform a premature and undocumented USQ evaluation at the screening stage, which may not address the eight points specifically required to be addressed by the CFR.

- Attachment 5, “Instructions for USQ Form Completion,” includes directions for the screening form, which address determining whether the proposed activity is a change to a procedure as described in the DSA (Block 2.b.). These directions state: “...changes to procedures simply listed, and not outlined, summarized, or described in the DSA, do not require review.” However, most procedures that apply to SSCs that are described in the DSA are not *listed, outlined, summarized, or specifically described* in the DSA. Most plant procedures are described in general terms or simply implied. Therefore, this direction would eliminate from USQ evaluations most procedure changes that are required to be evaluated. The procedure further states, “…changes to procedures that are outlined, summarized, or described are evaluated if the outline, summary, or description in the DSA is impacted [by the change].” This is also not a valid criterion because procedure changes could have profound impacts on whether the activities addressed in the procedures remained within the safety basis, without having any impact at all on the DSA outline, summary, or description. The only criterion, per the CFR, for whether a procedure change must undergo a USQ evaluation is whether or not the procedure is described or even implied in the DSA, not what the effect of the change on the procedure will be, the system the procedure addresses, the DSA description, or any other factor.

- Section E contains “guidelines” for evaluation of increases in frequency and consequences in determining whether a USQ exists, in terms of quantitative criteria, which, if not exceeded, would not constitute a USQ. It also states that unless a change does not cause an increase in the “*accident risk class, as discussed in DOE-STD-3011,*” it does not constitute a USQ. This guidance is non-conservative because changes can cause large increases in frequency or consequences, or both, without causing increases in the “accident risk class.” Therefore the guidance could result in a change incorrectly not being considered a USQ. This quantitative approach is contrary to the CFR, which states that an increase in either of these parameters constitutes a USQ, without any qualification regarding the magnitude of the increase. It is also inconsistent with DOE Guide 424.11, Section 3.3, which states that, “It is inappropriate to set a numerical margin for increases in the probability or consequences within which a positive USQ determination would not be triggered,” and “It is the direction that the change has on probability or consequences that is important, not the magnitude that is important.”

In addition to the CFR-related weaknesses above, some other procedure weaknesses were identified:

- Section F.1, “Use of Prior USQSs and USQEs,” discusses using a prior USQ screening or evaluation to fulfill the review requirements of a new change if “...any difference in the activity [from the prior activity] is not technically significant enough to warrant additional review.” The determination of what is “not technically significant enough to warrant additional review” is highly subjective. This allowance has a high potential for error or abuse and, therefore, is not appropriate for the USQ process.

- DOE Guide 424.1-1, Section 3.2, “Screening,” states, “...categorical exclusions are regarded as part of the contractor's USQ procedure, requiring DOE approval.” The site procedure has no provisions implementing this statement, and the categorical exclusions approved to date by WSRC have received no formal, documented DOE approval.

- Section F.6 states that changes for which USQ evaluations are not performed because they are categorical exclusions, inconsequential changes, or are like prior USQ screenings and evaluations must be documented in the change review/approval documentation or other related documents for the proposed activity rather than in the USQ screening form. As a result, USQ screenings are documented in many potentially diverse locations, with potentially inconsistent and incompatible format, rather than in the USQ screening form. This practice unnecessarily circumvents one of the reasons for the form, which is to document USQ screenings in one standard, consistent, easily retrievable form.

The high rate of incorrect USQ screenings (12 of 32 reviewed) and the four incorrect USQ evaluations indicate significant deficiencies in the USQ program. The primary cause of the deficient screenings and the deficient USQ evaluation that involved inadequacy in the safety analysis is an inadequate USQ procedure. The procedure provides direction and guidance that is inconsistent with the CFR and that can be, and has been, misleading and non-conservative.

Finding #13: WSRC is not evaluating changes to the facilities or procedures as described in the DSA, or potential inadequacies in the DSA, in accordance with 10 CFR 830 to determine whether they constitute a USQ; deficiencies in the USQ procedure and its implementation are a contributing factor.

SR reviewed and approved the WSRC USQ procedure and has reviewed compliance with the procedure. However, the SR technical review was not sufficient to identify and correct the inadequate USQ process prior to approval, which has resulted in incorrect screenings and evaluations. 10 CFR 830 recognized that guidance documents are not mandatory but are considered an acceptable method to satisfy the requirements. 10 CFR 830 references DOE Policy 450.2A, which allows alternate methods to be used; however, the alternative methods must be justified to ensure an adequate level of safety. The required justifications have not been performed in the cases where the SRS USQ procedure deviates from DOE Guide 424.1-1. In addition, some weaknesses in the DOE Guide are also a contributing factor to inconsistent field implementation of the USQ process.

Finding #14: SR has not ensured that the SRS USQ process, procedure, and implementation are adequate.

DWPF Configuration Management. Configuration management is important for maintaining the accuracy and validity of the safety basis and technical documents, such as the DSA, TSRs, drawings, procedures, and other technical documents used in day-to-day facility operations. Excepting the deficient USQ process, SRS has established other basic elements of an effective configuration management program, including drawing controls, calculation controls, procedure revision protocols and controls, and a design change process to assure that facility modifications are properly evaluated, documented, reviewed, and verified to be within the bounds of the DSA, the TSRs, and applicable codes, standards, and DOE orders.

The DSA and the TSRs, in most instances, adequately document the safety functions, roles, and performance requirements in detecting, preventing, and mitigating analyzed events. The descriptions of normal and accident conditions for the CPC Safety Grade Nitrogen System and the Melter Off-Gas System Instrumentation and Associated Interlocks, in most cases, were clear, adequately documented, and contained appropriate inputs, assumptions, and levels of detail.

However, as previously discussed, significant aspects of the DSA had not been adequately considered in the design and engineering of the systems. Additionally, weaknesses in configuration control have been identified at DWPF in the areas of seismic interactions, the environmental qualification (EQ) program, and the modification process. These weaknesses did not threaten operability of the systems, but indicated insufficient rigor and attention to detail in documentation.

- **Seismic Interactions.** Documentation of the evaluation of the seismically induced interactions between the non-seismically-supported overhead structures and the safety-class components for the Melter Off-Gas System Instrumentation and Associated Interlocks is incomplete. The OA team identified several discrepancies, including not all potential hazards were identified, and in those cases where the hazards were identified, the interactions were determined to be acceptable without any explanation. A contributing factor is that the walkdown procedure does not require documenting the justification for accepting potential hazards.

- **Environmental Qualification.** Review of the design basis documents indicated that the documentation of the evaluation of the EQ program for the safety-class components of the Melter Off-Gas System Instrumentation and Associated Interlocks is incomplete. Several discrepancies were identified that indicate potential deficiencies in the EQ program, including:

  - The EQ program evaluation referenced in the DSA is incomplete. Not all safety-class components are identified, and the ones that were identified were not evaluated based on technical analysis (i.e., based on an arbitrary, 10-foot distance criterion between the safety-class components and the pressurized lines). Additionally, for the components identified, the expected EQ conditions and the ability of the equipment to meet these conditions were not documented.

  - The EQ program does not document the expected design basis events for which the safety-class equipment is required to function (the components are credited to function only during the design basis events).

  - A timeframe of the expected operation for the safety-class equipment was not documented. The equipment degradation will not happen instantaneously but over time, while the safety function of the safety-class components may be credited only for a short period after the event.

  - The facility procedures direct the operator to manually trip the melter feed pump (from the Control Room, or locally if the Control Room function cannot be accomplished) in case of the seismic event indication. For other events that may result in the delayed safety function actuation, the operator response can be credited prior to the equipment malfunction, thus negating any potential failures of the safety-class components that were qualified to mild EQ requirements only.

- **Modification Process.** The OA team review of recent modifications to upgrade the melter off-gas system to safety-class revealed that added equipment was purchased as commercial grade and then dedicated and installed. The dedication process did not address any EQ requirements. The modification process does not have specific requirements to evaluate EQ and seismic interactions; instead it relies on the general design review process. Also, WSRC indicated that it relies on the USQ process to identify adverse interactions, which is not the focus or intent of this process.

DWPF configuration management processes and procedures, with the exception of the USQ program, are generally in accordance with applicable standards and regulations and are carried out in accordance with these procedures. In addition, facility engineers are knowledgeable, conscientious, and highly motivated. However, some weaknesses in the EQ program, seismic interaction, and modification processes were identified that indicated insufficient rigor in documentation but did not threaten operability.

Tritium Facilities Configuration Management. As with the DWPF, most aspects of configuration management are adequate for the Building 233H systems reviewed. No significant technical discrepancies or weaknesses were identified for the configuration management of the Exhaust Ventilation System.

Although configuration control documentation is adequate in most respects, a few weaknesses were identified in Fire Suppression System calculations and DSA references to this facility, as discussed in the following paragraphs. However, none of these process issues resulted in preventing the system from fully performing its intended safety function.

Design basis calculations have not been kept up to date and do not reflect the systems' current configuration. For example, the 233H facility hydraulic calculation has not been updated with current water supply capability since 1989. The calculation determines the water pressure and flow required to be delivered to the most demanding design area of the building, considering the hazard classification and flow density requirements. The calculation compares the building requirements with the water pressure and flow capability of the fire water supply system to ensure that sufficient margin exists as required by DOE-STD-1066-99, *Fire Protection Design Criteria*, and SRS Engineering Standard 01120. The DOE standard requires that hydraulically designed sprinkler systems be designed for a supply pressure of at least 10 percent but not less than 10 pounds per square inch below the supply curve. The SRS standard reiterates this same requirement. Additionally, SRS document F-ESR-G-00055, entitled "AB/Engineering Guidance for Fire Protection Systems," states that the facility must verify initially and periodically the adequacy of the supply system with regard to flow rate and pressure. Although this requirement is verified by the facility annual drain test, the test results are not used to update the hydraulic calculation. The fire pump test curve determines the supply curve. However, since 1989, the H-Area fire pumps have been replaced with new fire pumps that have different performance curves. Additionally, tests have consistently shown degradation to the pressure/flow capability of the pumps, which translates into reduced margin at the building. However, the results of these changes, as reflected in the annual pump testing mandated by NFPA and performed by the Site Utilities Department, have not been translated into the facility-specific suppression system hydraulic analysis of record for the 233H facility.

Calculation S-CLC-H-00372, "Frequencies of Fires in 233H," does not reflect the current system configuration. The calculation documents the estimated frequencies of fires in Building 233H. The calculation still makes reference to the preaction suppression system that was replaced with the current wet suppression system in 1997. As a result of the design modification, the frequencies of fire changed with the modified system. The calculation, which is used as the basis for design basis earthquake selection for fires in the accident analysis, was not revised as part of the system design modification.

Chapter 2 of the DSA makes reference to compliance to DOE Order 6430 with certain exemptions; however, the current configuration does not conform to the requirements of the DOE order in that redundancy and single-failure criteria are not implemented in the system design. SRS documentation permitted deviation from the requirements of the DOE order with regard to redundancy and single-failure criteria; however, there is no apparent reference in the DSA to the DOE-approved deviation.

Site Utilities Department. The Tritium Facilities suppression system relies on the site fire protection pumps to supply water. Site Fire Protection Engineering does not maintain a current, controlled set of calculations that support water distribution to H-Area facilities. At the request of the OA team, the Fire Protection Engineering Group that supports the Site Utilities Department ran two computer model calculations for water supply capability to 233H based on the latest electric motor-driven pump and the diesel-driven pump test data. The analyses indicate that even with the degradation realized in the two pumps, sufficient margin exists in the water supply capability to the tritium processing facility. However, until this request, there was no analysis on record to support the latest fire pump annual flow test results.

The OA team reviewed the General Service classification of the H-Area fire pump, storage tank, and underground distribution system, and the system's ability to provide a reliable water supply to the safety-class suppression system in Building 233H. Federal regulation 10 CFR 830 defines a safety-class system as a system, or components, including portions of process systems, whose preventive or mitigative function is necessary to limit radioactive hazardous material exposure to the public, as determined from safety analyses. The tritium building safety analysis clearly defines the suppression system as safety-class, and its safety function is to limit the consequences of fires to the general public. Based on these definitions, the water supply system should be classified consistent with the classification of the interfacing suppression system and commensurate with the evaluated hazards of the facility, or have documented evidence as to the system's reliability in light of the safety-class requirements. Although the water supply system appeared to be robust and was tested against NFPA standards, documented evidence and analysis to support a reliable water supply to a safety-class system was not apparent.

Summary of Engineering/Configuration Management. In general, the facilities and systems, excepting certain aspects of the CPC Safety Grade Nitrogen System and the Melter Off-Gas System Instrumentation and Associated Interlocks, are well designed and in accordance with the requirements of the DSAs, TSRs, and applicable codes, standards, and good engineering practices. Most supporting calculations and analyses were generally clear, concise, and complete, and the level of detail and rigor were commensurate with the systems' safety significance. They demonstrated adequate and, in some cases, very large margins in the design of the SSCs. The material condition of the SSCs was generally very good. The engineering personnel, technical support personnel, and managers who were interviewed were technically qualified and knowledgeable of their facilities, their systems, and the applicable authorization bases' requirements. They were also highly motivated and possessed a strong sense of ownership. However, there are engineering deficiencies in two safety-class systems that indicate insufficient technical rigor by WSRC and insufficient technical review by SR.

In most cases, configuration management was established and implemented in a manner that adequately ensured the configuration of SSCs, the associated procedures, and configuration changes. However, the USQ program is deficient, largely because of a deficient procedure. These USQ process deficiencies are contributing to incorrect USQ screenings and evaluations. Some documentation and analysis weaknesses were also evident in seismic interactions, EQ, modifications, and some calculations.

F.2.2 Surveillance, Testing, and Maintenance

Surveillance and testing of the selected safety components is governed by the TSRs. The TSRs establish appropriate requirements for functional testing of critical components at a frequency to assure the components operability. At both facilities, the TSR surveillance and test acceptance criteria are appropriately based on the DSA, and comprehensive maintenance programs are in place.

DWPF. The safety components at DWPF were in good physical condition. The Maintenance organization uses the Passport system for work package generation and work control. DWPF has a substantial number of maintenance crafts personnel dedicated to DWPF systems. For highly specific tasks, such as fire protection inspections or critical lifting, specialized groups are brought in from central services. Schedulers prepare the planned outages packages with an emphasis on implementing lessons learned. The lessons-learned information is obtained from critiques conducted by management from previously completed outages.

The in-service inspection program specified in the DSA is referred to as the Structural Integrity Program and is coordinated by Plant Engineering. The Structural Integrity Program is adequate. The analysis performed for the data sheets was thorough and detailed. The program requires all safety-significant or safety-class components to be evaluated by system, material, and structural engineers to analyze potential failure mechanisms and stress locations. The resulting analysis is utilized to recommend testing and inspection criteria and frequencies.

One deficiency was noted with the Structural Integrity Program. Specifically, there is no requirement to periodically update the data sheets with new information or changes to analyzed components (e.g., safety-class to safety-significant). Also, the Structural Integrity Program-recommended surveillances were not fully integrated into the Passport system. The Structural Integrity Program should be integrated to ensure that all work activities are accurately reflected in the component work history database. As a result, maintenance history does not always reflect the current activities performed on some equipment.

The system engineers were knowledgeable of their individual system components' configuration, operation, and maintenance requirements, and they coordinated well with the DWPF maintenance personnel. In addition, the engineering division at DWPF has assigned Plant Engineering personnel to work directly with plant maintenance personnel to assist in job planning and troubleshooting.

Plant Engineering recently initiated system health reports and has had the Facility Performance Monitoring Program in place for some time. Both processes are intended to provide in-depth, focused evaluations of specific systems and thereby identify potential issues and resolve emerging problems related to those systems.

Preventive maintenance and surveillances for the selected safety components are effectively tracked and trended by both the DWPF maintenance manager and a designated operations surveillance coordinator for the surveillance system. A 10-day, look-ahead schedule is prepared each day for the plan of the day and identifies the upcoming required surveillances and preventive maintenances. Authorization and approval for overdue surveillances are required from either the operations manager or the facility manager to enter into the overdue grace period for any safety-significant components. Vendor manuals were available for use by planners. However, some effort may be required to physically retrieve manuals that are not yet stored electronically in the document control databases.

Predictive maintenance on specified components is performed by the Maintenance Technical Services organization. Thermography and vibration analysis techniques are both used. Monthly update reports are provided to the DWPF Maintenance Manager by the Maintenance Technical Services organization.

Maintenance work packages were clear and concise. Appropriate planning was performed, and hazards were appropriately identified in the Passport system. In accordance with the graded approach, work packages included all necessary information, including up-to-date drawings appropriate to the complexity of the work. Review of completed work packages identified no significant deficiencies.

There was one minor deficiency related to authorization to start work in the completed work packages. Several of the work packages did not document the status of Control Room notification prior to starting work; however, the work packages were formally approved by Operations to proceed. The Operations Department work release control group has responsibility to determine whether the Control Room needs to be notified.

Tritium Facilities. Four limiting conditions of operation form the basis for surveillance and testing of the fire suppression and detection systems. Implementation of these TSRs in the safety-class Fire Suppression System results in the formulation of appropriate functional requirements for surveillance and testing of critical systems, equipment, and components. Documentation supported surveillance and testing frequencies that maintained system operability and reliability. Surveillance and test acceptance criteria established by TSRs were appropriately based on NFPA standards.

The material and physical condition of the fire suppression and detection systems are acceptable. The material and physical condition of the electric and diesel fire pumps and engines in Buildings 241-125H and 902-3H that serve as the water source for Building 233H are also acceptable.

Preventive maintenance and corrective maintenance of the fire suppression and detection systems are adequately being performed in compliance with NFPA Standards 25 and 72. Completion of preventive maintenance, corrective maintenance, and surveillance tasks, along with system inventory, are effectively tracked in a number of software packages, such as Passport, Fire Protection Database System, Asset Information Management, and the Tritium Work Package System. Formal processes for maintenance tasks and activities, along with requisitioning procedures for components and parts, have been established.

The senior fire protection engineer, fire protection coordinators, and technical staff from the Tritium Facilities combine with the inspectors from Fire Protection Services and maintenance mechanics from the Fire Alarm shop to provide a maintenance program that improves reliability and dependability of the fire suppression and detection systems. The maintenance processes implemented by the above staff have resulted in no maintenance backlog in the fire detection and suppression systems for over a year.

Training and qualification of fire protection maintenance managers, supervisors, and technical staff (fire protection engineers/coordinators and mechanical maintenance workers) are adequate. In-depth responses to queries indicate technical staff and fire protection engineers/coordinators are technically competent. Fire protection engineers, coordinators, technical staff, and maintenance workers performing surveillance, testing, and maintenance receive factory-based training on installed systems and equipment. The engineering personnel at the Tritium Facilities displayed a detailed comprehension of the fire suppression and detection systems in Building 233H.

Fire suppression and detection-related maintenance work packages were adequately planned with the following minor exceptions. Several work packages lacked detailed instructions for installation, removal, or repair of equipment and components (e.g., instructions from the manufacturer's vendor manual). There were no attached documented pre- and post-job briefings to the work packages that might aid in the performance of the maintenance activity. The retention of fire maintenance work packages for one year limited the ability to capture lessons learned and some potentially useful historical data. Also, the short document retention period resulted in a situation where documentation of some preventive maintenance work packages was not available for review. For example, maintenance work packages were not maintained from the most recent test or replacement of gauges (which occurs every five years) or the internal inspection of pipes.

Maintenance source documents, vendor manuals, and SRS manuals and requirements were readily available. Tritium Facilities and Site Utilities Department planners routinely use these source documents to formulate fire maintenance work packages.

An effective calibration program is in place for fire suppression and detection measurement and test equipment. As a result, calibrated equipment is being used for fire suppression and detection equipment surveillance and testing.

A few deficiencies were discovered during the inspection of the fire suppression and detection systems. However, these items are exceptions to an overall sound maintenance program.

- The weekly, annual, and triennial preventive maintenances performed by the Site Utilities Department for the two diesel fire pump engines in Building 241-125H, which is the source of water for Building 233H, were not in full compliance with NFPA Standard 25, Chapter 8. For example, the triennial preventive maintenance, which required the replacement of belts and the battery, was not being performed.

- The Fire Protection Services group does not have a process in place to track corrective actions affiliated with deficiencies noted during testing and inspections of 233H and other buildings under their jurisdiction.

- A formal predictive maintenance program has not been established for the 233H equipment and components of the fire suppression and detection systems, even though a predictive maintenance manager has been assigned to the tritium facility.

Summary of Surveillance, Testing, and Maintenance. The selected safety systems at DWPF are in good physical condition, with appropriate corrective and preventive maintenance being scheduled and performed to assure their continued capabilities. Recent system engineering program initiatives to perform focused team evaluations on specific systems demonstrate a solid approach towards addressing aging components. Work packages are appropriately prioritized, and maintenance backlogs have been maintained at an appropriately low level.

For 233H, the fire suppression and detection systems and the supporting diesel fire pumps and engines in Buildings 241-125H and 902-3H are in good material and physical condition. Ongoing preventive and corrective maintenance from various organizations has supported continued operability and reliability that has resulted in no maintenance backlog. The positive overall maintenance and upkeep can be attributed to the appropriate level of management priority being placed on maintenance activities.

F.2.3 Operations

The OA team evaluated operating procedures and operator training at both DWPF and Building 233H for the selected safety systems to determine how well operators are prepared to take appropriate actions in the case of abnormal and accident events. The OA team also evaluated normal operations as they pertained to ensuring that the selected safety systems are in the proper operating configuration. As discussed below, most OA observations are applicable to both facilities. However, a few observations are specific to DWPF or to 233H.

At both facilities, there were several examples where the Operations Department had implemented good conduct of operations principles with regard to operating the selected safety systems. The positive areas included procedures, equipment labeling, training, and qualification.

In most cases, at DWPF and 233H, an effective set of operating procedures has been established. These procedures are current, technically accurate, controlled, sufficiently detailed, and clearly written. The set of operating procedures addresses normal, abnormal, remote, and emergency conditions. The set of procedures for Zone 1 ventilation at DWPF is a clear example of the thoroughness of the set. The set includes detailed procedures for start-up and shutdown and several tailored procedures describing local operation at electric panels LCS 272, B-9, and B-10. There are also procedures for each alarm and abnormal condition for the system.

Labeling of components at both facilities is effective. Electrical breakers, fans, valves, and dampers associated with the selected safety systems are uniquely labeled, with clearly visible and readable tags. These identification labels are rigorously used to identify components in the operating procedures. The labeling of the selected safety system components matched the associated facility drawings.

At both facilities, the training and qualification process for the Operations Department is adequate and, in general, has resulted in a knowledgeable group of watchstanders. The qualification requirements at both facilities are clearly defined in separate training and qualification program procedures, which are supplemented by watchstander qualification cards. The qualification cards provide a detailed list of required training courses, knowledge requirements, including separate sections associated with the selected systems, and a list of specific performance tasks and procedures. The qualification process includes a comprehensive written and oral test. At both facilities, requalification is also required every two years and includes a comprehensive written test and oral board. Based on a sample set of training lesson plans, plans were adequate at both DWPF and 233H. The training material also included well-written study guides. In general, watchstanders at both facilities had a good understanding of the operating requirements for the selected systems and were also, in general, proficient with performing operating tasks.

For the most part, at both facilities, personnel understood and effectively implemented conduct of operations principles. However, as discussed below, a few facility-specific shortcomings were noted in application of conduct of operations principles, and a few areas were identified where operating procedures could be improved.

The following conduct of operations shortcomings were identified in DWPF procedures or operator knowledge:

- The prevalent use of IMMEDIATELY without a completion time in the TSR action statements does not comply with the recommendations in the DOE TSR writing standard. In one case, IMMEDIATELY is used for an action statement that may take hours to correct depending on the event conditions.

- Control Room and Balance of Plant operators were not fully knowledgeable of their areas of responsibility. A few Balance of Plant operators were not fully knowledgeable on the operation of the exhaust fan local flow controllers on LCS 272. Three Control Room operators were not fully proficient with utilizing the TSRs. In general, the Control Room operators defer TSR questions to the shift manager. The Operations Department has previously recognized this weakness and has requested TSR training for the Control Room operators.

- A few isolated deficiencies were identified with some of the DWPF operating procedures:

  - In general, procedures are written for each limiting conditions of operation condition. During a tabletop review of the TSRs, it was discovered that the link to the procedure for ventilation action condition E was not clearly defined. It was also discovered that the procedure for ventilation action condition C could not be performed.

  - In several procedures the following note is used, "Placing the exhaust fan load center Local/Remote hand switch in Local makes the associated fan INOPERABLE unless LCS 272 is INOPERABLE." This note is a poor interpretation of the TSRs and could be misunderstood.

  - Procedure 5.6.2, "Transfer Zone 1 Exhaust Fans from Load Center to DCS or LCS-272," does not require resetting the exhaust fan flow controller bypass reset buttons prior to transferring to the distributed control system.

  - In Procedure 6.2, "Zone 1 Exhaust Fan Loss of Power Surveillance," the step to ensure approximately zero-percent output (maximum flow) is confusing; it does not specifically state which controller display should be selected to indicate zero-percent output.

One general procedure deficiency was noted at Building 233H. The alarm response procedures for the local exhaust ventilation control panel in some cases lacked accurate set-point information. This procedure deficiency does not directly affect the performance of the procedure, but does provide important background information for the operator.

Summary. DWPF and Building 233H have implemented several sound practices regarding the selected safety system. Specific positive attributes include knowledgeable operators and supervisors, well-written operating procedures, appropriate component labeling, up-to-date system drawings, and a thorough training and qualification process. A few deficiencies were evident in operator proficiency with performing non-routine procedures and with understanding the TSRs, but the overall approach to conduct of operations at both facilities is sound.

F.3 CONCLUSIONS

With a few notable exceptions, most aspects of engineering, configuration management, surveillance, maintenance, testing, and operations are effective and provide assurance that the safety systems will perform their safety functions in normal and accident conditions. The systems are in good condition and well maintained, and engineers, operators, and maintenance personnel are, for the most part, well qualified and knowledgeable. In most respects, the systems have substantial safety margins.

However, there are weaknesses in a few aspects of engineering of two safety-class systems that could prevent them from performing their design safety functions in some scenarios. These conditions have not yet been adequately analyzed, although for one safety-class system SR and WSRC have initiated appropriate actions. In addition, there are weaknesses in certain aspects of configuration management, including a deficient USQ process, which is largely the result of a deficient USQ procedure. Other configuration management weaknesses in analysis and documentation of seismic interactions, EQ, and facility modifications are evident but do not threaten operability of the system. Collectively, the identified deficiencies indicate a need for improved rigor and attention to detail, as well as enhancements of SR technical reviews and oversight.

F.4 RATINGS

Engineering and Configuration Management..SIGNIFICANT WEAKNESS
Surveillance, Testing, and Maintenance ....EFFECTIVE PERFORMANCE
Operations...EFFECTIVE PERFORMANCE

F.5 OPPORTUNITIES FOR IMPROVEMENT

This OA inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are offered to the site to be reviewed and evaluated by the responsible line management, and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

Savannah River Operations Office

1. **Provide direction and perform technical reviews, assessments, and ongoing oversight to ensure the operability of safety-class systems; enhance the USQ process; and strengthen the systems to prevent recurrence of deficiencies.** Specific actions to consider include:

    - Provide direction to WSRC and monitor WSRC actions related to verifying and documenting safety-class system operability.

    - Strengthen technical reviews of any associated engineering calculations and any changes to DSA and TSR documents.

    - Assess internal SR technical review processes to determine reasons for inadequate review of engineering, and take corrective actions.

- After WSRC actions are complete relative to safety-class systems, assess effectiveness of WSRC actions for specific systems and extent-of-condition determinations and recurrence controls.

- Incorporate lessons learned into the SR systems engineering program.

- Consider provisions for regular design assessments.

- After WSRC actions are complete relative to USQ procedure changes, assess the effectiveness of WSRC actions, including procedures, training, and follow-up actions.

- Perform ongoing SR oversight and technical reviews to validate effectiveness in USQ implementation and training.

Westinghouse Savannah River Company

1. **Ensure operability of safety-class systems and take actions to prevent recurrence of deficiencies.** Specific actions to consider include:

    - Complete the NCR process and take necessary actions for the CPC Safety Grade Nitrogen System check valves.

    - Reevaluate the Melter Off-Gas System Instrumentation and Associated Interlocks against the DSA requirement that safety-class SSCs meet the single-failure criterion.

    - Develop adequate DSA and TSR documentation relative to any changes in the analysis of these two systems, and obtain SR review and approval.

    - Perform extent-of-condition evaluations to determine whether other systems could have similar problems.

    - Evaluate processes for reviewing and documenting the safety basis to determine reasons for deficient conditions and take corrective actions. Address design requirements, which are not consistently translated correctly into system procedures; insufficient DSA/TSR documentation; and insufficient rigor in documentation of evaluation of technical issues. Examine related quality assurance processes as applied to essential systems.

    - Incorporate lessons learned into the WSRC systems engineering program. Consider provisions for regular design assessments.

2. **Revise the site USQ procedure and associated training programs to correct the following areas where the procedure provides directions contrary to the 10 CFR 830 requirements, or has other weaknesses.** Specific actions to consider include:

    - In Section A, "General," paragraph 4, delete the entire section that addresses defense-in-depth systems, since this discussion erroneously implies that changes to such systems require different treatment with respect to USQ requirements. Remove all like discussions at other procedure locations.

    - In Attachment 5, "Instructions for USQ Form Completion," remove all discussions that state or imply that determining whether the proposed activity is a change to the facility as described in the DSA (Block 2.a.) is anything other than just that; that is, determining whether the change being proposed is to an SSC that is described, implied, or a part of an SSC that is described, implied, etc., in the DSA, period. Remove all like discussions at other procedure locations.

- In Attachment 5, "Instructions for USQ Form Completion," remove all discussions that state or imply that determining whether the proposed activity is a change to a procedure as described in the DSA (Block 2.b.) is anything other than just that; that is, determining whether the change being proposed is to a procedure or type of procedure that is described or implied in the DSA, period. At minimum, such procedure types should include all procedures that address or describe any technical activities, such as maintenance, operations, or testing, on SSCs that are described or implied in the DSA. They typically should not include procedures that relate to SSCs that are typically not described or implied in the DSA, such as sanitary plumbing, office lighting or fixtures, or janitorial procedures. Remove all like discussions at other procedure locations.

- Remove all directions in Section E and other procedure locations that place quantitative criteria on determining whether frequency and consequences have increased, when determining whether a USQ exists. Provide instead qualitative instructions that mirror the DOE Guide 424.1-1 statement, "It is the direction that the change has on probability or consequences that is important, not the magnitude that is important."

- Remove the discussion in Section F.1, "Use of Prior USQSs and USQEs," that allows use of a prior USQ screening or evaluation to fulfill the review requirements of a new change if "...any difference in the activity [from the prior activity] is not technically significant enough to warrant additional review." Instead, require that any change that is technically different from a previous change, regardless of the significance, require its own USQ screening and, if required by the screening, its own evaluation.

- Insert requirements in the procedure that all categorical exclusions must be individually approved by DOE before being implemented, as addressed in DOE Guide 424.1-1, Section 3.2.

- Revise the screening form to include (1) check-off notation for changes for which USQ evaluations are not performed because they are categorical exclusions, inconsequential changes, or similar to prior USQ screenings and evaluations, and (2) identification of the reference documents and appropriate justifications for the inconsequential changes and similar prior screenings and evaluations.

- Revise current USQ training course materials to reflect the above-described changes to the procedure, and implement this new training for all currently qualified and future USQ screeners, evaluators, and approvers.

- Perform assessments to verify effectiveness of changes to the procedure and to determine the level of understanding by USQ screeners and evaluators.

- Perform extent-of-condition reviews of changes previously screened out of the USQ process and USQ evaluations of changes determined not to be USQs per the current criteria. Perform corrective actions on discrepancies discovered, and expand extent-of-condition reviews as indicated by the extent of discrepancies found.

3. **Evaluate and enhance seismic interactions, EQ programs, and modifications.** Specific actions to consider include:

- Revise the modification process to require a review of the seismic interactions and EQ requirements for any modification in the general area of the safety-class and safety-significant SSCs. Use a design process separate from the USQ review because the USQ review should be reserved for ensuring safety basis compliance.

- Enhance the facility seismic response procedures by including caution statements to ensure that the tripping of the melter feed pump is not removed from the procedure unless an EQ analysis is performed.

- Revise the EQ program document to clearly indicate the EQ conditions and equipment qualification for the Melter Off-Gas System Instrumentation and Associated Interlocks. Review other safety-class and safety-significant systems for the extent of condition.

- Revise the seismic interaction walkdown procedure to require documentation of all hazards and justification of the conclusions.

- Revise the DSA to provide all references for the seismic interactions for the Melter Off-Gas System Instrumentation and Associated Interlocks. Review other safety-class and safety-significant systems for the extent of condition.

4. **Upgrade and update calculations and documentation.** Specific actions to consider include:

- Perform a review of facility calculations and other design basis documentation and revise as necessary to be consistent with current facility configuration and the DSA.

- Perform an evaluation of the fire water supply system with regard to providing a reliable water supply to safety-class or safety-significant SSCs. Provide documented justification for the General Services classification. A graded approach to implement the requirements of 10 CFR 830 is permitted; however, the basis of the graded approach must be documented and approved by DOE.

- Have the Site Fire Protection Engineering group prepare design basis hydraulic calculations on a facility basis that reflect the most current fire pump flow tests, since fire hydrant tests are performed less frequently than the annual pump tests. These calculations should be distributed to each facility so that facility margin can be determined.

5. **Enhance maintenance procedures and record keeping in specific areas.** Specific actions to consider include:

- Improve the overall effectiveness of fire protection maintenance work packages.

- Attach detailed instructions from the vendor's manual to maintenance work packages for preventive maintenances, installations, and removal or repair of equipment and components.

- Document pre-job and post-job briefings and include them as part of the fire protection maintenance work packages.

- Retain hard copies of fire protection maintenance work packages for multiyear surveillances, tests, and inspections for at least one cycle.

- Consider modifying existing maintenance work documents to reflect the vendor's required checklists, troubleshooting procedures, and preventive maintenance schedules.

- Establish a formal process to track the deficiencies and corresponding corrective actions affiliated with periodic testing and inspections. Consider affixing time periods when corrective actions will be completed.

- Formalize a predictive maintenance program for the equipment and components of the fire suppression and detection systems.

- Consider developing an application or modifying one of the many maintenance software application programs to enhance the sharing of fire protection maintenance activities by managers, engineers, work planners, and technical staff. Ensure that the DWPF Structural Integrity Program is periodically updated and reviewed to reflect system and/or component changes.

- Enhance maintenance organizations' processes for ensuring work package designation for work requiring operations notification prior to starting work.

6. **Enhance operator procedures and knowledge in specific areas.** Specific actions to consider include:

- Conduct the necessary training to improve DWPF Balance of Plant operators' knowledge of the local Zone 1 exhaust fan controllers operation.

- Conduct the necessary training to improve the DWPF Control Room operators' knowledge of the TSRs.

- Revise the definition of IMMEDIATELY in the TSRs to include a maximum completion time.

- Review and revise the DWPF procedures to ensure that the procedures are properly linked to the TSRs and can be performed.

- Review and revise the Zone 1 exhaust ventilation procedures, considering deficiencies identified in this report.

- Review and revise the set-point information in the 233H alarm response procedures for the local exhaust control panel.