Inspection of Environment, Safety, and Health Programs at the

Savannah River Site

February 2006

SSA
Office of Security and Safety Performance Assurance

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

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Abbreviations Used in This Report

AB	Authorization Basis
ACTL	Aiken County Technical Laboratory
AHA	Assisted Hazards Analysis
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
CARB	Corrective Action Review Board
CDNS	Chief Defense Nuclear Safety
CFR	Code of Federal Regulations
CTA	Central Technical Authority
CY	Calendar Year
D&D	Deactivation and Decommissioning
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
ECA	Environmental Compliance Authority
ECATS	Executive Correspondence and Action Tracking System
ECP	Employee Concerns Program
EM	DOE Office of Environmental Management
EM&PT	Emergency Management and Protection Team
EMS	Environmental Management System
EQMD	SR Environmental Quality Management Division
ES&H	Environment, Safety, and Health

(Continued on inside back cover)

OVERSIGHT

1.0 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight (Independent Oversight) conducted an inspection of environment, safety, and health (ES&H) programs at the DOE Savannah River Site (SRS) during January and February 2006. The inspection was performed by Independent Oversight's Office of Environment, Safety and Health Evaluations. Independent Oversight reports to the Director of the Office of Security and Safety Performance Assurance, who reports directly to the Secretary of Energy. Independent Oversight also evaluated the emergency management programs at SRS during this 2006 inspection; the emergency management results are contained in a separate report.

Aerial View of SRS

The DOE Office of Environmental Management (EM) is the lead program secretarial office for SRS. As such, it has overall Headquarters line management 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 Defense Programs operations, with support from SR in various technical and administrative areas.

SRS is managed and operated by Washington Savannah River Company (WSRC), under contract to DOE. WSRC was renamed in December 2005 (it previously was known as the Westinghouse Savannah River Company). 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, and nuclear material stewardship. Under EM/SR direction, environmental stewardship activities at SRS include the management, treatment, and disposal of radioactive, hazardous, mixed, and sanitary 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 disassembly/conversion capability. SRS encompasses approximately 310 square miles of DOE-owned property near Aiken, South Carolina, about 20 miles from Augusta, Georgia.

In May 2004, the Savannah River National Laboratory (SRNL) received National Laboratory designation, and as a multi-program laboratory provides a diverse spectrum of research and development (R&D) in areas of energy security, national and homeland security, and environmental and process technology. SRNL is principally funded by the DOE Environmental Management program, with additional funding provided by other DOE program offices and other Federal agencies.

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.

The purpose of this Independent Oversight inspection was to assess the effectiveness of ES&H programs at SRS as implemented by WSRC, EM/SR, and NNSA/SRSO. Independent Oversight used a selective sampling approach to evaluate a representative sample of activities at SRS, including:

- SRS implementation of the core functions of integrated safety management (ISM) for selected aspects of research, operations, maintenance, and construction at the tritium facilities, the H-Canyon, and SRNL. In evaluating these activities, Independent Oversight focused primarily on implementation of ISM at the facility and activity/task levels, and included a review of activity-level feedback processes.

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

- Essential safety systems, with primary emphasis on engineering, configuration management, surveillance, testing, maintenance, and operations of safety-related ventilation and explosion prevention systems for HB-Line. Independent Oversight also selectively evaluated feedback and improvement processes as applied to the essential safety systems.

- EM/SR, NNSA/SRSO, and WSRC effectiveness in managing and implementing selected aspects of the ES&H program that Independent Oversight has identified as focus areas, including the environmental management system (EMS); workplace monitoring of non-radiological hazards; quality assurance in engineering and configuration management programs and processes; safety system component procurement; safety management for protective force training; and the status of implementation of the recently issued DOE Policy 226.1 and DOE Order 226.1, which delineate an integrated approach to DOE oversight and contractor assurance systems. Independent Oversight selects focus areas—areas that warrant increased attention across the DOE complex—based on a review of operating events and inspection results. Although these topics are not individually rated, the results of focus area reviews are integrated with or considered in the evaluation of ISM core functions and/or essential safety systems.

Sections 2 and 3 discuss the key positive attributes and weaknesses identified during this review. Section 4 provides a summary assessment of the effectiveness of the major ISM elements that were reviewed. Section 5 provides Independent Oversight's conclusions regarding the overall effectiveness of EM/SR, NNSA/SRSO, and WSRC management of the ES&H programs, and Section 6 presents the ratings assigned during this review. Appendix A provides supplemental information, including team composition, and Appendix B identifies the specific findings that require corrective action and follow-up.

Four technical appendices (C through F) contain detailed results of the Independent Oversight review. Appendix C provides the results of the review of the application of the core functions of ISM for work activities. Appendix D presents the results of the review of feedback and continuous improvement processes and management systems, and includes the discussion of the DOE Policy and Order 226.1 focus area. Appendix E presents the results of the review of essential safety system functionality and two related functional areas (quality assurance in engineering and configuration management programs and processes, and safety system component procurement). Appendix F presents the results of the review of safety management of the other selected focus areas. For each of these areas, Independent Oversight identified opportunities for improvement for consideration by EM/SR, NNSA/SRSO, and WSRC management. The opportunities for improvement are listed at the end of each appendix so that they can be considered in context of the status of the areas reviewed.

2.0 Positive Attributes

Several positive attributes were identified in ES&H programs, including noteworthy practices in a containment fabrication facility and preventive/predictive maintenance processes.

WSRC managers at all levels are fully engaged in promoting safety programs and performance towards the achievement of excellence. Although there are a number of areas where SRS safety systems and programs need continued attention and improvement, managers in all organizations, from the president to first-line supervisors, repeatedly demonstrated in meetings, correspondence, initiatives, and challenges to the workforce that safety is a priority at SRS. These expectations were reflected in the attitudes, actions, and responses of the WSRC staff, including a positive approach to assessment and the identification of weaknesses and opportunities for improvement in safety programs and performance. Significant and continuing progress has been made at SRS in the areas of feedback and improvement, occupational injury and illness rates, radiological performance indicators, exposure assessments, behavior-based safety programs, environmental management, activity-level event databases (e.g., the SRNL events database), procurement practices, and Conduct of Operations. For example, ongoing or recently completed actions to improve effectiveness of the WSRC exposure assessment program include implementation of the Industrial Hygiene forms database, tools to critically review the allocation of Industrial Hygiene resources across the site based on risk and operating data, a recovery plan for medical surveillances to better link worker exposures to health care programs, and a peer review committee for exposure assessment decisions. The lessons-learned and Facility Evaluation Board programs are noteworthy processes that warrant emulation elsewhere in the DOE complex. WSRC has also demonstrated leadership in improving safety performance throughout the DOE complex through their significant involvement in the efforts of the Energy Facilities Contractors Group (e.g., developing ISM implementation guidance and tools). Senior management has made managers' presence in the field observing work activities and interacting with workers a continuing priority. Line managers have instituted effective processes to identify issues and areas needing management attention for prioritizing and focusing resources, including Corrective Action Review Boards, management councils, performance analyses, and management evaluations. A high level of management attention is devoted to the analysis and prevention of occupational injuries and injury rates at WRSC.

SRS has a noteworthy containment fabrication facility that contributes to worker safety and facilitates efforts to minimize the spread of contamination and airborne radioactivity. The facility provides SRS with a capability, unique in the DOE complex, to design and build nearly any size containment, hut, or leak collection device. The shop is staffed by experienced personnel who are available to visit the job site and custom-design containments that will address the unique hazards associated with the job. They are able to work with the facility to design and build specialized containments that have proven effective (in both performance and cost) in using engineered controls to protect workers, while minimizing the spread of contamination and the production of waste. SRS deactivation and decommissioning (D&D) projects make extensive use of the facility's capabilities.

WSRC has established and effectively implemented a noteworthy set of configuration management and engineering program documents and procedures to support its nuclear facilities, and a comprehensive preventive and predictive maintenance program, which enhances safety by reducing a safety-related component's potential for failure. A major contributor to the reliability and good material condition of H-Canyon and HB-Line safety system components is a mature preventive and predictive maintenance program. Safety system component preventive maintenance was well defined, effectively translated into maintenance procedures, and closely tracked and performed as required within specified frequencies. Condition-based preventive and predictive maintenance activities are being conducted to monitor safety


Work at the H-Canyon Facility

system components' performance and degradation, and such advanced techniques and technologies as failure modes and effects analysis, vibration analysis, and infrared thermography (to monitor electrical component conditions) are used extensively. In most cases, degradation of safety system components is being identified early to prevent inadvertent failure. In addition, WSRC configuration management and engineering program documents and procedures to support its nuclear facilities are noteworthy. For example, procedures include clear and user-friendly flowcharts.

H-Canyon managers and operators are committed to rigorous and formal Conduct of Operations. At the H-Canyon, facility management has effectively communicated its expectations for meeting Conduct of Operations requirements. In response to a series of Conduct of Operations errors in early 2005, management suspended operations of the facility, and dedicated significant resources to reinforce Conduct of Operations principles and improve operations procedures. The improvements are evident. Operations procedures are generally technically accurate and complete. In observed operations activities, procedural controls were generally appropriate for the hazards. Conduct of Operations training days for the operators also presented an excellent avenue for refreshing Conduct of Operations principles and requirements and providing a two-way feedback mechanism between operators and management. In the observed sessions, most of the operations organization and facility management were present. Operators were actively involved in discussions with managers, and the forum provided real-time feedback to and from management on worker questions, concerns, and practices.

3.0 Weaknesses

Although many aspects of the SRS safety management program are effective and mature, there are weaknesses in a number of important aspects. In some cases, the weaknesses are attributed to the learning curve and start-up problems associated with the implementation of a number of new processes, most of which are part of recent or ongoing corrective actions. Such new processes include the new assisted hazards analysis (AHA) process, new activity-level feedback mechanisms, new methods for exposure monitoring, and a number of other enhancements. Continued attention in these areas is needed to ensure that recent and ongoing corrective actions are completed, verified to be effective, and periodically assessed to ensure their effectiveness. However, a few of the identified weaknesses, as summarized below and discussed in more detail in the appendices, warrant increased management attention because they were either not fully recognized by line management or the corrective actions were not sufficiently mature or effective.

There is insufficient assurance that the safety-related ventilation and explosion prevention systems at the H-Canyon and HB-Line will perform their intended safety functions in certain accident conditions because of weaknesses in the design and the authorization bases, and their translation into facility procedures and processes. While many aspects of the contractor's engineering and configuration management programs were comprehensive and well defined, and the systems reviewed were well designed and robust for their normal operating functions, numerous weaknesses and discrepancies were identified with respect to their accident prevention and mitigation functions. Authorization basis documents contained discrepancies in requirements and their bases in many areas such that there is not sufficient assurance in the performance requirements and capabilities of safety-related structures, systems, and components. The number and nature of the technical discrepancies identified for the safety systems reviewed indicate that the engineering design program and processes were not being executed with the rigor, attention to detail, and questioning attitude necessary to assure reliable performance of accident prevention and mitigation functions.

Some of these technical discrepancies were identified as having immediate potential operability ramifications. For all of those identified, WSRC reported that compensatory measures or analyses were identified or established to ensure that, even if the affected items failed to function as required in a design basis accident, the resultant consequences would be within the current safety basis limits. Additionally, all such items were entered into one or more of various facility issue identification and tracking processes to ensure that documentation, notification, and processing required by regulations and facility procedures would be performed.

HB-Line Control Room

SR and WSRC feedback systems have not been effectively applied to safety system design and authorization bases. Many aspects of SR and WSRC feedback systems are effective or improving, and some cover various aspects of safety system engineering. However, the WSRC cognizant system engineers and various assessment programs have not adequately assessed the design features of safety systems to ensure that they will function in an accident, and the authorization basis to ensure that there is confidence that the system will function as intended in all credible accident conditions. In addition, SR safety system oversight (SSO) and other oversight functions, as applied to the H-Completion Project (HCP), have not been effective in identifying and correcting significant deficiencies in HCP safety system design and authorization bases.

Some corrective actions were not fully effective in addressing the identified safety issues and preventing recurrence. SR, SRSO, and WSRC have been diligent in developing, implementing, and tracking corrective actions for identified deficiencies and in many cases have been effective in addressing the issues. However, in some cases, the corrective actions were not sufficiently effective to address all aspects of the weakness and to prevent recurrences. Further, mechanisms to verify effectiveness of corrective actions and ongoing assessments were not always sufficient to identify residual problem areas. For example, significant effort was devoted to enhancing the AHA process, particularly in the areas of training personnel, improving the user interface, and refining the approach. However, some of the deficiencies in the previous approach were not corrected, such as instances where the yes/no question set was not sufficient to ensure that hazards were adequately analyzed so that appropriate controls were selected and incorporated into work documents. While important improvements have been made, continued deficiencies in some aspects of the issues management process contribute to the failure to identify residual deficiencies and instances of ineffective corrective actions.

The AHA process is a marked improvement over the previous automated hazards analysis system, but there are still deficiencies that need to be corrected. The hazard tree database does not adequately drive hazards analysis to ensure that correct controls are identified. In many cases, the system asks the user whether the control is required, rather than analyzing the hazard and helping the user identify that the control is required. Deficiencies in the hazards analysis process were evident at H-Canyon, where implementation is not yet mature. For maintenance activities at SRNL and tritium facilities, where the system has been implemented longer, these deficiencies were not as evident, but did exist. Additional attention is required to ensure that the AHA system results in technically accurate and repeatable analyses, that correct controls are consistently identified, and that outputs from the system are useful to the end-user.

Aerial View of Tritium Facilities

4.0 Summary Assessment

The following paragraphs provide a summary assessment of the EM/SR, NNSA/SRSO, and WSRC activities that Independent Oversight evaluated during this inspection. Additional details relevant to the evaluated organizations are included in the technical appendices of this report.

Work Planning and Control

Tritium Facilities. The Tritium Maintenance Organization has applied the site AHA procedure to essentially all maintenance activities. Work is adequately defined, and most industrial safety hazards and controls are adequately described in work packages issued to maintenance mechanics. However, health hazards described in material safety data sheets are not always fully analyzed, and appropriate controls are not always established for these hazards. Workers understand that management expects them to work safely, and their level of compliance with safety requirements is good. Worker knowledge and experience are strengths and have compensated for some deficiencies in the work control process and its implementation. The Tritium Maintenance Organization has effectively implemented several feedback and improvement initiatives and has created a work culture in which critical review is valued.

Modern Tritium Facility

H-Canyon Operations. Work control processes for operations activities are generally adequate to meet activity-level ISM expectations. The new AHA process has recently been implemented, but there is not yet sufficient performance data to determine the effectiveness of implementation of the new AHA process for operations activities at the H-Canyon.

H-Canyon Maintenance and Construction. There are weaknesses in some aspects of ISM implementation in maintenance and construction work at H-Canyon, primarily in hazards analysis and specificity of controls. Although workers are committed to safety, the processes used to identify and analyze hazards and ensure that appropriate controls are identified and implemented are not effectively supporting the workers. Consequently, the workers are not adequately instructed on the hazards and what controls to use. Personal protective equipment is being prescribed without sufficient consideration of alternatives, and some additional hazards may not be sufficiently analyzed during maintenance/construction work.

SRNL. The SRNL work control processes provide effective mechanisms for implementing the core functions of ISM. R&D activities are generally well defined, most research hazards are sufficiently analyzed, and controls are typically appropriate and effectively implemented. However, in several cases, the Conduct of R&D process has not been effective, work scopes and/or work limitations are not well defined, hazards have not been adequately identified or analyzed, and controls lack specificity, especially with respect to identification and implementation. Within SRNL machine shops and other R&D shop-like activities, which rely more on skill of the craft, hazards are not as well analyzed and/or documented, and the controls are not always clearly understood or effective. Operations activities are rigorously controlled through procedures, but in some cases gaps in the activity-level hazards analysis exist, and the interface between operations and research lacks a sufficient work control process. Maintenance activities are typically well defined, with hazards that are analyzed and appropriately controlled, but limitations in the new AHA process have impacted hazards analysis. Research, operations, and maintenance activities observed by the team were performed safely, but improvements are needed to ensure that work is performed within defined boundaries and that procedures are adequate and are followed, particularly with respect to maintaining the facility authorization basis. On January 10, 2006, a flash fire occurred in one of the SRNL laboratories, resulting in a researcher being hospitalized as a result of his burns. A Type B investigation was convened and was ongoing at the time of the Independent Oversight inspection. The root causes of this event are currently being investigated by EM/SR and WSRC to identify the causes and failures in one or more of the core functions of ISM.

Essential System Functionality

The configuration management aspects of the processes for generating and controlling design documents are noteworthy and can be used as a positive example for the DOE complex. With few exceptions, most of the reviewed procedures and processes correctly translated regulatory requirements. The processes are well thought out and web-link driven, which allows for efficient implementation with minimal errors. However, while many aspects of the contractor's engineering and configuration management programs were comprehensive and well-defined, the number and nature of the technical discrepancies identified for the safety systems reviewed indicate that the engineering design program and processes were not being executed with the rigor, attention to detail, and questioning attitude necessary to assure reliable performance of accident prevention and mitigation functions, and warrant increased management attention and action.

The surveillance procedures were well written and controlled, and were being performed and completed in a rigorous manner; however, a few surveillances were not fully demonstrating the readiness of some safety-related systems due to inadequacies that have resulted in incorrect test criteria. Operating procedures, electronic systems, and operator training for the safety systems reviewed were effective such that technicians, operators, and supervisors are well prepared to monitor, calibrate, and operate the systems and associated support systems and take appropriate action in an emergency. Safety system components are generally in good physical condition, with appropriate corrective and preventive maintenance being scheduled and performed to assure their continued integrity, operability, and reliability. Some improvements are needed in the consistency of implementation of some aspects of the facility condition inspection processes and their integration to fully support the management of deferred maintenance and reporting into the facility information management system. In addition, safety system procurement processes are well defined and are being effectively implemented for procured items to ensure that they meet quality criteria and are appropriate to the intended application for safety-related systems, structures, and components.

The HCP has an extensive and vigorous program of self-assessments and independent assessments covering various aspects of safety system engineering. Some aspects of the contractor's system engineering program have not yet been assessed, and there were weaknesses in the feedback processes to identify and correct major deficiencies related to engineering design and authorization bases. Although SR has qualified SSO engineers assigned to the HCP facilities and has conducted some oversight investigations and assessments, the strategy and requirements of the SSO program, as applied to HCP, are not adequately defined or described, and implementation of the SSO functions for HCP facilities is inadequate.

WSRC Feedback and Improvement Systems

WSRC has made progress in the process for and the performance of the various elements of safety feedback and improvement. The framework of a comprehensive safety assessment program has been established and is comprised of safety inspections/walkthroughs, management work observations, topical self-assessments, functional area and facility/organizational management evaluations of performance, and comprehensive independent facility/organization assessments. WSRC has established new and improved institutional issues management and corrective action processes and a robust tracking tool. Many safety issues are documented and evaluated, and corrective actions are developed, implemented, and tracked to closure. WSRC has established and implemented a robust lessons-learned program, with a user-friendly database of information on the intranet, sharing of lessons learned with the DOE complex, and generally well-documented, specific corrective actions. WSRC total recordable and lost time occupational injury rates are excellent when compared to industry and DOE peers. Occupational Safety and Health Administration (OSHA) recordable and DOE reportable occupational injuries and illnesses are logged, categorized, investigated, and reported as required by OSHA and DOE requirements, although attention is required in documenting the evaluation and disposition of non-recordable, first-aid cases. WSRC has established an effective employee concerns program (ECP) that appropriately evaluates and resolves ES&H concerns. An active behavior-based safety program involves managers and workers in one-on-one work observations and performance analysis to identify and correct unsafe behaviors and conditions.

Notwithstanding the many positive aspects of the WSRC feedback and improvement program, implementation of some self-assessment program elements is not yet fully mature. The issues management program is not always identifying and correcting root causes of deficiencies in such areas as hazards analysis. In addition, issues management process weaknesses remain, new processes are not fully implemented, and institutional and organizational oversight and monitoring of performance is not fully sufficient. Most significantly, WSRC feedback programs in the area of essential safety systems have not adequately assessed the design and authorization basis for the facilities and systems at the H-Canyon and HB-Line, and there are significant deficiencies in the design and authorization basis in these areas. Similar concerns may apply to other SRS facilities not reviewed by Independent Oversight on this inspection.

EM/SR Feedback and Improvement Systems

EM and SR have the elements of an effective oversight program in place, and most aspects are functioning adequately. Some EM and SR oversight functions are particularly detailed and comprehensive, such as the processes for review and approval of standards/requirements identification documents. Most assessment and operational awareness reports were of high quality and provided useful feedback about safety performance. However, some of the SR processes have not been fully and effectively implemented, such as the ECP and self-assessment programs. In a few areas, such as EM assessments of SR SSO, SR assessments of its ECP, and SR reviews of work planning and control, the oversight activities have not focused sufficiently on performance to identify deficiencies in implementing requirements. Most significantly, SR SSO has not been effective in assessing safety systems and identifying deficiencies in safety system design and authorization bases.

NNSA/SRSO Feedback and Improvement Systems

NNSA and SRSO have made improvements in their line management oversight program in several areas, including the technical quality of assessments, communication of operational awareness results, and corrective action tracking processes. However, NNSA and SRSO do not have adequate procedures and processes in some areas, contributing to deficiencies in assessment planning, Facility Representative program implementation, the technical qualification program, and self-assessments. Some ongoing actions appropriately address current deficiencies, but additional attention is needed in a number of areas to ensure that process and performance deficiencies are addressed.

Water Sampling

Focus Areas

Environmental management system. The EMS has been implemented pursuant to DOE Order 450.1 and incorporated into line operations by WSRC for both EM and NNSA functions at SRS, and the pollution prevention program is effective. SR provides effective oversight for EMS-significant aspects by participating in contractor assessments and frequently interacting with WSRC environmental management and staff.

Workplace monitoring of non-radiological hazards. There has been progress in the continuing development of the WSRC exposure assessment program since the 2004 Independent Oversight review, and there are several ongoing or planned initiatives. However, there are some implementation weaknesses, and many challenges lie ahead to develop a fully effective workplace monitoring and exposure assessment program.

Quality assurance in engineering and configuration management programs and processes. The configuration management aspects of the process for generating and controlling design documents are noteworthy and can be used as a positive example for the DOE complex. However, there were two cases of procedures not fully addressing the regulatory requirements.

Safety system component procurement. The HCP procurement program was adequately implemented, and safety system component procurement processes were effective.

Safety management for protective force training. EM, SR, and Wackenhut Services, Incorporated-SRS have adequately integrated a formal safety process into protective force training at SRS, and SR performs adequate oversight of protective force training. Observations of protective force training indicated that safety was a high priority and was effectively incorporated into lesson plans.

Status of implementation of the recently issued DOE Policy 226.1 and DOE Order 226.1. While many aspects of a DOE Order 226.1-compliant DOE oversight program are in place, EM/SR and NNSA/SRSO do not have a comprehensive strategy for their integrated management oversight program that addresses ES&H as well as other applicable areas (e.g., security, emergency management, and cyber security), and that includes baseline requirements, the effectiveness of the contractor assurance program, and operational risks and priorities. At this stage, EM/SR and NNSA/SRSO have taken some actions to ensure compliance by the implementation milestone, but the approach is not systematic or managed as a formal project, with clear expectations and milestones. WSRC has an approved contractor assurance system; many elements of this system are consistent with the DOE Order 226.1 expectations, and WSRC has analyzed the new requirements to identify gaps.

5.0 Conclusions

Most aspects of EM/SR, NNSA/SRSO, and WSRC ISM systems are conceptually sound, and many aspects are effectively implemented. For the most part, WSRC managers and workers were well qualified and demonstrated their understanding of and commitment to safety. WSRC has devoted significant attention and resources to addressing previously identified deficiencies and has made considerable progress in many areas, such as assessments, activity-level hazard control, exposure monitoring, unreviewed safety question processes, and other such areas. SRS has also devoted attention and resources to such programs as EMSs and safety of protective force training and has effective programs and innovative approaches in these areas.

However, there are weaknesses in engineering design and authorization bases for safety systems at the H-Canyon and HB-Line that raise questions about the adequacy of the systems to perform their safety function in certain accident scenarios. These weaknesses indicate failures in important supporting programs, such as the cognizant system engineer program and SR SSO. There are also residual weaknesses in work planning and control in research, maintenance, and construction activities at the facilities reviewed, indicating that some aspects of previous corrective actions were not sufficiently effective and that the self-assessments and issues management processes were not sufficient to identify the continued problems. In some cases, however, the deficiencies evident today can be at least partially attributed to the learning curve associated with implementation of generally sound new processes.

Although progress has been made, continued and increased EM/SR, NNSA/SRSO, and WSRC management attention is warranted in a number of areas, particularly in:

- Ensuring that safety systems will perform their intended safety function with a high degree of reliability and assurance in all credible accident scenarios at H-Canyon, HB-Line, and other SRS nuclear facilities, including evaluations and corrective actions for the underlying engineering, configuration management, and authorization basis functions

- Addressing the inadequacies in feedback systems that allowed deficiencies in safety systems to remain undiscovered, with a focus on SR SSO and WSRC cognizant system engineers and other feedback mechanisms as applied to safety system design, authorization bases, and surveillance and testing

- Continuing to enhance work control processes at the activity level, including such related processes as exposure assessments, with emphasis on the AHA, skill of the craft activities, radiation work permits, and research activities

- Continuing to enhance self-assessment activities and issues management processes, with increased emphasis on evaluating performance at the activity level.

In addition, NNSA/SRSO and EM/SR should continue to enhance their oversight processes, including such related functions as the ECP and internal processes. In addition, EM/SR and NNSA/SRSO need to increase their focus on the implementation of DOE Policy and DOE Order 226.1, with particular emphasis on rigorous gap analyses and application of sound project management principles to identify needed actions, organizational responsibilities, milestones, and needed resources to meet the established DOE milestone for implementing DOE Order 226.1 by September 15, 2006, and to develop an integrated management approach to oversight that addresses ES&H as well as other applicable areas (e.g., security, emergency management, cyber security, and business practices).

6.0 Ratings

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

Implementation of Core Functions #1 – #4 for Selected Work Activities

SRS ACTIVITY	CORE FUNCTION RATINGS			
	Core Function #1 – Define the Scope of Work	**Core Function #2 – Analyze the Hazards**	**Core Function #3 – Identify and Implement Controls**	**Core Function #4 – Perform Work Within Controls**
Tritium Facilities	Effective Performance	Needs Improvement	Effective Performance	Effective Performance
H-Canyon Operations	Effective Performance	Effective Performance	Effective Performance	Effective Performance
H-Canyon Maintenance and Construction	Effective Performance	Needs Improvement	Needs Improvement	Effective Performance
SRNL	Effective Performance	Needs Improvement	Needs Improvement	Needs Improvement

Feedback and Continuous Improvement - Core Function #5

EM/SR and WSRC Feedback and Continuous Improvement Processes ....NEEDS IMPROVEMENT
NNSA/SRSO Feedback and Continuous Improvement Processes.......................NEEDS IMPROVEMENT

Essential System Functionality

Configuration Management Programs and Supporting Processes ....EFFECTIVE PERFORMANCE
Engineering Design and Authorization Basis ....SIGNIFICANT WEAKNESS
Surveillance and Testing ....NEEDS IMPROVEMENT
Maintenance and Procurement...EFFECTIVE PERFORMANCE
Operations ....EFFECTIVE PERFORMANCE

APPENDIX A
SUPPLEMENTAL INFORMATION

A.1 Dates of Review

Planning Visit	January 9 – 13, 2006
Onsite Inspection	January 23 – February 2, 2006
Report Validation and Closeout	February 13 – 17, 2006

A.2 Review Team Composition

A.2.1 Management

Glenn S. Podonsky, Director, Office of Security and Safety Performance Assurance
Michael A. Kilpatrick, Deputy Director for Operations, Office of Security and Safety 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	Patricia Worthington	Thomas Staker
Dean Hickman	Robert Nelson	

A.2.3 Review Team

Patricia Worthington, Team Leader

Phil Aiken	Vic Crawford	Brad Davy	Ivon Fergus
Robert Freeman	Marvin Mielke	Bill Miller	Shiv Seth
Robert Compton	Al Gibson	Joe Lischinsky	Jim Lockridge
Tim Martin	Joe Panchison	Don Prevatte	Michael Shlyamberg
Ed Stafford	Mario Vigliani		

A.2.4 Administrative Support

MaryAnne Sirk	Tom Davis

A.3 Ratings

Independent Oversight uses a three-tier rating system that is intended to provide line management with a tool for determining where resources might be applied toward improving environment, safety, and health. It is not intended to provide a relative rating between specific facilities or programs at different sites because of the many differences in missions, hazards, and facility life cycles, and the fact that these reviews use a sampling technique to evaluate management systems and programs. The rating system helps to communicate performance information quickly and simply. The three ratings and the associated management responses are:

- **Significant Weakness (Red):** Indicates senior management needs to immediately focus attention and resources necessary to resolve management system or programmatic weaknesses identified. A significant weakness rating would normally reflect a number of significant findings identified within a management system or program that degrade its overall effectiveness and/or that are longstanding deficiencies that have not been adequately addressed. A significant weakness rating would, in most cases, warrant immediate action and compensatory measures as appropriate.

- **Needs Improvement (Yellow):** Indicates a need for improvement and a significant increase in attention to a management system or program. This rating is anticipatory and provides an opportunity for line management to correct and improve performance before it results in a significant weakness.

- **Effective Performance (Green):** Indicates effective overall performance in a management system or program. There may be specific findings or deficiencies that require attention and resolution, but that do not degrade the overall effectiveness of the system or program.

APPENDIX B
SITE-SPECIFIC FINDINGS

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

FINDING STATEMENTS	Page
1. Identification and analysis of chemical hazards are not always adequate to ensure that appropriate exposure controls are implemented for tritium maintenance activities.	19
2. WSRC has not provided a sufficient set of requirements to ensure that operations line organizations effectively and consistently apply the hazards analysis process to identify and analyze hazards specific to an operational activity.	22
3. Some hazards associated with maintenance and construction work are not being appropriately characterized, analyzed, and documented during work planning and hazards analysis processes to ensure that appropriate controls are identified.	26
4. Controls identified during the hazards analysis process for maintenance work in H-Canyon are not always sufficiently specific and detailed to ensure effective implementation by workers and supervisors.	27
5. Some H-Canyon RWPs have not been prepared and selected in a manner that ensures adequate task breakdown, accuracy of radiological information, and proper specification of controls for discrete work activities.	28
6. Elements of the SRNL Conduct of R&D process do not ensure that all work is defined, hazards are analyzed and documented, controls are sufficiently identified and implemented, and work is performed within controls.	32
7. In some cases, the lack of interface between SRNL research and development activities and SRNL operations activities has resulted in the potential for hazards not being sufficiently identified and analyzed.	33
8. SRNL has not ensured that hoisting and rigging procedures for the SRNL shielded cell facility engineered lifts have effectively implemented SRS or DOE hoisting and rigging requirements and established appropriate administrative controls.	35
9. The SR employee concerns program is not effectively implemented in accordance with SR's implementing procedure and DOE Order 442.1A, *Department of Energy Employee Concerns Program.*	48
10. SRSO does not adequately or routinely accomplish and document reviews of contractor self-assessment results as required by SRSO procedures and does not ensure that some required assessments are planned and scheduled.	49
11. The SRSO Facility Representative program does not meet some requirements of DOE-STD-1063-2000, *Facility Representatives*, or SV-PRO-010, *SRSO Facility Representative Program.*	50
12. The SRSO technical qualification program does not meet the requirements of DOE Order 360.1B, *Federal Employee Training*, or DOE Manual 426.1-1A, *Federal Technical Capability Manual*, in the areas of assessments and records management.	51
13. The SRSO self-assessment process does not meet some requirements of SV-PRO-012, *SRSO Self-Assessment*, or NNSA guidance on the process.	51

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

FINDING STATEMENTS	Page
14. WSRC self-assessment and issues management programs have not been consistently effective in evaluating performance, identifying deficiencies, and ensuring effective corrective actions to prevent recurrence.	54
15. The H-Canyon and HB-Line authorization basis documents contain discrepancies and inadequacies, which resulted in their not providing adequate assurance that some safety-related ventilation and explosion prevention structures, systems, and components will perform their intended safety functions under design basis accident conditions.	69
16. Weaknesses in the design engineering of the H-Canyon exhaust system and its essential supporting structures, systems, and components and in the translation of the design and the authorization bases into facility operating procedures/practices and surveillance testing procedures and practices are such that the capabilities of these structures, systems, and components to fully perform design safety functions under design basis accident conditions are not sufficiently assured.	71
17. The Design Engineering, Systems Engineering, and Authorization Basis organizations have not applied sufficient rigor, attention to detail, and a questioning attitude in addressing the HCP facility authorization bases and safety system designs and their translation into technical procedures and practices.	72
18. SR has not adequately implemented the safety system oversight functions for HCP facilities.	81
19. SRS non-radiological workplace exposures have not been sufficiently analyzed and/or documented for some facilities and for a number of work activities as required by DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees.*	90

APPENDIX C
WORK PLANNING AND CONTROL

C.1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight (Independent Oversight) evaluated work planning and control processes and implementation of the core functions of integrated safety management (ISM) for selected activities at the Savannah River Site (SRS). The Independent Oversight review of the ISM core functions focused on environment, safety, and health (ES&H) programs as applied to selected aspects of the following SRS facility- and activity/task-level work activities:

- Maintenance of tritium facilities (see Section C.2.1)
- H-Canyon operations (see Section C.2.2)
- H-Canyon maintenance and construction (see Section C.2.3)
- Savannah River National Laboratory (SRNL) operations and maintenance (see Section C.2.4).

For each area, Independent Oversight reviewed implementation of ISM (including activity-level feedback processes), observed ongoing operations, toured work areas, observed equipment operations, conducted technical discussions and interviews with managers and technical staff, reviewed interfaces with ES&H staff, and reviewed ES&H documentation (e.g., plant standards, permits, and safety analyses). The evaluation of activity-level feedback and improvement systems for tritium facilities, H-Canyon operations, H-Canyon maintenance, and SRNL operations and maintenance is reflected in the evaluation of the overall feedback and improvement program, as discussed in Appendix D.

In reviewing the work planning and control programs for the selected facilities/activities, Independent Oversight focused on the various work control processes in place, with particular emphasis on the assisted hazards analysis (AHA) process. Washington Savannah River Company (WSRC) has devoted significant management attention to improving the AHA process, including establishing milestones for program development, training, implementation, and assessment. These changes to the AHA process, which were developed with the involvement of process users and subject matter experts (SMEs), have made the process easier to use and have improved both the questions and analysis tree that are maintained in a computerized AHA database. The changes include more definitive walkdown requirements and the addition of a work-scope-definition checklist, which includes aids for hazards identification and analysis. As discussed in the following subsections, the AHA is in various stages of implementation and maturity at the facilities and activities reviewed during this Independent Oversight inspection.

C.2 Results

C.2.1 Tritium Facilities

SRS tritium facilities process tritium in support of the U.S. nuclear weapons program and are maintained by the WSRC Defense Programs Tritium Maintenance Organization (TMO). This Independent Oversight inspection assessed the implementation of ISM core functions, including the effectiveness of SRS processes for identifying and controlling hazards that potentially impact the health and safety of maintenance workers at operating tritium facilities. The hazards that could be encountered by maintenance workers at these facilities include radiation exposure from tritium, and hazards commonly associated with facility maintenance, such as electrical hazards and exposure to industrial chemicals. Because tritium is a relatively low-energy beta emitter, risks associated with external radiation exposure are low, and the primary concern is the potential for radiation damage if tritium is absorbed through the skin or inhaled. The adequacy of waste management and environmental controls was also assessed. Work packages were reviewed, and work was observed for corrective and preventive maintenance in several tritium facilities. Work activities in Building 233-H were limited at the time of the inspection because of a planned ventilation testing outage in that facility.

Core Function #1: Define the Scope of Work

WSRC has established adequate requirements and guidance for defining the scope of work. The AHA procedure specifies sitewide requirements and guidance for safely controlling work. The procedure, which is based on the ISM core functions, requires that the boundaries of the scope of work be clearly defined, and provides a work-scope-definition checklist as a tool for meeting the expectations for work-scope definition. The requirements and guidance are adequate for defining work in the facilities.

AHA requirements and guidance for defining work are being applied to most maintenance work performed by TMO. The only exceptions are some routine shop work and a few jobs that were planned several months before the process was implemented. Planners were observed to walkdown jobs during the planning process as required by the AHA procedure. The work-scope-definition checklist was used as an aid during these walkdowns, and worker assistance was obtained when appropriate. Work packages that were reviewed identified tasks and subtasks with sufficient specificity to support subsequent identification of hazards and controls. The scope of most work is adequately described in safe work permits (SWPs) and in maintenance instructions that are included in work packages issued to maintenance mechanics. A few exceptions were identified in which the scope of work did not meet the requirements of the AHA procedure (e.g., the SWP did not clearly describe the activity to be performed or the boundaries for the work).

Summary. Although a few implementation deficiencies exist, the AHA process provides adequate procedures and guidance for defining work, and in most cases the procedure is being applied effectively by TMO in tritium facilities.

Core Function #2: Analyze the Hazards

In general, the requirements and guidance for hazard identification and analysis specified by the sitewide AHA procedure are effectively implemented for the maintenance at tritium facilities. The AHA process has evolved over the past few years, and TMO has used the current version since fall 2005. All TMO planners and mechanics have been trained in its use. The level of hazards analysis is commensurate with associated hazards, and most hazards are adequately analyzed. SMEs and workers are involved in work planning when required; work packages adequately addressed most hazards; and tasks, hazards, and controls are appropriately linked in SWPs.

Although most hazards are adequately addressed in maintenance work packages, some exceptions were noted. In particular, hazards specified in material safety data sheets (MSDSs) were not adequately addressed in some packages. For example:

- Some SWPs describe a hazard as "Chemicals or chemical products involved," without identifying the chemical, thus leaving the task of identifying chemicals and establishing controls to work crews. Further, when the chemical hazard is not clearly described in the work package, Industrial Hygiene review of the package may not be effective in assessing the adequacy of controls. For example, an SWP for replacement of Building 234 exhaust fan bearings did not include hazards or exposure controls from the applicable MSDS. The MSDS for grease used on the bearings specified the use of neoprene gloves. However, the SWP specified that leather gloves and latex gloves were worn. The SWP for this job was approved by an industrial hygienist.

- MSDS hazards for use of a brazing filler material were not analyzed in the AHA process and were not listed in the work package for use of this material, and some controls were not followed. The MSDS for the brazing filler material states that it possibly contains beryllium. Hazards associated with inhalation of brazing fumes were not adequately evaluated. MSDS controls not followed included: use of local exhaust when brazing indoors, face protection, and use of flame-retardant clothing. In addition, the SWP for the brazing did not identify phosgene gas (a highly toxic gas that may be formed when hydrogenated organic compounds, such as Freon, are heated) as a hazard even though the brazing was performed on a refrigeration system that contained Freon. The mechanic controlled the hazard by purging the system before brazing, but this control was not specified in the work package. The SWP for this job was also approved by an industrial hygienist.

- Worker exposures to welding fumes in the Building 248-H welding shop were not adequately evaluated. Welders in this shop rely upon room and local ventilation to control exposure to toxic welding fumes. The SWP for this job was also approved by an industrial hygienist. The ventilation may have been adequate, but air sampling was not adequate to confirm the adequacy. Although the shop had been in operation for a few years, breathing zone samples were taken only recently (January 18, 2006), and results are not yet available. Further, these samples are being analyzed for hexavalent chromium but not for other toxic materials listed on the MSDS that may be present.

Most of the examples involve inadequate identification and analysis of chemical exposure hazards. In particular, health hazards described in MSDSs were not adequately analyzed or incorporated into work packages issued to the maintenance mechanics. SMEs were involved in the planning for each job, but this involvement was not fully effective.

Finding #1. Identification and analysis of chemical hazards are not always adequate to ensure that appropriate exposure controls are implemented for tritium maintenance activities.

SWPs generated by the AHA process incorrectly list some work activities and controls as hazards. For example, the statement "A lockout/tagout is needed" is listed on SWPs as a hazard without specifying whether the hazard is pressurized fluid, or electrical, or both. This practice can mislead mechanics and result in inadequate controls. There were a number of other similar examples of work activities and controls that were improperly defined in SWPs for tritium maintenance work. (See Finding #3.)

Summary. Most industrial safety hazards have been adequately identified and analyzed using the new sitewide AHA process. However, health hazards associated with chemical exposures were not always identified or adequately analyzed and thus controls for these hazards were not always required by work packages issued to the craft.

Core Function #3: Identify and Implement Controls

Effective engineering controls have been incorporated into the design of tritium processing equipment by enclosing the equipment in gloveboxes, which protects operators and maintenance mechanics from tritium exposures. The use of personal protective equipment (PPE) is not normally required for radiological protection because of the protection provided by gloveboxes, and because bioassay results indicate that tritium exposure controls have been effective. The average effective dose equivalent from tritium in 2005 was 4.8 millirem (mrem), and the highest dose from tritium was 21 mrem. These doses are small fractions of the 5000 mrem per year limit specified by 10 CFR 835.

AHA procedure changes have improved the process for establishing controls. The link between controls in the AHA database and requirements in the SRS standards/requirements identification document (S/RID) was strengthened, additional guidance was provided for conducting pre-job briefings, and SME involvement in selecting controls was increased. For work packages and activities reviewed during this inspection, controls in SWPs and maintenance procedures were consistent with the S/RID, and pre-job briefings were adequate. SMEs were involved when required, but as previously discussed under Core Function #2, their involvement was not always fully effective.

In general, when hazards are clearly identified, appropriate controls are specified in SWPs. For work packages reviewed, most mandatory controls that were included in the SWP were appropriate. Controls that were not needed were marked "not applicable" by the planner, as permitted by the AHA procedure. Supplemental controls were added when needed in most cases. Applicable permits, such as hot work and confined space permits, were identified and included in work packages when appropriate.

Controls specified for electrical hazards are adequate. SWPs require the use of lockout/tagouts when appropriate. Electrical PPE is typically not specified in work packages but is included in a procedure referenced by SWPs, as permitted by the AHA procedure. Worker training is relied on for use of a table in the procedure. Workers and supervisors are required to sign an Electrical Work Expectations Acknowledgement Form prior to performing hazardous electrical work to certify that they are aware of the hazards and controls in the procedure. Proper PPE was worn, and training was current for observed electrical work.

Training, experience, and supervisory oversight help ensure that appropriate controls are established. Most planners and mechanics have had significant maintenance experience in tritium facilities and understand the controls that are necessary to ensure safety. Although training requirements are not typically identified as controls in SWPs, training is tracked and status reports are routinely reviewed by workers, supervisors, and managers. Review of training records for several maintenance workers indicated appropriate training had been received. Supervisory coverage of maintenance activities was observed to be good. TMO management expects supervisors to spend at least 50 percent of their time in the field directing crew activities, and supervisors were present at most of the job sites visited by the Independent Oversight team. Supervisors remind workers of hazards and controls during pre-job briefings.

Although most controls were adequately addressed in SWPs and maintenance procedures, a few deficiencies were identified in this area. For example, SWPs do not normally specify requirements for disposing of sanitary waste generated during maintenance activities. TMO mechanics have received waste generator training but not waste handler training (in which disposal requirements for the applicable types of waste are taught). Some uncertainty was observed in the field regarding proper disposition of oily rags. In another example, controls to be implemented by maintenance mechanics and supervisors were identified only on work package disposition reports, which TMO mechanics/supervisors would not be expected to use.

Summary. Engineered controls included in the design of tritium processing facilities are effective in controlling worker exposures to tritium. Requirements and guidance for specifying applicable controls in work packages are adequate, and with few exceptions, appropriate controls are specified when hazards are clearly identified. Training, experience, and supervisory oversight are strengths and have compensated for some deficiencies in the AHA process and its implementation.

Core Function #4: Perform Work Within Controls

TMO confirms readiness prior to starting work as required by the AHA process. Shift managers and work group supervisors sign SWPs indicating that hazards are analyzed and that controls are appropriate as required by the AHA process. Workers sign to indicate their understanding of task hazards and controls. Appropriate signatures were on SWPs for all observed work.

Workers understand their safety responsibilities and were observed to comply with safety requirements. Maintenance workers understand that management places priority on safety and that they are expected to stop work if they have any question about safety. They understand that they are expected to have their work package at the job site whenever work is in progress and to strictly comply with requirements in the package. Work packages were present and were being followed at inspected job sites. Hard hats, safety glasses, safety shoes, and thermoluminescent dosimeters were consistently worn when required. Rigging practices were good in an observed lifting activity. The rigging supervisor was knowledgeable of the safety requirements in the work package, the crane and rigging were in good condition, and records of daily, monthly, and annual crane inspections were up to date. The area around the crane was properly barricaded and workers stood clear of lifted loads. Noise levels in the vicinity of the crane were measured and were below the threshold limit value even though this measurement was not required by the SWP.

Other work was also performed safely and in accordance with established controls. Electrical work was safely performed; lockout/tagouts were performed as required; zero-energy checks were performed at appropriate locations in circuits; and proper PPE was worn by electricians making these checks. Disconnected leads were properly de-terminated and taped as required, and records confirmed that electrical worker training for workers performing zero-energy checks was up to date. Radiological controls were adequate for all jobs observed. Workers read and followed radiation work permits (RWPs), and health physics coverage was provided when needed. HP technicians covering observed work were knowledgeable of radiological conditions, and portable instruments were properly calibrated.

Summary. Workers demonstrated a good understanding of hazards and controls and of their responsibilities for following requirements and stopping work when they have safety concerns or questions. The observed level of safety compliance was good.

Core Function #5: Feedback and Continuous Improvement

TMO uses several mechanisms to assess their performance and assure that corrective actions are taken. These mechanisms include management field observations, behavior-based safety programs, a planner feedback program, a performance analysis program, a plan of the month, lessons learned, and other initiatives.

For the most part, these efforts are implemented effectively and are identifying deficiencies and resulting in corrective actions. For example, managers conduct weekly observations of work activities; each manager is expected to spend at least one hour in the field each week, identify at least one observation requiring corrective action, and initiate corrective action for that issue. Performance of these field observations is tracked, and results are recorded in a database. In addition, an effective process has been established through which mechanics and supervisors are encouraged to provide feedback to planners on work packages; safety performance is monitored and reported monthly as part of the plan of the month; a behavior-based safety program is in place; and integrated performance analyses are regularly performed by WSRC Defense Programs senior managers.

Although there are a number of positive aspects, in some cases (e.g., management field observations and the lessons-learned program), as discussed in Appendix D, there are no procedures or formal processes to ensure that the feedback mechanisms are effectively performed, and feedback mechanisms need to focus more on chemical hazards.

Summary. TMO devotes significant resources and management attention to feedback and improvement. Performance deficiencies are identified, documented, tracked, and analyzed. Feedback and improvement initiatives have been effective in identifying and resolving deficiencies and in focusing management attention on areas where improvement is needed.

C.2.2 H-Canyon Operations

This Independent Oversight review focused on operations at H-Canyon (H-Canyon maintenance and construction are discussed separately in Section C.2.3). Observed operations activities included control room operations, cold chemical operations, waste repackaging operations, and an AHA team meeting. In addition, procedures and associated review and approval processes were reviewed. Because the hazards analysis process is new to the operations organization (implementation is still in progress), few AHAs have been performed for operations activities. Consequently, the scope of document reviews for this process is based on limited records, and conclusions are, in many cases, based on interviews of affected personnel.

Core Function #1: Define the Scope of Work

The scope of activity-level operations work is generally well defined in task-specific implementing procedures. Operations procedures specifically describe the scope of work for discrete work activities. Production activities and requirements are adequately defined in schedules that break down production needs to discrete operations tasks. The schedules are constantly monitored and revised as necessary to address completions or unforeseen circumstances. The facility then works from these documents on a daily basis to produce the required products.

Although scopes of work are generally well defined in the procedures, in some cases, the information in AHA scopes of work for new procedures or major revisions may not be sufficient to fully identify and analyze the hazards as required by the corporate hazards analysis process (8Q-122, *Hazard Analysis*). For example, a team AHA report for transferring a Hanford container to a trailer only listed the title of the activity, with no additional information on the scope of the activity and no task breakdown. In this case, the scope of work was defined in the draft procedure being used as the scope definition in the AHA team meeting. Although this method adequately defined the scope of work for this particular activity, it did not meet new 8Q-122 requirements for task breakdown and scope definition within the AHA. (See Finding #2.)

Summary. Existing procedures adequately define the scope of work for most current operations activities, and project and work schedules adequately define production needs and integrate operations and maintenance tasks. Although some implementation problems with the new AHA process were observed, the overall definitions of work for operations activities are adequate.

Core Function #2: Analyze the Hazards

Most hazards associated with H-Canyon operations activities are well understood as a result of years of operation and prior hazards analyses. Hazards analyses for operations procedures have generally resulted in the appropriate hazards analysis being incorporated into the procedure review process. For new procedures or major changes over the last two years, the procedure review process has included a team hazard review driven by either the old automated hazards analysis process or the new AHA process in which the appropriate SMEs and safety professionals review the procedure as a team. Individual reviews by safety professionals are still required, and team reviews have integrated the safety review into a team technical review, resulting in an improved hazards analysis process. For example, the automated hazards analysis for the black box repackaging activities performed under the old system was comprehensive and addressed all hazards observed by the Independent Oversight team.

Although most hazards are adequately identified and analyzed, the Independent Oversight team identified one case in which an obvious fall hazard was not identified for a routine activity, even though at least two hazards analyses had been performed on the associated procedure. The procedure requires workers to connect flexible hoses to a tanker truck at an unloading station. The workers make the connections at the top of the tanker on platforms with unguarded edges that are considerably more than six feet off the ground and which require some type of fall protection. In addition to this hazard not being identified in the original hazards analysis for the procedure, a new AHA was recently performed on a change to the steps performed on the top of the tanker, and the hazard was not identified.

Implementation of the new AHA process is incomplete, and in many cases, the computerized AHA tool is only used as a verification of hazards analysis for new or revised operations activities. In these cases, hazards have been discussed and controls have been agreed upon prior to exercising the computerized question set. In this capacity, use of the AHA tool is an improvement over previous procedure review-only processes but still does not meet the stated intent of the tool, which is to assist in the hazards analysis process. Problems with implementation of the AHA process for operations procedures and activities discussed here, and in Core Functions #1 and #5, illustrate that the AHA procedure provides minimal requirements for AHAs for operations procedures and activities.

Finding #2. WSRC has not provided a sufficient set of requirements to ensure that operations line organizations effectively and consistently apply the hazards analysis process to identify and analyze hazards specific to an operational activity.

In general, the existence of appropriate controls in operations procedures provide the Independent Oversight team with anecdotal evidence of adequate hazards analyses; however, the documented evidence of these analyses was not readily available, did not exist, or was not current. In most cases, the original hazards analyses were performed on an earlier revision of a procedure, and most procedures have had a number of minor revisions since a comprehensive analysis had been performed. For example, the operations procedure for calorimeter calibration and sampling is at revision 39, and H-Canyon could not locate a documented hazards analysis for this procedure in response to questions about the analysis of radiological hazards associated with uranium solutions being used. In these cases, the hazards analysis on the original procedure has been archived in document control with the original revision and is difficult to retrieve. The facility does not maintain a retrievable record of the latest hazards analyses on all current operations procedures, making it difficult to verify adequacy of some controls.

Hazards analysis for vendor actions on site was enhanced through the point-of-entry program as a result of corrective actions from a Type A investigation in 2005. The Independent Oversight team observed a delivery of caustic material by a vendor at H-Canyon that was covered by this process. In this case, the point-of-entry program resulted in an appropriate hazard classification for the activity. The program provides an acceptable ranking system for hazards presented by vendors, and results in generation of checklists applicable to identified hazards for medium- and high-hazard activities. The system also requires an assigned competent person to provide a hazard briefing and to perform oversight of the vendor while on site. (See Core Function #4 for problems with performance in this area). Although the hazard identification is adequate, in some cases, the resulting check sheets for safety briefings and oversight are generic, do not provide minimal acceptance criteria specific to the hazard, and do not ensure that vendor performance is to the same standards and requirements expected of WSRC employees. WSRC continues to evaluate program implementation and make improvements. For example, a Facility Evaluation Board (FEB) evaluation in December 2005 discovered implementation problems similar to those discussed in Core Function #4, and the ES&H organization is currently developing associated corrective actions.

Summary. It is still too early in the implementation of the new AHA process for operations procedures to provide a comprehensive assessment of effectiveness of that specific system. However, it is apparent from initial implementation difficulties that expectations are not clearly delineated in a minimum set of requirements for operations activities. Notwithstanding these implementation problems, hazards for operations activities are generally well identified and analyzed as part of the procedure review process, as evidenced by the appropriate controls in most operating procedures.

Core Function #3: Identify and Implement Controls

Institutional expectations for Conduct of Operations are clearly delineated in the SRS Conduct of Operations manual. At the H-Canyon, facility management has communicated its expectations for meeting the Conduct of Operations requirements. In response to a series of Conduct of Operations errors in early 2005, management suspended operations of the facility, and dedicated significant resources to reinforce Conduct of Operations principles and improve operations procedures. The improvements are evident. Operations procedures are generally technically accurate and complete. The procedures are well written and contain the appropriate information and level of detail to perform the tasks. In observed operations activities, procedural controls were generally appropriate for the hazards.

Summary. In most cases, controls are adequately established and implemented for hazards associated with operations activities.

Core Function #4: Perform Work Within Controls

Readiness to perform operations work is verified using plan-of-the-day schedules, plan-of-the-day meetings, shift turnover meetings, crew briefings, and pre-job briefings. In most cases, crew and pre-job briefings effectively covered identified hazards and controls.

H-Canyon operators generally performed activities safely and in accordance with established controls. For most observed work, operators performed activities in accordance with the appropriate procedures and administrative requirements. Operators properly completed logs and round sheets. For example, records in outside control areas were neat and legible, with appropriate and concise narrative entries when needed. Response to abnormal conditions was effective and in accordance with established controls. For example, operators in the main control room appropriately suspended a first-cycle feed in accordance with the procedure when a material balance parameter was found out of specification. In another example, the Radiological Control Operations (RCO) group response to a spill in the hot gang valve corridor was timely, efficient, and effective. RCO personnel immediately entered the appropriate emergency response procedure upon hearing that a spill had occurred and performed the appropriate actions, including posting and securing access to the area, surveying potentially impacted personnel, and executing a plan to re-enter and survey the area for potential radiological impacts. Workers who were interviewed were also fully aware of their stop-work authority and indicated they would use it if an imminent danger situation arose.

Although most operations were performed safely and within established controls, the Independent Oversight team observed one case where a required control was not followed, and two cases where workers did not follow specific PPE requirements. During black box repackaging, an AHA control to perform daily documented inspections of powered lift equipment per Manual 8Q, 42, was not being performed during this work. The control is not listed in the black box procedure, as it is assumed to be implemented through the use of trained and qualified operators. For the PPE concerns, in one case, workers were already dressed and inside a contamination area to manually operate chemical valves when the Independent Oversight team questioned their lack of PPE required by the procedure's precautions and limitations section. Following review of the procedure, the workers obtained the required PPE for the activity. Interviews indicated that workers had not followed this particular requirement in the past. In another case, a responsible individual did not provide a required safety briefing to and documented oversight of a vendor delivering stock hazardous chemicals, as required by the point-of-entry program. The Independent Oversight team observed that the vendor in this activity was not wearing some PPE correctly and was not wearing all specified PPE.

Summary. Although isolated deficiencies were identified, most observed operations activities were performed within established controls, and workers understood the importance of procedural compliance.

Core Function #5: Feedback and Continuous Improvement

Formal activity-level feedback for operations activities is primarily provided through the procedure change process. When operators identify problems with, or enhancements to, operations procedures, they generally identify these problems with procedure change requests. Problems requiring immediate attention are effectively addressed through the time-out or stop-work processes. In these cases, a formal immediate procedure change process is available if the immediate problems can be addressed with a procedure change. Other immediate feedback mechanisms, such as formal shift communications, logs, and shift routines, are governed by the Conduct of Operations manual.

Senior facility management is also actively involved in providing feedback in Management Observed Evolution Self-Assessments. Over the past year, facility management had performed Management Observed Evolution and/or Team Observed Evolution Self-Assessments for most of the operational activities observed by the Independent Oversight team. Assessors from the direct line management for the operators included the H-Completion Project manager, the H-Canyon facility manager, and H-Canyon and H-Outside operations managers and deputies. Assessors also included other facility management, such as the Radiological Control group manager, the Engineering group manager, and the Facility Support group manager. The self-assessments were comprehensive and well written, and many appropriately resulted in opportunities for improvement and findings that were entered and tracked in the site tracking, analysis, and reporting (STAR) database, the WSRC corrective action tracking program.

Conduct of Operations training days for the operators present an excellent avenue for refreshing Conduct of Operations principles and requirements and providing a two-way feedback mechanism between operators and management. In the observed sessions, most of the operations organization and facility management were present. Operators were actively involved in discussions with managers, and the forum provided real-time feedback to and from management on worker questions, concerns, and practices. Senior facility management expressed verbal plans to continue this type of training in the future.

Lessons learned and improvement items for black box repackaging work have been formally solicited through post-job reviews and communicated to workers as part of the pre-job briefing process. Lessons learned were documented from F-Canyon work and passed along to H-Canyon as part of planning for H-Canyon repackaging. In addition, formal post-job reviews were conducted following initial repackaging efforts and were used to modify and enhance safety and efficiency.

Although the overall feedback and improvement area for operations is generally strong, the Independent Oversight team identified one specific deficiency. Site management has provided expectations for a feedback mechanism for hazards analyses for operations activities; however, these expectations have not been effectively implemented. The AHA procedure states that feedback is not optional, but provides no specific requirements for feedback from operations activities. The new AHA tool provides a required feedback mechanism at the conclusion of a work activity, but since most operations activities are repetitive or ongoing, this mechanism is not practical for most operations activities. (See Finding #2.)

Summary. WSRC generally has effective mechanisms in place at the activity level for feedback and improvement of operations activities. Because the primary control mechanism for operations work activities are operations procedures, the activity feedback and improvement mechanisms deal primarily with the procedure revision process. Facility management is also actively involved in self-assessments of operations activities.

C.2.3 H-Canyon Maintenance and Construction

In addition to H-Canyon operations activities, this Independent Oversight review focused on H-Canyon maintenance and construction activities. Maintenance activities observed included several chemical line breaks and valve replacements, welding work, planning walkdowns, pre-job briefings, and radiological and industrial hygiene surveys and samples. Independent Oversight also reviewed both open and closed work packages. Some construction activities, performed by subcontractors in coordination with the maintenance organization, were also observed. Many hazards analyses have been performed in support of maintenance and construction work planning using the new AHA process.

Core Function #1: Define the Scope of Work

Scopes of work for individual activities in H-Canyon are generally well defined in facility work packages and task-specific implementing procedures or work instructions. The primary tool for defining maintenance and construction type work is the Passport Work Management system. This system has been in place for many years and is a mature computer system used to develop complete work packages, document equipment history, and generate accounting information. Many supplemental forms document other planning considerations in the work management system, including SWPs (from a newly implemented AHA system), maintenance instructions (detailed maintenance steps), RWPs, various data sheets, or other forms. The work order, SWP, and other supplemental documents constitute the work package.

Maintenance and construction work requests are screened by management and prioritized within the system based upon equipment safety and production requirements. Work is appropriately planned and scheduled in accordance with the assigned priorities. Long-term schedules are created and maintained, weekly planning meetings are used to review and update as necessary a rolling eight-week "look-ahead," and daily plan-of-the-day meetings are used to coordinate work efforts.

H-Canyon conducts several formal meetings to address scheduling and resource needs and to define the specific work to be performed in the facility each day. In general, these meetings provide a suitable forum to define work activities and coordinate necessary resources. However, in practice, these meetings are not always effective in ensuring that appropriate personnel are committed to support jobs when necessary, and work planning is not always effective in identifying conflicts in advance.

Summary. Existing procedures, technical work documents, and work packages adequately define the scope of work for most current maintenance and construction activities, and project and work schedules adequately integrate operations and maintenance tasks.

Core Function #2: Analyze the Hazards

The primary tool used to perform hazards analysis is the new AHA process, which has been in effect in an interim form at H-Canyon for approximately two months. The AHA process identifies many controls based on inputs of hazards by the work planner, and has been revised to reduce much of the documentation produced by the old automated hazards analysis system. However, for the work observed in H-Canyon, many of the hazards associated with the tasks were not properly identified and/or analyzed as required under the new AHA and work planning processes. In nearly all work evolutions observed, associated approved work packages contained problems in the identification and analysis of hazards, as discussed below.

Some important hazards were not adequately identified during the AHA process. Examples of hazards that were not always correctly identified included mixed wastes, mercury and mercury wastes, potential hazards associated with the use of breathing air systems, and inclement weather hazards. In other cases, hazards were identified, but not properly characterized and analyzed. For example, none of the packages reviewed, or the associated documentation, clearly identified the actual level or quantity of potentially contaminated material that might be expected from opening a system. Most of the packages reviewed and the associated AHAs did not clearly identify the quantity of hazardous material, such as nitric acid, potentially remaining in the system. While the AHA process contains mandatory guidance that is intended to prompt the planner to quantify the chemical hazard, that guidance was not used by the planners in H-Canyon in the reviewed cases.

Often, airborne hazards from chemicals and radioactive materials are being assumed, but not analyzed or documented. Industrial Hygiene has some limited data indicating that for the majority of work observed, respiratory protection would not be required for the chemical hazards identified. The H-Area Industrial Hygiene staff has begun more extensive monitoring to determine whether PPE protocols can be changed. Radiological surveys performed during work would indicate a similar condition for the radiological hazard. Although there may be residual risk from unknown or uncharacterized contamination, the current practices of surveys and sampling during line breaks have not shown this to be a prevalent problem. Nevertheless, RWPs for several observed jobs placed workers in supplied air plastic suits; the AHAs for these jobs did not provide sufficient hazard information and analysis and did not specify whether the controls were needed for radiological or non-radiological hazards. In these cases, a full-face respirator would have been acceptable for the radiological concern, and the supplied air controls were intended to mitigate potential welding fumes and/or nitric acid fumes. However, Manual 4Q Procedure 107 requirements for documentation of respiratory selection for these non-radiological hazards were not followed, resulting in the inability to determine whether plastic suits were the appropriate hazard control. Further, the additional fall/trip hazards associated with maximal PPE (air-fed plastic suits, hoods) have not been analyzed in any case where these were used, including elevated work on scaffolds, tank tops, catwalks, or in close areas (basin liner work) with additional hazards (energized welding leads) present.

Similarly, "hazardous energy sources" is identified on all AHAs, but the specific energy source is not identified or quantified (pressure, volume, temperature, liquid volume, electrical voltage, amperage, etc.) to ensure that the appropriate control is identified. Other specific examples include a failure to analyze the quantity of mercury that might be present for a job on a system containing mercuric nitrate. The AHA for that job did not analyze the potential for mercury vapors, and subsequent controls assumed mercury vapors would be present, although sampling data in the Industrial Hygiene database indicates otherwise (see Core Function #3 regarding extensive use of PPE). A job to install steel plates for a basin liner identified use of a portable powered ventilator with a high-efficiency particulate air (HEPA)-filtered trunk line, but did not analyze hazards introduced into other areas of the plant as a result of using this ventilator (e.g., the effect on the sample aisle where the exhaust was directed subsequently led to a work delay to allow access to the sample aisle). The exhaust could have contained a mixture of welding fumes, acid vapors, and radiological contamination, but the potential was not analyzed. Additionally for that job, radiological hazards were incorrectly identified and analyzed. The RWP for the job identified a suspension limit of 2000 disintegrations per minute (dpm) alpha, whereas the SWP identified radiological hazards as expected contamination levels greater than 2000 dpm alpha.

In several cases, hazards not identified or specified on the SWP were recognized during pre-job briefings or during conduct of the work, and workers either implemented compensatory measures or stopped work. For example, the 211 line-break work was delayed twice because of weather concerns, but these hazards and specific evaluation criteria were not identified in the AHA. In other cases, compensatory measures affected other plant areas that were subsequently not analyzed, leading to further work delays. Compensatory actions left to workers included: location of work boundaries (including respiratory protection areas), compensatory ventilation measures, contamination boundaries, and hearing protection. The compensatory measures taken by workers may or may not have been appropriate, but the implementation of the process did not ensure that the appropriate analysis was performed.

While some of the identified problems can be attributed to implementation deficiencies, a fundamental concern is that the AHA system is not sufficiently tailored to specify some unique hazards, such as specific chemical or stored energy hazards. Also, for some key hazards, the answers to the question set inappropriately results in an SWP hazard listing output that identifies controls as hazards. For example, "Non Rad PPE is needed for this job" is incorrectly identified as a hazard, without further specification as to what the hazards are. Similarly, "lockout needed" is inappropriately identified as a hazard. Some hazards are simply identified, without a requirement for further characterization or analysis. For example, the question set asks simply "are there sources of energy which if suddenly or unexpectedly released could harm a worker?" The system does not further prompt the planner to clearly identify and quantify those sources. The system then simply asks the planner "Lockout needed?" rather than identifying that a lockout is required because of the energy source and location.

Another problem with the AHA system may be that planners do not fully understand the output of the system. In many cases, the AHA system may identify a control output as "Evaluate." The planners incorrectly assume that statement should be included in the work package to implement the control. In reality, that statement should be treated as an action to the planner or SME to conduct the evaluation, and include the results of the evaluation in the final work package.

Finding #3. Some hazards associated with maintenance and construction work are not being appropriately characterized, analyzed, and documented during work planning and hazards analysis processes to ensure that appropriate controls are identified.

Summary. For maintenance and construction activities, the AHA process is not effectively used to ensure that hazards are appropriately identified and analyzed, resulting in potentially inadequate or unjustifiable controls. The concept of a computerized hazards analysis system to assist the planner is generally sound, but implementation of the process, particularly the analysis of hazards, needs improvement to ensure that the system is technically accurate and that results are justifiable and repeatable.

Core Function #3: Identify and Implement Controls

Many elements of hazard control at H-Canyon were comprehensive and detailed. Strong efforts related to maintaining facility condition and safety awareness and discipline were evident. For example, there was good general safety-related and radiological housekeeping, as evidenced by the orderly condition of work areas, including neatly wrapped cords, emptied waste receptacles, good boundary integrity, and janitorial cleanliness. Personnel at all levels of the site displayed a high awareness for safety, including the various types of hazards present and the importance of implementing effective controls. Potential for airborne and surface radiological contamination is effectively monitored and controlled. Additionally, WSRC has an extensive system of corporate procedures that define and implement most hazard controls.

SRS has an impressive containment fabrication facility. It has a capability, unique in the DOE complex, to design and build nearly any size containment, hut, or leak collection. The shop is staffed by experienced personnel who are available to visit the job site and custom-design containments that will address the unique hazards associated with the job. They are able to work with the facility to design and build specialized containments that have proven effective (in both performance and cost) in using engineered controls to protect workers, while minimizing the spread of contamination and the production of waste.

In radiological protection, H-Canyon makes good use of electronic systems to facilitate and simplify otherwise cumbersome processes, such as RWP entries and radiological survey recordkeeping. The facility effectively uses two such SRS systems, including the ProRad RWP system and Visual Survey Data System (VSDS). The ProRad database system provides for electronic RWP sign-in, and automatically checks several qualifications, such as radiological training status and dosimetry type, to ensure that the worker is authorized before authorizing entry. The system also offers a variety of useful reports to RCO line management. The VSDS greatly increases the efficiency associated with generating and retrieving survey forms and their legibility. Survey records are accompanied by photographs or CAD drawings and are highly legible due to electronic entries.

On most jobs observed by the Independent Oversight team, a pre-job briefing was conducted by the work group supervisor before work began. This briefing served as a final reminder to the workers of the work to be performed, associated hazards, and required controls. In some cases, this briefing identified some additional controls.

The primary tool for identifying controls is the AHA process previously discussed. This process produces the SWP, as well as four disposition reports. The SWP and the disposition reports list all the controls that should be implemented during the course of work, and define the tasks for which those controls are applicable. The resulting reports and controls, as currently implemented at H-Canyon, provide some improvement over the previous system, but the process is not yet mature, and personnel at H-Canyon are not effectively tailoring the controls to the hazards. Further, controls from the disposition reports are not always effectively integrated into appropriate work instructions. Instead, the mechanics and their supervisors must remember all the appropriate controls at the time of work. The Independent Oversight team observed cases where the controls identified in the disposition report were not specific, and workers and supervisors could not properly identify how to implement the controls. For example, for the 201-5 valve replacement, the Work Scope Definition Controls report identifies “Engineering and/or Administrative controls (specify).” Those controls were not specified as additional text or included in the work instructions. The same section identified “Utilize cooling devices,” but did not specify which cooling devices should be used. The report further identified “protect scaffolding materials from corrosive substances, chemicals or heat producing processes,” but did not specify how to protect the scaffolding materials (e.g., quick cleanup, wrap in plastic, leak containments). Finally, the work description for the valve replacement stated “neoprene or nitrile or PVC gloves.” The SWP controls section stated “Nitrile gloves are not to be worn, use either PVC or Neoprene.” This control was not integrated into the maintenance instructions, which repeated in the remarks section “Neoprene or Nitrile or PVC gloves.” Additional controls not adequately defined included “work group supervisor/manager or designee present for initial access” as a control for toxic, corrosive, reactive, flammable, explosive, asphyxiant, or biological hazards.

Finding #4. Controls identified during the hazards analysis process for maintenance work in H-Canyon are not always sufficiently specific and detailed to ensure effective implementation by workers and supervisors.

A predominant control used for H-Canyon maintenance is PPE. The WSRC policy is to use a hierarchy of controls (eliminate the hazard, engineering controls, administrative controls, PPE, in that order). However, in many cases, PPE is being specified as the primary control without sufficient analysis of the potential for engineering or administrative controls. Further, the resources of the SRS containment fabrication facility are not being used effectively wherever possible to provide engineered containment solutions. Records indicate that for the previous 12 months, only two maintenance jobs in H-Canyon used containment glove bags. In some cases, maximum PPE (double anti-C coveralls, air-fed plastic suits) was specified without sufficient analysis of the alternatives (e.g., engineered controls) or the hazards associated with wearing the bulky maximum PPE during work activities.

The RWP is the principal mechanism used to identify radiological controls in H-Canyon. While many activities were adequately controlled, a variety of concerns with implementation of the RWP process were identified, resulting in unclear and/or potentially inadequate controls for some work activities. Deficiencies include inadequate job descriptions and/or task breakdown, improper use of standing RWPs, inaccurate and/or incomplete radiological information, and insufficient specification of controls as described in the following paragraphs.

SRS appropriately expects RWPs to be divided into various unique subtasks when radiological hazards would drive changes to the required controls. However, the RWP procedure has no information on expectations for task breakdown, particularly in relation to integration with the AHA and SWP processes. While H-Canyon uses task descriptions on job-specific RWPs, the task descriptions for observed work were not sufficiently tailored to the operation and/or clearly linked to SWP task breakdowns such that workers could use them. In these cases, the RWP task descriptions were based on the needed controls rather than the activity being performed. For example, the black box repackaging RWP includes several activities for which the task descriptions are the same, but different PPE requirements are specified. Consequently, workers are unable to determine which RWP task they should use without RCO direction. However, the RCO direction is not governed by any formally defined or pre-defined criteria specifying when the different PPE-driven tasks (and associated PPE) are needed. In a similar concern, the RWP for third-level basin re-lining outlined the tasks as “welding/grinding with plastic suit” and “welding/grinding with full face respirator.” Again, the workers could not choose the appropriate task because it was broken down by PPE requirement versus activity (in this case, the RWP task breakdown should have conveyed that a plastic suit was called for in open areas, while the full-face respirator was needed when working between the tanks).

SWPs did not always list the RWP to be used for the work, resulting in the potential for inadequate or incorrect controls. For example, the SWP for calorimeter testing did not define the RWP to be used, and workers had some confusion over which RWP was the correct one. In response, the work group supervisor and planner decided to include this information on future SWPs; however, this practice is not a requirement for “pre-screened” SWPs. In another case, an RWP was specified on the SWP for a work evolution that went through a full activity hazards analysis, but the RWP was a standing RWP that was not appropriate because it conflicted with Industrial Hygiene controls defined in the SWP. According to 5Q1.2-231, for mixed hazards, PPE is to be jointly specified by Industrial Hygiene and RCO using the RWP system. This RWP also did not require RCO coverage, which was a requirement in the work instructions. For these reasons, a job-specific RWP should have been prepared for this work.

In a related concern, RWPs did not always contain enough specificity to ensure that controls were properly implemented. For example, many RWP tasks specified respiratory protection but failed to address when during the task that respiratory protection was intended. Portions of several observed jobs for which the task specified respiratory protection were observed, and workers were not working in respiratory protection. However, the RWP did not specify when workers were to don respiratory protection or that the control was not needed for the entire task. In practice, the condition under which respiratory protection is to be used is based on RCO direction and is not properly defined in the RWP. Similarly, specific requirements for lapel air sampling were not defined when lapel sampling was specified as a control, in that controls did not specify whether all or only some workers would wear lapel samplers.

Lastly, a number of RWPs contained incomplete and/or inaccurate information, or potentially insufficient controls. Examples include overly broad radiological conditions that could exceed triggers for additional radiological controls, incorrect radiological conditions, inconsistent suspension limits, and related anomalies indicative of inattention to detail during preparation and approval. These items were reviewed with facility RCO management. The most recent H-Area FEB review also noted concerns with the quality and accuracy of RWPs in H-Canyon.

Finding #5. Some H-Canyon RWPs have not been prepared and selected in a manner that ensures adequate task breakdown, accuracy of radiological information, and proper specification of controls for discrete work activities.

Summary. Many elements of hazard control at H-Canyon were comprehensive and detailed. However, at the activity level, maintenance and construction work controls are frequently not sufficiently tailored to specific activities and do not demonstrate adherence to the WSRC hierarchy of controls. In addition, some RWP controls lacked sufficient clarity, detail, and integration with non-radiological hazards and controls. Tailoring of hazard controls and the selection of controls (e.g., engineering controls rather than PPE) for maintenance and construction work also needs improvement.

Core Function #4: Perform Work Within Controls

Work authorization for maintenance is accomplished through the SWP, which provides a means for the workers and the lead work group supervisor to indicate they understand the hazards of the work and the required controls for the work. The Shift Operations Manager must then authorize the work before it can begin. By signature, the Shift Operations Manager acknowledges an understanding of the scope of work, associated hazards, and that facility conditions support performance of the work. All work performed was appropriately authorized by the Shift Operations Manager prior to the start of work.

Workers displayed a strong willingness to comply with requirements. Workers clearly demonstrated their concern for safety, and want to ensure that their actions do not endanger themselves or their co-workers. There was only one case observed during maintenance actions where workers failed to implement identified controls, and that was the use of the supplemental HEPA filter blower during welding work on the basin liner, when a welder began working without starting the blower. The workers were attempting to ensure that they were properly protected, and were focused on ensuring that they were properly wearing their PPE (air-fed plastic suits), getting screens properly positioned, obtaining radiological surveys, routing air hoses, and positioning the steel plates. These tasks were all made more difficult because of restricted visibility and hearing. The person in charge outside the boundary was similarly concerned. Without a work instruction checklist for the controls, all the workers and supervisors simply forgot to start the blower.

Summary. Maintenance activities were performed safely within identified controls, and workers understood the importance of procedural and requirements compliance.

Core Function #5: Feedback and Continuous Improvement

A number of mechanisms are used to provide feedback on maintenance work control. Each week, there is an H-Canyon Work Week Assessment meeting. At that meeting, supervisors and managers are provided with data regarding effectiveness of work scheduling, and are provided an opportunity to discuss work delays. Although this meeting provides an opportunity for managers to evaluate problems in work planning and control, they are not making full use of that opportunity. Planning deficiencies associated with the AHA process have not been identified as a source of work delays.

Workers are provided an opportunity to give feedback to the planners on work packages during the closeout process. In at least one case, a worker has provided feedback to move a back-flow preventer out of a contaminated area into a nearby clean area to reduce the hazard to workers when the device is checked annually per state regulations. Other work packages reviewed from the past two months have not contained written feedback to the planners from the workers or supervisors.

On January 23, 2006, one job was stopped by the work supervisor because of procedural and planning errors that resulted in some prerequisites for a leak containment not being properly met prior to installation. The final critique report identified the cause of the event as “inadequate work package preparation,” but the corrective actions did not identify or address problems in the planning process that led to this failure. The corrective actions were directed at revising the leak collection procedure and training workers on when the procedure is required. There were no corrective actions directed at revising the AHA database to ensure that the leak collection procedure is included as a control for H-Canyon during the AHA development process, and there were no corrective actions identified about the failure to identify mercury controls in the work package.

Corrective actions for the findings identified in the February 2004 Independent Oversight report have not fully addressed problems in hazards analysis and control implementation. Although there have been large changes in how the results of the hazards analysis are presented in the work packages, and many changes were made in the hazard tree, some weaknesses in the hazards analysis process were not corrected, and problems in the data question set that affected the previous system persist in the new system.

Summary. Feedback and improvement mechanisms for maintenance and construction activities are in place and have contributed to improvements. However, in some cases, the causes of identified problems are not thoroughly evaluated, and corrective actions do not always adequately consider more systemic problems with management processes.

C.2.4 Savannah River National Laboratory

SRNL, which has served as the applied research and development (R&D) laboratory at SRS for over 50 years, received National Laboratory designation in May 2004. SNRL provides a diverse spectrum of R&D in areas of energy security, national and homeland security, and environmental and process technology. With over 900 employees in more than 30 SRS buildings, SRNL is principally funded by the DOE Environmental Management program, with additional funding provided by DOE's Office of Energy Efficiency and Renewable Energy, Office of Nuclear Energy, Science and Technology, Office of Science, and the National Nuclear Security Administration (NNSA).

This Independent Oversight inspection focused on SRNL R&D, operations, and maintenance work activities within the primary SRNL R&D facilities located within the SRS H-Area, as well as selected activities within the SRNL facilities at the Aiken County Technical Laboratory (ACTL) located at the Savannah River Research Campus. Ongoing research activities were sampled within the following SRNL sections and/or directorates: Hydrogen Technology, Process Science and Engineering, Actinide Technology, Remote and Specialty Equipment Systems, Analytical Development, Environmental Technology and Bio-Technology, and Materials Science and Technology. In addition, routine shielded cell operations and maintenance activities were reviewed. During this process, work documents were reviewed; managers, researchers, technicians, and other workers were interviewed; and laboratory operations and work spaces were observed to assess the application of the safety management core functions. Approximately 25 activities were observed from these various SRNL R&D, operations, and maintenance groups.

On January 10, 2006, a flash fire occurred in one of the SRNL laboratories, resulting in a researcher being hospitalized as a result of his burns. A Type B investigation was convened and was ongoing at the time of the Independent Oversight inspection. The root causes of this event are currently being investigated by the DOE Office of Environmental Management (EM)/ Savannah River Operations Office (SR) and WSRC to identify the causes and failures in one or more of the ISM core functions.

Core Function #1: Define the Scope of Work

Within SRNL, work activities are defined through a variety of mechanisms, depending on the nature of the work activity. Research work, the predominant activity reviewed by the Independent Oversight team, is defined through the Conduct of R&D process, a work control process initially developed by SRNL in 1998 for implementing ISM for the R&D environment. The Conduct of R&D process is well defined in a WSRC manual and is continually improved though self-assessments and employee suggestions provided to the SRNL Conduct of R&D Board. In general, the Conduct of R&D process has resulted in research work descriptions that are well developed and tailored to the research activity though task technical and quality assurance plans, the hazard assessment packages (HAPs), procedures, work instructions, and memoranda.

Most SRNL operations and maintenance activities are also well defined in SRNL procedures and maintenance work packages. SRNL maintenance activities are governed by the SRS maintenance work control program and, in most cases, are adequately defined in work requests. Most SRNL operations, such as the operation of the Building 773-A shielded cells, are well defined in operating procedures. One exception, however, is that the description of an 8-ton-cask inner sample packaging was not sufficiently communicated from the tank farms to the SRNL shielded cells operations team, so that the appropriate work planning could be conducted. (See Finding #7.)

SRNL operates a number of machine shops, testing labs, and support labs in which routine work is performed by skilled crafts. The level of work descriptions varies widely among these shops, from detailed work requests with attached drawings, to verbal instructions only. On occasion, because of the varied nature of the materials received by these shops from the requestor, this informal process for defining the work may result in hazards being missed or not sufficiently analyzed (as described under Core Function #2). Typically, these shops or laboratories do not have well-defined limitations or boundaries on materials or work activities that are either not permitted in the shop or would require a job-specific job hazards analysis (JHA) (e.g., grinding lead or welding chromium-containing materials). For example, in the Glass Blowing Apparatus Development Laboratory, a Conduct of R&D review was conducted for general work activities performed in this lab, and JHAs and work instructions have been prepared for individual equipment items. However, the limitations or restrictions concerning the type of work that can be performed in the lab, and the thresholds for initiating a work-specific JHA or involvement of ES&H SMEs, are not well defined and rely solely on the skill of the craft. (See Finding #6.)

Summary. In general, SRNL research, operations, and maintenance activities are well defined through the SRNL Conduct of R&D process, operations procedures, and maintenance work packages, respectively. In a few cases, the description of work for some SRNL research, operations, and maintenance activities has not been sufficient or adequately communicated to ensure that all of the hazards could be identified.

Core Function #2: Analyze the Hazards

The hazards within SRNL R&D, operations, and maintenance activities are diverse and continually changing with the dynamics of the research and support operations. Most of the research, operations, and maintenance staff are knowledgeable of these diverse hazards and have sufficiently analyzed the potential impacts of these hazards through a variety of hazards analyses processes.

At the facility level, SRNL buildings with significant hazards are well defined in authorization basis documents, including a detailed documented safety analysis for work within nuclear facilities (such as Building 773-A, a hazard category 2 nuclear facility); an auditable safety analysis for low-hazard chemical facilities, such as the engineering development prototype work conducted in Building 723-A; and hazards analysis documents and industrial permits (e.g., environmental permits) for industrial facilities, such as the ACTL. In general, these documents appeared to be adequate and appropriate for the identification and analysis of facility-level hazards. Several concerns, however, were identified in the identification and analysis of facility-level hazards when implementing the SRNL Conduct of R&D process. For example, the unreviewed safety question (USQ) determination process as implemented for SRNL does not require the preparer to document a rationale when electing not to perform a USQ screen for new research activities being conducted within the shielded cells of Building 773-A. Furthermore, as in the case of the flammable gas generation research being conducted by the SRNL Process Science and Engineering group, only segments of the activity deemed necessary were analyzed with respect to the USQ determination, consistent with the guidance provided in the SRNL Conduct of R&D manual. This concern was also identified by SRNL in a recent self-assessment. In another case, for non-nuclear facilities (i.e., the electrolyzer for hydrogen production research project), the Management of Safety Basis process is not being applied consistent with the guidance provided in the SRNL Conduct of R&D manual. That is, although the process is being conducted informally, documentation of the Management of Safety Basis screen is typically provided only when the informal, undocumented screen identifies hazards outside the facilities' documented basis. (See Finding #6.)

At the activity level, hazards associated with research activities are identified and analyzed through the Conduct of R&D process, whereas the hazards associated with operations activities are addressed though procedures, and the hazards of maintenance work are defined and analyzed though the SRS Conduct of Maintenance and hazards analysis processes. In general, the Conduct of R&D process has been effective in identifying, analyzing, and documenting hazards associated with SRNL R&D work activities. Most of the research activities reviewed during this inspection had been evaluated and documented in an HAP, consisting of an R&D hazards screening checklist, a variety of figures extracted from the Conduct of R&D manual based on responses to the screening checklist, and a JHA. Some of these HAPs are exceptional, such as the ones for the electric discharge machine project within the Materials Science and Technology group, and research being performed in the Bio-Technology Laboratory. However, a number of concerns with the implementation of the Conduct of R&D process for hazards analysis were also noted (see Findings #6 and #19):

- In several research HAPs, results of the hazards analysis were not sufficiently documented. For example, in some HAPs, the researcher has not identified the "yes" or "no" decision paths to identify whether the hazard was analyzed and the results of the analysis. Some of the research staff have been diligent in documenting (e.g., through footnotes on the figures or attached memos) the extent of the hazards analysis; however, in other HAPs, documentation is not sufficient.

- In general, there was no "footprint" within the HAP of any requirement for or the presence of the ES&H SMEs. When SMEs were involved, such as Industrial Hygiene SMEs, there was often no indication in the HAP that a review was required by the Industrial Hygiene SME, that a threshold(s) was exceeded that triggered the review, or that the Industrial Hygiene review was conducted; further, there was no documentation about the results or findings resulting from the Industrial Hygiene review (e.g., additional controls required). In some cases, the involvement of Industrial Hygiene had been extensive, but this involvement was not documented.

- Some of the JHAs included in the HAP are less than adequate with respect to the identification of hazards. In some cases, research-related JHAs have not adequately addressed the hazards associated with a research activity's preparation or closure activities. For example, in the collection of residues and simulants generated at ACTL (e.g., the Saltstone Grout Variability Study), some potential ergonomic or lifting hazards were involved that were not included in the JHA for these research activities. These hazards were either informally addressed or incorrectly assumed to be addressed in the environmental evaluations checklist. In other examples, the actinide sample re-pack work and neutralization of aqueous solutions conducted by the Actinide Technology Section provided little information about the activity-specific hazards and requisite controls.

- In some Conduct of R&D HAPs, a JHA was not prepared if the activity was being performed via a procedure. For example, research being conducted in the Neutron Activation Laboratory in Building 773-A is performed through an activity procedure without an accompanying JHA. However, the procedure does not address the hazardous chemicals (i.e., acids), and does not address controls for working with lead, heat sealing of samples, and pinch points.

Finding #6. Elements of the SRNL Conduct of R&D process do not ensure that all work is defined, hazards are analyzed and documented, controls are sufficiently identified and implemented, and work is performed within controls.

Throughout SRNL, there are a number of machine shops or shop-like activities within R&D laboratories (e.g., the glass apparatus, robotics, and materials non-destructive examination laboratories) in which many activities are routine, and the hazards are not well analyzed and/or documented. Typically, there are hazards analysis processes, such as JHAs and Conduct of R&D packages, associated with either the equipment or general work activities within these shops or labs. When new equipment items are procured, an SM-51 review is conducted to ensure that the appropriate ES&H SMEs are included in the initial hazard review process. However, as indicated in Core Function #1, the description of work for these activities may be verbal, and there are no clear boundaries or limitations for work activities based on an analysis of the hazards. For example, within the welding area of the Building 749 machine shop, there are no well-defined limitations on the materials that can be welded in the shop, no analysis of the potential exposure to fumes associated with these materials, and no guidance on when and how to use the local exhaust systems to limit exposures to these fumes. In other cases, there is no documented evidence that the hazards in these shops have been analyzed, and therefore there is insufficient assurance that the designated controls, if any, are adequate. (See Finding #19.) For example:

- The sand/bead blasting filters in Buildings 749-A and 723-A did not have a hazards analysis for performing maintenance or cleaning.

- The potential aluminum dust hazard from a polishing operation in Building 749-A had not been recognized and was therefore not analyzed by Industrial Hygiene.

- The potential lead hazards from benchtop soldering work without local ventilation in the Robotics Lab had not been identified by line management or analyzed by Industrial Hygiene.

- A maintenance mechanic wearing hearing protection in the Building 735 maintenance shop was using a hammer to loosen pipes, while nearby workers were not protected from the loud noise.

For SRNL maintenance activities, the AHA process in general was effective in identifying and documenting most pertinent activity-level hazards. However, as discussed in detail in the H-Canyon section of this report, implementation of the new AHA process is incomplete. For example, since the hazards analysis process does not list disposal of asbestos waste as a hazard, an AHA for a project to remove and replace transite (asbestos-containing material) panels at SRNL had checked hazardous and mixed waste (which is not appropriate since asbestos is not regulated under the Resource Conservation and Recovery Act [RCRA]), which resulted in the AHA's work scope definition controls section having only the additional statement "Asbestos waste (transite)." No hazards analysis or resulting controls for the asbestos waste was provided. Instead, the SRNL expectation was that by using workers trained in working with asbestos, listed elsewhere in the AHA, the asbestos waste could be properly managed.

For SRNL operations activities, most hazards are sufficiently identified and analyzed through operating procedures; older procedures utilized the previous hazards analysis process as the primary hazards analysis tool. For the majority of SRNL shielded cell operations observed, hazards were sufficiently identified in operating procedures. However, this is not always the case. Some hazards associated with the operation of the Building 773-A shielded cells are not addressed by an AHA, operational procedures, JHA, or other equivalent mechanism. For example, the potential hazards associated with the transfer of samples from Cell 4 were not covered by the current work control process, other than expectations for skill of the craft. For the flammable gas generation experiment, conducted within the hot cells, the Conduct of R&D package addressed the hazards associated with the research activity but not the transport of the radioactive sample containers to a laboratory outside the shielded hot cells for subsequent analysis of flammable gases. This sample transport activity, which was conducted by shielded cell operations, considered only the radiological hazards that were documented on an RWP, and a JHA or AHA was not required. The RWP, however, would not adequately describe the potential chemical or pressure hazards associated with the sample, and the hazards would vary from one individual experiment to the next.

Finding #7. In some cases, the lack of interface between SRNL research and development activities and SRNL operations activities has resulted in the potential for hazards not being sufficiently identified and analyzed.

Summary. Facility-level hazards are defined in a variety of authorization basis documents, depending on the risk categorization of the SRNL facility. Generally these facility-level documents are robust, although the implementation of the USQ screening process lacks rigor for research conducted in Building 773-A. At the activity level, most hazards associated with research, operations, and maintenance are sufficiently identified, analyzed, and documented through the Conduct of R&D and JHA processes, operations procedures and accompanying hazards analyses, and maintenance packages with supporting AHAs. However, weaknesses were observed with respect to some hazards not being identified, analyzed, or documented; insufficient involvement of ES&H SMEs; poor quality of hazard documentation; and lack of hazards analysis and exposure assessments, particularly for shop activities.

Core Function #3: Identify and Implement Controls

In general, SRNL has been effective in identifying, developing, documenting, and implementing hazard controls through the Conduct of R&D process, operating procedures, maintenance packages, and AHAs.

Engineering controls in most SRNL research labs and facilities have been effective in controlling hazards. Engineering controls are well maintained, and are inspected, tested, and calibrated to ensure that the controls will perform as designed. For example, all the observed laboratory fume hoods were within their inspection frequencies, sashes were appropriately adjusted, and clutter inside the hoods was minimized. A variety of door locks are provided to ensure that laboratory access is limited to authorized research staff and workers. Gloveboxes and chemical storage cabinets were adequate and orderly. The shielded cells in Building 773-A are effective controls when working with highly radioactive materials, and the safety systems for the cells are well maintained.

Similarly, administrative controls within SRNL have been appropriately implemented and have been effective in identifying and controlling hazards and personnel exposures. For example, hazard communication postings on most SRNL laboratory doors adequately reflect hazards identified within the laboratory spaces. Laboratory training and qualification programs for technicians and maintenance mechanics are well designed and effective. SRNL has implemented a qualification program for laboratory technicians. Shielded cell operators have completed a formal qualification program and use approved procedures for most operations. Technicians (e.g., machinists, welders, and glass blowers) are experienced, trained, and well qualified. Radiological controls were generally appropriate for the hazards identified, such as those radiological controls established in Radio-Chemical Laboratory B-138 in Building 773-A. Appropriate radiological boundary controls were also established for observed cell maintenance and operations.

In some cases, however, hazard controls in Conduct of R&D and SRNL shop activities have not been adequately identified, developed, or documented in hazards analysis documents and JHAs. Several of the JHAs in Conduct of R&D HAPs do not sufficiently specify the required controls. In some cases the hazard controls were generically defined as "use appropriate PPE," or "use good lab practices." In other cases, JHAs and SWPs developed through the hazards analysis process refer to other ES&H and maintenance procedures, MSDSs, or technical manuals in lieu of specifying a hazard control, thereby requiring the participant to identify the appropriate hazard control. In a few cases, the JHA does not identify the appropriate hazard control(s). For example, in the Materials Science and Technology Non-Destructive Evaluation (NDE) Laboratory, the JHA for the cutoff saw identified chemical splash hazards, but no controls for this hazard were listed in the JHA. In the Building 749 machine shop, although the machinists were enrolled in the hearing conservation program, as required by the high noise producing equipment in the shop, a student apprentice in the same shop performing similar activities was not enrolled in the hearing conservation program. (See Finding #6.)

In other cases, hazard controls in Conduct of R&D packages were not adequately linked to the hazard. For example, a preventive control measure listed in the JHA for the atomic absorption analysis in Laboratory B-143 of Building 773-A required a cart being placed in front of the fume hood when pouring concentrated acids. However, when diluting concentrated acids, as observed in the laboratory, different controls were implemented, none of which were specified in the JHA. (See Finding #6.)

Controls for some similar hazards are inconsistent among the various SRNL sections. For example, each SRNL section has established procedures and practices for the use of hydrofluoric acid (HF). The Analytical Development Section has developed a detailed procedure for HF use, whereas the Materials Science and Technology NDE Laboratory relies on a procedure for "Etching of Metallographic Samples," which identifies HF as one of hundreds of etchants, but provides no unique controls for HF. The SRNL Chemical Safety Committee self-identified this inconsistency in HF controls and is developing a uniform procedure for HF usage.

In some cases, when hazards have changed, the administrative controls have not been re-analyzed. For example, when the Shop-Bot sawing operations in Building 749 changed from plastics to aluminum stock, the noise hazard was not reevaluated. Upon subsequent review, the noise protection boundary increased from 10 to 15 feet. When small concentrations of toluene and xylenes were identified in the flammable gas generation research in 2005, the flammable gas calculation performed in 2004 was not revised to explain the impact, if any, of the presence of these gases. This calculation is mandated to ensure that the technical safety requirement (TSR) margins for flammable gases within the shielded hot cells are not exceeded. In another example, when the Parr pressure vessel testing was initiated in an Analytical Development laboratory, the hazard communication postings were not changed to reflect the pressure hazard within the laboratory. (See Finding #6.)

During a recent lift of an 8-ton cask over the shielded cells in Building 773-A, procedural controls were not in place to ensure that the rated capacity of lifting fixtures was not exceeded (the rated capacity of the lifting yoke is 16,000 pounds). However, there were insufficient administrative controls to ensure that the 8-ton cask with contents did not exceed this capacity prior to commencing the lift. Following the lift, an initial weighing of the cask was performed, and the weight of the inner sample container and contents was estimated and the dynamometer error was computed, which concluded the cask weighed approximately 15,900 pounds. However, prior to lifting the cask, the exact weight of the cask had not been verified, nor had the weight of the sample within the cask or the potential for error been factored into the administrative controls for the lift. Furthermore, because the actual lift is near the limit of the capacity of the lifting device, there was no documentation or basis to conclude that an independent review and approval of the entire process had been conducted for the engineering lift (as performed) as defined in both the SRS hoisting and rigging manual and the DOE hoisting and rigging standard, DOE-STD-1090-2004. The specific lift performed meets many of the prerequisites to be classified as a pre-engineered lift, and therefore would not require the application of critical lift planning. However, for each evolution, both the SRS hoisting and rigging manual and DOE standard require an engineering or independent review and approval of the entire process (i.e., flight path of suspended loads, training, administrative and engineering controls, etc.) in order to be designated as a pre-engineered production lift. The procedure for this activity lacks a step to verify the cask weight before the actual lift to ensure that the maximum rated capacity of the various cranes and lifting fixtures are not exceeded.

Finding #8. SRNL has not ensured that hoisting and rigging procedures for the SRNL shielded cell facility engineered lifts have effectively implemented SRS or DOE hoisting and rigging requirements and established appropriate administrative controls.

Summary. Engineered hazard controls, such as laboratory hood ventilation systems, shielded cells, and gloveboxes, and access controls are well maintained and are effective in controlling laboratory hazards. Similarly, most administrative controls within SRNL have been appropriately implemented to control hazards and personnel exposures. However, in some cases, such as the lifting of a shielded cask in Building 773-A, the administrative controls are either not sufficient or have not been verified prior to the performance of work. In other cases, the appropriate hazard control is unclear because the hazard has not been sufficiently analyzed (Core Function #2), hazard controls are not consistent across SRNL groups for the same hazard, or the controls are not being reevaluated when hazards change.

Core Function #4: Perform Work Within Controls

Overall, SRNL R&D, operations, and maintenance work activities are being conducted safely and within the controls specified in work documents. In addition, SRNL satellite accumulation areas, less-than-90-day areas, and treatment storage and disposal facilities are operating within RCRA requirements. In a number of examples, machine shop controls identified in JHAs were adequately implemented.

On several occasions, SRNL staff initiated a time-out when hazards and/or controls were unclear. For example, workers at the shielded cells appropriately initiated a time-out to collect additional data concerning the adequacy of the packaging of a cask received from the SRS tank farms and to develop a temporary procedure for retrieving the sample container from within the cask, to minimize unnecessary exposure or risks to workers. In another example, workers within the Glass Blowing Apparatus Development Laboratory initiated a time-out when uncertainties were identified in the composition of the plasticizer being used to coat a number of small glass vials.

In some cases, work was performed beyond the identified work scope or outside of established controls. For example, maintenance personnel in the shielded hot cell areas conducted unplanned electrical troubleshooting (throwing circuit breakers to attempt to locate power supply) that was beyond the scope of the work package and was not discussed in the pre-job briefing. In another example, maintenance workers were using a petroleum lubricant that was not identified in the work package, and subsequent controls were missed.

A continuing challenge for research activities is performing work within established boundaries and avoiding "scope-creep." Established procedures were not always followed or work was not stopped when procedural controls were not adequate. For example, for the flammable gas generation research, the results from the flammable gas calculation performed for benzene generation were not included in the TSR generation rate for flammable gases as required by a procedure associated with the implementation of TSR Administrative Control 5.7.2.18 for the shielded hot cells. (See Finding #6.)

In some cases, controls were not effectively implemented. For example, in one case, radiological controls being implemented were not sufficient to characterize the radiological hazard. During one work activity many of the swipe samples taken by radiation control as part of the job coverage were far below the 100 cm^2 smeared surface area required for appropriate determination of the potential for removable contamination. Additionally, the actual surface area sampled was not documented as required by procedure. In several cases, housekeeping in some shops and outside areas was less than adequate. For example, in the mechanics shop in the basement of Building 735, several unused old machines lacking proper safety controls were still located in the work area, a small drum of packing material was left from an old construction project, and cords for the welding machine were hung in a manner that created an entanglement hazard. Within construction layout areas, numerous legacy items, including broken equipment and open containers (e.g., old scrip collection drums), were located in the yard, thereby increasing the potential for improper waste items to be dumped into this cluttered yard. (See Finding #6.)

Summary. Overall, most SRNL R&D, operations, and maintenance work activities are being conducted safely and within the controls specified in work documents. However, in some cases, controls were not effectively implemented, work was performed outside the boundaries of prescribed controls, and procedures were not followed.

Core Function #5: Feedback and Continuous Improvement

SRNL has developed a robust interconnecting system of feedback and improvement processes at the facility and programmatic levels. For example, each of the SRNL sections has developed an aggressive and comprehensive self-assessment schedule. A typical self-assessment schedule, such as the 2006 calendar year (CY) self-assessment schedule developed for the SRNL Process Science and Engineering Section, consists of 15 self-assessments covering 15 topical areas of importance to the type of research being conducted, ranging from laboratory postings to technical use of lab notebooks. In addition, in CY 2006, each SRNL section will be required to conduct self-assessments of the Conduct of R&D and Management of Safety Basis processes. Each group manager within Process Science and Engineering is tasked with leading at least one of these self-assessments. In 2005, SRNL conducted 346 scheduled self-assessments and an additional 120 non-scheduled self-assessments. In addition, SRNL section managers are expected to conduct monthly management walk-arounds of their spaces and operations.

In addition to the self-assessment programs (further discussed in Appendix D), SRNL has implemented a number of other processes at the programmatic level that have provided mechanisms for feedback and improvement at the work-activity level. Examples include the mandatory monthly safety meeting for each section, and a myriad of councils, such as the Operations Council and Conduct of R&D Board, to focus on continual improvement of work processes. Additionally, for Building 773-A, a Facility Safety Oversight Committee and a Facility Radiological Action Team have been established as feedback and improvement mechanisms for radiological work performed in Building 773-A facilities. A behavior-based safety program has been implemented at SRNL, and the number of trained observers continues to grow. Results from behavior-based safety observations are factored into the overall SRNL safety feedback and improvement process. In addition, some programmatic assessments of research and operations activities are comprehensive, such as the SRNL Environmental Compliance Authority's routine oversight of hazardous and mixed-waste generator activities. Details of these programs as well as the SRNL lessons-learned and feedback and improvement metrics programs are provided in Appendix D.

One of the most significant recent feedback and improvement programs at SRNL is the development and implementation of an events database. The SRNL laboratory event database provides an effective feedback and improvement mechanism for capturing, critiquing, trending, and analyzing significant and/or reportable events at SRNL as well as a variety of lower-threshold events, such as near misses, first-aid medical cases, and time-outs. The laboratory event database is a single source of event-related information for SRNL line managers, providing a quick method for disseminating information on an event to SRNL line managers, SRNL facility managers, ES&H support staff, and the SRNL Operations Council Executive Committee. The laboratory event database establishes data sets for leading indicator trend analysis and provides a mechanism for documenting critiques. The laboratory event database was fully implemented only within the past few months and is not yet well defined in policies or procedures. However, the system has already been used to capture, report, and analyze events that may otherwise have been missed, such as research-related time-outs (e.g., informal work pauses to ask safety questions or resolve discrepancies), lockout violations, non-recordable first-aid cases, inadvertent hydrogen releases or transfer of waste, and a nitric acid solution container leak. In addition, the SRNL laboratory event database is compatible with and interfaces with other SRS feedback and improvement systems, such as the STAR database. Although the database is in the early stages of implementation, SRNL has recognized the need to address a longstanding problem with collecting operational information in laboratories and has identified the event database process and tool as an important measure to address the concern. The process may have similar benefits at other SRS facilities or other DOE sites.

Although the SRNL feedback and improvement processes are extensive, there are a number of opportunities for improvement. For example, neither the Conduct of R&D requirements nor other SRNL policy documents define expectations for capturing feedback and improvement actions during and/or following the completion of a research experiment. Although several of the aforementioned programs, such as the time-out program, may capture individual research activity opportunities, there is no systematic mechanism for routinely capturing improvement items at the research-activity level, nor expectations for capturing and trending this feedback information. Although SRNL sections and groups have routine meetings to discuss research progress, a systematic process to encourage and capture lessons-learned feedback is not established and implemented.

Although the SRNL lessons-learned program is generally effective, two Independent Oversight observations indicate that improvement is warranted. In one observation, researchers had discovered that the manufacturer's rated thermal capacity of a Parr pressure vessel, which is routinely used within the labs, could not be safely achieved without design modifications to the vessel. Although the manufacturer was aware of this design deficiency, the manufacturer had not notified all of the users. At SRNL, the Pressure Safety group identified this defect through discussions with the manufacturer. However, neither the Pressure Safety group nor the SRNL researchers who had performed the modification to their Parr vessels had informed their management or others within SRNL of the defect. Once management was informed of this concern, a sitewide lessons-learned bulletin was issued. In a second example, a recent lessons-learned item from the Los Alamos National Laboratory concerning the respiratory illnesses incurred when researchers were overexposed to acid fumes from aqua regia was not effectively communicated to the research staff. During an observation of an experiment involving aqua regia, the researchers were unaware of the event at Los Alamos. Although their management had received the event notification, the event was communicated primarily as a failure to report an illness and did not emphasize overexposure to aqua regia fumes; thus, the importance of the lesson learned to the SRNL staff was missed.

Another concern in the feedback and lessons-learned process at SRNL is the event critique process. Although SRNL routinely conducts critiques following a near miss, the thresholds for initiating a critique are not well established, resulting in some critique opportunities being missed. For example, in March 2005, as part of a research activity being conducted at ACTL to measure the benzene evolution from Saltstone grout, unpleasant odors were identified by researchers in the laboratory in which the experiment was being conducted. Industrial Hygiene was notified and conducted air sampling. Low concentrations of ammonia and trimethylamine were detected, which were not expected. However, because airborne concentrations were well below regulatory requirements, a formal inquiry and/or critique was not conducted to examine the causes for the event, estimate personnel exposures, and identify lessons learned and appropriate corrective actions.

Finally, a number of concerns with respect to the lack of documented exposure assessments at SRNL have been identified by Independent Oversight, as discussed in the previous paragraphs. These concerns were not identified by either SRS institutional feedback and improvement processes (e.g., the 2004 FEB report for SRNL), or in self-assessments conducted by SRNL managers. Furthermore, none of the planned SRNL self-assessments is directed at assessing workplace exposures, perhaps with the exception of radiological exposures or radiological contamination control practices. In addition, institutional procedures (i.e., SRS ES&H and work control procedures) that impact the exposure assessment process generally fail to address R&D work activities, although attention is provided for maintenance, operations, and construction work.

Summary. Multifaceted feedback and improvement mechanisms for research, operations, and maintenance activities are in place at SRNL, and many aspects are effective in identifying and correcting deficient conditions. Some of these processes have only recently been implemented (e.g., an expanded self-assessment process, and the SRNL laboratory events database), but their implementation should result in a more robust feedback and improvement process at SRNL. However, there are a number of opportunities for improvement, particularly in the areas of timely identification and distribution of lessons learned, establishing lower thresholds for critiques, and defining expectations for feedback and improvement mechanisms at the research-activity level.

C.3 Conclusions

Tritium Facilities

TMO has applied the site AHA procedure to essentially all maintenance activities. Work is adequately defined and most industrial safety hazards and controls are adequately described in work packages issued to the craft. However, health hazards described in MSDSs are not always fully analyzed, and appropriate controls are not always established for these hazards. Workers understand that management expects them to work safely, and their level of compliance with safety requirements is good. Worker knowledge and experience are strengths and have compensated for some deficiencies in the work control process and its implementation. TMO has effectively implemented several feedback and improvement initiatives and has created a work culture in which critical review is valued.

H-Canyon Operations

Work control processes for operations activities are generally adequate to meet activity-level ISM expectations; however, the new AHA process has not been implemented long enough for operations procedures to be able to review sufficient completed AHAs to make definitive conclusions on the effectiveness of implementation of the new AHA process and tools.

H-Canyon Maintenance and Construction

There are weaknesses in ISM implementation in maintenance and construction work at H-Canyon, primarily in hazards analysis and specificity of controls. Although workers are committed to safety, the processes used to identify and analyze hazards and ensure that appropriate controls are identified and implemented are not effectively supporting the workers. Consequently, the workers are not adequately instructed on the hazards and what controls to use. PPE is being prescribed without sufficient consideration of alternatives, and some additional hazards may not be sufficiently analyzed during the maintenance/construction work.

SRNL

The SRNL work control processes provide effective mechanisms for implementing the core functions of ISM. R&D activities are generally well defined, most research hazards are sufficiently analyzed, and controls are typically appropriate and effectively implemented. However, in several cases, the Conduct of R&D process has not been effective, work scopes and/or work limitations are not well defined, hazards have not been adequately identified or analyzed, and controls lack specificity, especially with respect to identification and implementation. Within SRNL machine shops and other R&D shop-like activities, which rely more on skill of the craft, hazards are not as well analyzed and/or documented, and the controls are not always clearly understood or effective. Operations activities are rigorously controlled through procedures, but in some cases gaps in the activity-level hazards analysis exist, and the interface between operations and research lacks a sufficient work control process. Maintenance activities are typically well defined, and hazards are analyzed and appropriately controlled. Research, operations, and maintenance activities observed by the team were performed safely, but improvements are needed to ensure that work is performed within defined boundaries and that procedures are adequate and are followed, particularly with respect to maintaining the facility authorization basis.

C.4 Ratings

The ratings for the first four core functions are presented separately for the activities reviewed to provide EM/SR, NNSA/SRSO, and WSRC management with information on the effectiveness of organizations and the implementation of the various core functions. The results of the reviews of Core Function #5 are considered in the evaluation of the overall feedback and improvement program, as discussed in Appendix D.

Implementation of Core Functions for Selected Work Activities

SRS ACTIVITY	CORE FUNCTION RATINGS			
	Core Function #1 – Define the Scope of Work	**Core Function #2 – Analyze the Hazards**	**Core Function #3 – Identify and Implement Controls**	**Core Function #4 – Perform Work Within Controls**
Tritium Facilities	Effective Performance	Needs Improvement	Effective Performance	Effective Performance
H-Canyon Operations	Effective Performance	Effective Performance	Effective Performance	Effective Performance
H-Canyon Maintenance and Construction	Effective Performance	Needs Improvement	Needs Improvement	Effective Performance
SRNL	Effective Performance	Needs Improvement	Needs Improvement	Needs Improvement

C.5 Opportunities for Improvement

This Independent Oversight 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.

WSRC – Institutional

The review of H-Canyon identified a number of opportunities for improvement that should be considered on an institutional basis and applied to H-Canyon and other SRS facilities as applicable.

1. **Improve the clarity of hazards and controls in operations procedures as well as expectations for application of the new AHA process to operations activities.** Specific actions to consider include:

   - As operations procedures are revised, move PPE for specific activities or other action steps from the safety precautions and limitations section to the performance steps or cautions section within the procedure body.
   - Better define the AHA process with regard to the current procedure review and approval process to provide an integrated hazard assessment strategy for operations activities.
   - Ensure that a documented hazards analysis is maintained for all operations procedures, and that it is periodically reviewed and/or updated on some scheduled frequency.

2. **Revise the maintenance work planning process to provide logical, systematic documentation of the work plan.** Specific actions to consider include:

   - Reduce the number of differing work descriptions among the Passport work instructions, SWPs, and RWPs.
   - Ensure that necessary controls are adequately accounted for in the AHA system, and that controls unique to a job are clearly identified in the appropriate part of the work instructions.
   - Minimize use of non-specific instructions in documents provided to workers. Ensure that all control actions are clearly identified for the specific task.

3. **Revise the AHA hazard tree to provide a more logical, consistent, and systematic approach to the identification of hazards, and to drive**

the user toward appropriate analysis of the hazards and clear identification of the controls as a result of the analysis. Specific actions to consider include:

- Remove such controls as lockout/tagout from the hazard tree.
- Revise the hazard tree to follow a more systematic breakdown of the hazards (e.g., grouping into industrial hazards, environmental hazards, radiological hazards, chemical hazards, and hazardous tasks).
- Carefully review the hazard tree to ensure that tasks are identified as a hazard only when the analysis of the hazard might not accurately characterize the hazard (e.g., floor, wall, ceiling, or ground penetration).
- Ensure that tasks that remain in the hazard tree are followed up by appropriate analysis questions that analyze the potential hazards.
- Ensure that statements from the control set that require further analysis (e.g. evaluate, consider, or review) are recognized and completed as a planning action, not a worker action, and document results of the analysis in the SWP.
- Revise the AHA procedure to provide more specific information and detail as to expectations for identification of hazards and controls, in addition to the current database usage instructions.

4. **Identify compensatory measures to ensure that hazards are appropriately identified, analyzed, and controlled until the AHA process matures and planners and supervisors demonstrate the ability to consistently produce high-quality work documents.** Specific actions to consider include:

   - Add additional supervisory reviews for some percentage of work packages, or for work packages that exceed some predefined threshold (e.g., number of man-hours, multiple craft, line breaks, and high-pressure or high-voltage).
   - Have regular review sessions with planners, supervisors, and workers to conduct post-work reviews on complex packages to get critical feedback on the planning process and identify improvements.
   - Provide workers with incentives to give constructive, critical feedback on work package accuracy and usability.
   - Analyze work delays more effectively to identify planning deficiencies, and identify specific corrective actions related to systemic problems.

5. **Improve the RWP process to ensure that RWPs contain clear scopes of work and task breakdown, accurate and meaningful radiological information, and clearly defined controls. In addition, improve integration of RWPs with non-radiological hazards and controls specified during the AHA process.** Specific actions to consider include:

   - Revise the RWP procedure to include specific expectations and criteria for such key elements as task breakdown, RCO coverage requirements, and integration with radiological and non-radiological controls defined by the AHA and process.
   - Review and revise related WSRC procedures, such as PPE and respiratory protection, to ensure that mechanisms and processes for defining controls for mixed radiological and non-radiological hazards are adequate.
   - Conduct special training of RCO and Industrial Hygiene staff regarding expectations as to proper integration of the RWP and AHA processes.
   - Institute additional internal reviews and quality assurance of RWPs to ensure accuracy of the information presented.
   - Conduct additional training of RCO staff regarding expectations for defining radiological controls and ensuring their clarity in RWPs.
   - Review all standing RWPs and subdivide broad scope standing RWPs that currently

allow work in a wide range of radiological conditions that may exceed thresholds for additional controls. These should be divided into two or more discrete standing RWPs with a narrower range of radiological conditions. Minimize use of conditionals and the need for subjective interpretation of controls by RCO support personnel.

6. **Enhance activity-level feedback mechanisms.** Specific actions to consider include:

    - Ensure that procedures are in place that specify expectations and responsibilities at the activity and facility levels.

    - Increase the use of and enhance the application of techniques (e.g., root cause analysis) to better identify contributing factors and prevent recurrences.

    - Ensure that critiques are performed when applicable, to include reexamining thresholds for performing critiques.

    - Ensure that activity-level lessons learned are disseminated.

    - Monitor and assess activity-level feedback mechanisms to determine and improve their effectiveness.

WSRC - Tritium Maintenance

1. **Provide additional training for planners on the new AHA process**. In particular, provide instruction on:

    - Defining the scope of work as required by Manual 8Q, Procedure 122

    - The use and applicability of the various disposition reports included in maintenance work packages

    - Using the "Additional Text" column on SWPs to better tailor computer-generated hazards and controls to specific tasks

    - Planning work more thoroughly so that mechanics and supervisors do not have to guess about hazards or pick and choose controls

    - Incorporating hazards and controls specified on MSDSs into SWPs based upon input from Industrial Hygiene SMEs

    - Expectations for using SRS and TMO lessons-learned databases.

2. **Strengthen Industrial Hygiene reviews of TMO work packages.** Specific actions to consider include:

    - Clearly convey expectations to industrial hygienists for their review and analysis of hazards and controls specified in MSDSs.

    - Establish and implement a process for documenting the rationale used for specifying hazards and controls on SWPs that differ from those specified on MSDSs.

3. **Continue efforts to better characterize and control exposures to welding fumes.** Specific actions to consider include:

    - Perform bounding exposure analyses for the types of welding, brazing, and soldering activities commonly performed at SRS. Include a documented technical basis for the exposure controls to be applied for each analyzed type of welding.

    - Support the bounding analyses with air sampling to confirm that exposures are below threshold limit values when specified controls are applied.

    - Assure that air sampling is adequate to characterize all toxic constituents in the fumes. Assure that all hazards associated with welding and brazing fumes are fully analyzed and eliminated or controlled.

4. **Revise the AHA question set and database to better define hazards and controls.** Specific actions to consider include:

    - Revise questions and hazards to ensure that hazards listed on SWPs are actually hazards and not activities or controls.

    - Better quantify such hazards as voltages, pressures, and contamination levels to ensure that workers are informed regarding the magnitude of these hazards and the appropriate controls to be applied.

5. **Continue focusing management attention on the quality of AHAs to identify and reduce such errors as omission of waste disposition controls, incomplete scope definition, missing hazards and controls on SWPs, and using inappropriate disposition reports to specify controls to be applied by workers.**

WSRC – SRNL

1. **Improve the SRNL Conduct of R&D process.** Specific actions to consider include:

   - Provide a scoping hazard evaluation process at the initial planning stages for research projects (i.e., when the technical and quality assurance task plans are being developed). Include one or more ES&H SMEs in the planning stage.

   - Ensure that work is well defined for all research activities, including research preparation, set-up, and closure (e.g., waste removal and stimulant management) activities. Concentrated efforts should be focused on mechanisms to avoid research work "scope creep."

   - Establish clear thresholds for when Conduct of R&D packages should be revised and/or re-authorized.

   - Improve the quality of JHAs and documentation of decision-making and justification for figures included in the Conduct of R&D package. For work performed by procedures, ensure that hazards have been identified in either the procedure or an accompanying JHA.

   - Establish specific hazard controls in lieu of requiring only "good practices." Verify that hazard controls are clearly linked to the hazard for which the control is intended to mitigate.

   - Document the requirements for ES&H SME involvement, the extent of their involvement, and the conclusions and recommendations provided.

   - Improve the mechanisms for capturing and disseminating lessons learned within the research staff, develop expectations for post-research activity reviews, and expedite the implementation of the SRNL laboratory events database.

2. **Re-assess the work definition, hazards, and controls associated with SRNL machine shops and shop-like activities.** Specific actions to consider include:

   - Establish clear work activity boundaries within the shops, and establish mechanisms to verify that new work is within those boundaries.

   - Review the work activities within each shop to verify that the work is clearly defined, hazards are identified, controls are appropriate and documented, and good housekeeping is practiced.

   - With the assistance of ES&H SMEs, identify, quantify, and document the potential exposures of workers to the variety of hazards presented during routine shop work.

3. **Improve the work control interfaces between research and operations to ensure that all work activities are defined, all hazards are analyzed, and all controls are identified and implemented.** Specific actions to consider include:

   - Ensure that the hazards and controls for research activities that involve the movement, setup, or transfer of hazardous materials between research and operations staff are well established and documented.

   - For new research activities that are conducted within a hazard category 2 nuclear facility, document the rationale when electing not to perform a USQ determination screen.

   - Require greater attention to procedural compliance, particularly among the research staff, when conducting research within a hazard category 2 nuclear facility.

4. **Conduct a review of work practices in use for both research and operational activities to determine extent of condition for situations**

where skill of the craft or procedures are identified without linkage, reference, or documentation to a JHA or an AHA. Specific actions to consider include:

- Identify activities where work practices (i.e., work designated as skill of the craft or procedures) are not supported by JHAs or AHAs and do not contain sufficient identification of hazards and requisite controls to meet SRNL and DOE work control expectations.
- Establish a "sunset date" or risk-based schedule to ensure that activities governed by older procedures are revised to meet current Conduct of R&D or AHA requirements.
- Review operational procedures previously deleted and ensure that appropriate AHA coverage of these activities is provided.

APPENDIX D
FEEDBACK AND CONTINUOUS IMPROVEMENT (CORE FUNCTION #5)

D.1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight (Independent Oversight) team evaluated contractor feedback and improvement processes at the Savannah River Site (SRS). The Independent Oversight team examined four areas:

- The Office of Environmental Management (EM) and Savannah River Operations Office (SR) feedback and improvement processes, including assessments, the Facility Representative (FR) program, and issues management (see Section D.2.1).

- The National Nuclear Security Administration (NNSA) and its Savannah River Site Office (SRSO) feedback and improvement processes, including assessments, the FR program, and issues management (see Section D.2.2).

- Washington Savannah River Company (WSRC) feedback and improvement processes, such as the contractor assurance system assessments, corrective action and issues management, injury and illness investigation and prevention, lessons learned, the employee concerns program (ECP), and institutional processes. Independent Oversight focused on the organizations assessed through the evaluation of core function implementation for work activities and safety systems. These included the organizations that manage the tritium facilities, H-Canyon, and Savannah River National Laboratory (SRNL) (see Section D.2.3).

- EM/SR, NNSA/SRSO, and WSRC efforts to implement DOE Policy and Order 226.1. This focus area is closely related to the feedback and improvement area (see Section D.2.4).

Independent Oversight interviewed EM/SR, NNSA/SRSO, and WSRC personnel and reviewed various program documents and assessment reports. Feedback and improvement processes at the activity level are also discussed in Appendix C for the various organizations reviewed, and in Appendix E for the essential safety systems at the HB-Line. The results of the activity-level reviews, discussed in Appendices C and E, are factored into the evaluation of the overall feedback and improvement program discussed in this appendix. In addition, a discussion of EM/SR, NNSA/SRSO, and WSRC efforts to implement DOE Policy and Order 226.1 requirements is contained in Appendix F.

D.2 Results

D.2.1 EM/SR Feedback and Improvement

EM

EM has overall line management responsibility and accountability for SRS and maintains a comprehensive set of processes for oversight of SR and site contractor performance. Within EM, responsibilities for environment, safety, and health (ES&H) oversight are clearly defined for the EM managers with safety responsibilities. For example, the Deputy Assistant Secretary for Integrated Safety Management (ISM) and Operations Oversight, who reports to the Chief Operating Officer, serves as the senior EM official providing day-to-day operational oversight, feedback, and direction to SR, and is responsible for managing EM operational ES&H and quality assurance (QA) programs and ensuring implementation of ISM.

EM maintains appropriate day-to-day operational awareness for SRS through a wide range of activities (e.g., daily reviews of occurrence reporting and processing system [ORPS] and injury reports). EM has also established field element requirements for timely notification of certain events, weekly written reports of project and program activities and status, 30-60-90-day reports, and cabinet reports. The Chief Operating Officer conducts weekly conference calls with EM site managers. These calls routinely solicit information from each site on the status of problem projects, new ORPS reports and events of interest, lessons learned, significant accomplishments, and support or actions needed by EM. Oversight of SR program and project performance is also addressed in the draft

EM Headquarters oversight assessment schedule for fiscal year (FY) 2006, which includes plans for onsite performance assessments and project reviews, with a request for feedback to better coordinate Headquarters and field oversight activities. Other EM safety program feedback and improvement activities include detailed quarterly project reviews, establishing and periodically updating project performance measures, and managing the EM lessons-learned program.

EM recently issued their quality assurance program plan (QAPP) in accordance with Commitment 10A in the Department's *2004-1 Implementation Plan for Oversight of Complex, High-Hazard Nuclear Operations*. EM has committed to full implementation of their QAPP within one year, including required training, and conversion of previously approved field QAPPs within six months.

EM activities are appropriate measures for program-office-level line management oversight and are well designed to ensure that EM maintains awareness of site safety programs and issues. However, as discussed in Appendix E, SR has not effectively implemented its safety system oversight function, and there are significant weaknesses in certain aspects of essential safety system design and authorization bases. EM operational awareness and assessments of SR were not sufficient to identify and correct the deficiencies in this important new SSO program.

SR

SR implements a comprehensive, multifaceted set of processes for oversight of the safety performance of SRS contractors, with multiple avenues for feedback and improvement. The principal processes for feedback and improvement in contractor safety performance include SR's technical assessment program, Facility Representative program, sitewide ES&H program oversight processes, and the contractor standards/requirements identification document (S/RID) review and approval process.

ES&H-related roles and responsibilities for SR organizations and individuals are well defined through a number of processes. SR's functions, responsibilities, and authorities procedure clearly delineates ES&H and feedback and improvement roles and responsibilities for the SR managers with key safety management responsibilities, including the SR manager, SR deputy manager, the Director of the Office of Environment, Safety and Health (OESH), and the three project line organizations (H-Completion Project [HCP], Nuclear Materials Stabilization Project, and Waste Disposition Project). Specific organizational performance goals and tasks, which include safety-related actions, are also clearly delineated in the SR FY 2006 organizational performance management plan and corresponding plans for each SR project organization and OESH. These plans also require the establishment of employee performance and development plans to facilitate accomplishment of organizational plans, and require managers to specify planned actions for performing important safety functions, such as ensuring compliance with ES&H requirements and performing assessments.

The OESH FY 2006 oversight and management plan complements their organizational performance management plan and provides greater specificity in roles and responsibilities for performance assurance by ensuring the clarity of the office's support role to each SR line organization in implementing their line responsibility for ensuring safety. The results of OESH work activities are well documented and communicated through a variety of mechanisms (e.g., weekly manager's issue reports, monthly contractor performance reviews, various assessment reports, and ES&H regulatory reports). The plan also defines OESH's role in developing, maintaining, and improving the site issues management and technical assessment system (SIMTAS) for tracking and documenting technical assessment and operational awareness activities and for managing various feedback and improvement programs for which OESH is specifically responsible (e.g., ISM, QA, and lessons learned).

SR has a detailed and comprehensive process for reviewing and approving S/RIDs, the requirements of which become part of applicable SRS contracts, and regularly reviewing contractor compliance with S/RID requirements. The Safety and Radiation Protection Division within OESH adequately administers and provides oversight for SR's S/RID program.

SR has also established and adequately implemented detailed processes for communicating ES&H-related information and issues. For example, each project organization provides daily and weekly reports to the SR manager's office to ensure operational awareness. Independent Oversight's review of a sample of the daily and weekly reports indicated that the reports are meeting their intended purpose. In addition, each project organization and OESH develop monthly "plus/minus contractor feedback reports" in support of senior DOE and contractor management discussions; these reports appropriately focus on the contractor's performance strengths and weaknesses and provide a valuable opportunity for both DOE and the contractor to provide feedback, validate concerns, and discuss options, plans, and activities underway for improvements. Further, as required by the technical assessment program implementing procedure, each project organization develops a periodic report summarizing the results of technical assessments, Facility Representative assessments, and management walkthroughs that is discussed during a meeting between DOE and contractor counterparts, providing another important venue for feedback and improvement. When finalized, the reports are transmitted to the contractor by a contracting officer representative, with appropriate highlighting of concerns and directions for response, including any requirement for a corrective action plan.

SR has a number of established processes for providing timely and detailed information about ES&H issues to EM and SR senior management. In addition to the various reports (e.g., weekly reports), the SR manager's technical assistant briefs the SR manager each morning on significant issues and is responsible for notifying EM within defined time frames about safety-related events (e.g., "immediate" notification of a failure to meet any regulatory commitments). In addition, the SR manager and deputy manager conduct management walkthroughs approximately every other week in selected facilities and hold weekly meetings with SR managers and separately with WSRC senior managers to facilitate high-level feedback and improvement discussions.

SR has also established the Executive Technical Management Board (ETMB) and associated standing committees to guide SR plans and actions and promote integration in such areas as technical assessments and the Facility Representative program. SR self-identified that the board and the technical assessment program committee were not functioning as intended to enhance program oversight and promote continuous improvement. Actions are underway to address the concerns, and Independent Oversight's interviews with assistant managers, the OESH Director, and the technical assessment program manager confirmed the need for this initiative.

As discussed in Appendix E, SR has conducted some oversight investigations and assessments of essential safety systems and related programs for HCP facilities. However, the application of the oversight program to HCP is not adequately defined or described, and implementation of the safety system oversight and authorization basis review and oversight functions for HCP has not been adequate (see Finding #18). The SR deficiencies in safety system oversight are a significant factor in the deficiencies in safety system design, the authorization basis, and surveillance and testing.

SR Technical Assessment Program. The SR technical assessment program establishes the process for SR technical staff to: (1) monitor the contractor's performance in order to ascertain program status in facilities; (2) effect continuous improvement in contractors' operations; (3) determine the effectiveness of implementation of DOE orders, state and Federal regulations, national codes and standards, and other requirements for the site as a whole; and (4) evaluate the quality of the contractor's self-assessment program. The program includes annually planned and reactive assessments of contractor technical programs, review of contractor program self-assessments, review of performance indicators, and SR management walkthroughs of contractor-operated facilities, with a principal focus on performance and effectiveness.

Many aspects of the technical assessment program are effectively implemented. The program is well defined in an implementing procedure, annual technical assessment and management walkthrough plans are developed, assessment plan commitments are tracked and results are documented in SIMTAS, and reactive assessments are initiated based on program and activity risk and safety performance.

Independent Oversight reviewed annual technical assessment plans for FY 2006 and accomplishments for FY 2005 for the project organizations and OESH. The list of FY 2006 planned assessments by each organization encompasses an appropriate set of contractor activities, programs, and projects, but do not demonstrate similar strategies of development or specificity, or efforts to coordinate and integrate plans between SR organizations. Although the list of completed FY 2005 assessments was extensive, not all planned assessments were completed. Further, some organizations did not consistently meet established goals for time spent in management walkthroughs.

Reviewed technical assessment reports were found to be of good quality and included appropriate identification of proficiencies, deficiencies, and opportunities for improvement; the status of previously committed corrective actions; and evaluation of contractor self-assessments. Organization weekly reports communicated to the SR manager's office adequately captured the highlights of the assessments completed. Periodic assessment activity reports effectively summarized the results of assessments performed during the period in support of discussions between the responsible DOE contracting officer representative and contractor senior management.

In a number of cases, SR assessments have identified performance-related deficiencies for corrective action. However, one assessment of the work planning and control processes at the Savannah River Site performed by SR was not sufficiently focused on performance to uncover deficiencies identified during this Independent Oversight inspection. The SR assessment (draft) focused primarily on the existence of WSRC policies and procedures, not on the effectiveness of those policies and procedures. The assessment did not identify any of the hazards analysis problems identified in Appendix C for H-Canyon maintenance.

The tracking system for technical assessment information (SIMTAS) is capable of tracking and reporting the status of technical assessments planned and/or completed, maintaining and producing records of completed technical assessments and Facility Representative reports, and tracking the status of assessment-identified deficiencies and issues. However, many of the SR staff members who were interviewed regarded SIMTAS as difficult to use, and some were reportedly not using it as required by the implementing procedure. A web-based version of SIMTAS, which is far more user-friendly, was recently rolled out and will include additional modules to support other issue-generating programs, such as SR's self-assessment and independent assessment program; however, the enhanced capabilities of the new SIMTAS have not been effectively communicated and accepted by the staff, as indicated by the reluctance of some SR staff members to use the system. Further, although SIMTAS is the primary database program supporting SR's corrective action processes (other than those issues tracked by the executive correspondence and action tracking system), specific requirements for senior management oversight of the SIMTAS corrective action backlog are not sufficiently addressed.

SR Facility Representative Program. The FR program is mature, with clear assignment of responsibilities for determining facility coverage, development of annual master FR core assessment plans encompassing defined minimum core assessment activities, and qualification of FRs to approved standards; it also facilitates maintaining operational awareness, providing assessment results to DOE supervisors and contractors, following up on and communicating emergency events and occurrences, issuing stop-work orders, generating and maintaining activity records, and reporting quarterly FR program performance assessments to DOE Headquarters. FR responsibilities and activities are well defined (e.g., walk down systems, perform scheduled and reactive assessments, and communicate identified concerns). Reviewed daily and weekly FR reports were of good quality, effectively communicate assessment results, and generally meet the needs of line management for operational awareness. Further, SR FR activities have identified and communicated many examples of observed deficiencies in implementation of contractor programs; however, the resulting WSRC corrective actions were not sufficiently comprehensive to prevent or resolve the work planning and control deficiencies and other such deficiencies discussed in Appendices C and F.

SR Self-Assessment and Internal Independent Assessment Program. SR revised its processes for performing self-assessments and internal independent assessments of SR functions, partially in response to deficiencies in self-assessments identified during the 2004 Independent Oversight inspection. SR issued a new implementing procedure in March 2005 to replace the previous process and correct identified deficiencies. The new procedure is an enhancement in that it requires the development of annual organizational self-assessment schedules that systematically address all areas of responsibility over a three-year period, with focus on the areas representing the greatest risk for failure or potential for improvement. Some SR organizations performed organizational self-assessments during FY 2005, and OESH and the three project organizations have committed to perform organizational self-assessments in 2006. Internal independent assessment reports that were reviewed were of good quality, appropriately highlighted noteworthy practices, concerns, findings, and observations, provided sufficient detail to support those issues, and required development of corrective action plans, where warranted.

Although improvements have been made, some aspects of the SR self-assessment program warrant further attention. The new procedure does not provide clear training and qualification requirements for inspectors in assessment techniques. Some organizations did not meet their planned self-assessment schedules in 2005. The self-assessments planned for 2006 do not always specify the specific processes and procedures to be assessed. Interviewed HCP management indicated they have never conducted or documented a formal self-assessment, but are now developing lines of inquiry for a 2006 assessment.

Interviewed Nuclear Material Stabilization staff responsible for developing assessment plans and schedules indicated they had learned of the new procedure only recently. SR's effectiveness review for corrective actions related to 2004 Independent Oversight inspection findings is due in June 2006 and needs to examine performance in these areas to ensure that the self-assessment program is effectively implemented.

SR Employee Concerns Program. The ECP is well defined, and the ECP manager is knowledgeable of program requirements. The current program implementing procedure and plan are detailed and generally meet the requirements and guidance of DOE's order and guide for the program. The ECP files and logs are generally of good quality, and reviewed final investigation reports provided an appropriate basis for closure of recorded concerns. SR's ECP covers NNSA/SRSO personnel as well as SR personnel.

However, some aspects of program performance have degraded since the 2004 Independent Oversight assessment. Contrary to the current SR ECP implementing procedure, assigned roles and responsibilities are inconsistent with SR's current organizational structure and titles. Required quarterly and annual reports reviewed for lessons learned and possible adverse trends have not been prepared since 2004. The ECP manager has not ensured that required ECP posters are placed in sufficient conspicuous locations, and many ECP signs were posted just before the inspection started. Required time frames for investigation completion, and requirements for documentation of justification of extensions, have frequently not been met. The ECP manager has not been meeting with the SR manager/deputy manager monthly, as required. Further, the objective of the ECP, as stated in DOE's order, to ensure that employee concerns related to ES&H and management of DOE programs and facilities are addressed in a timely manner has not been met. There were 35 open concerns at the time of this assessment, 11 of which were related to safety or health issues, with an average age of 355 days, and one over 1,100 days old; the age of open concerns has increased since calendar year (CY) 2001. SR has recently provided direction to expedite action to close several of the oldest employee concern files. SR has performed a number of assessments of the ECP but had not explicitly identified the above performance deficiencies.

Finding #9. The SR employee concerns program is not effectively implemented in accordance with SR's implementing procedure and DOE Order 442.1A, *Department of Energy Employee Concerns Program.*

D.2.2 NNSA/SRSO Feedback and Improvement

NNSA Headquarters

The NNSA functions, responsibilities, and authorities manual (FRAM) generally adequately flows down the requirements listed in the DOE FRAM. NNSA Headquarters organizational elements and personnel perform a number of appropriate operational awareness activities in coordination with SRSO, including two regularly scheduled televideo conferences each week between NNSA and SRSO. In addition, NNSA Headquarters communicates programmatic expectations through a variety of documents and scheduled meetings. NNSA (primarily through NA-124) gathers site programmatic and safety performance information and issues a quarterly report to senior NNSA management, regularly reviews the SRSO monthly contractor performance measurement report, and reviews SRSO weekly Facility Representative roll-up reports. As a result of newer SRSO procedures, NNSA Headquarters is beginning to receive such information as assessment results and quarterly roll-ups. Although NNSA performs appropriate operational awareness activities, it has few procedures (or equivalent documents) that describe expectations and responsibilities.

NNSA currently uses an issues management package to track correspondence and other actions, but does not have a structured process for tracking safety issues and corrective actions (development of such a process is a DOE Order 226.1 provision). NNSA has not defined a strategic approach for NNSA's role in supporting or participating in SRSO assessments of contractors that provide sufficient line program office participation while avoiding unnecessary duplication of effort with other internal and external oversight functions (also a DOE Order 226.1 provision).

In accordance with the DOE response to Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2004-1, NNSA established a Central Technical Authority (CTA)/Chief Defense Nuclear Safety (CDNS). The CTA/CDNS developed and implemented a process for biennial reviews of defense nuclear facilities in the NNSA complex and plans to issue a NNSA policy letter to formalize the process. The CDNS performed a review of SRSO and the SRS tritium facilities in CY 2005.

SRSO

The SRSO FRAM, SRSO procedures, and SRSO position descriptions generally provide an unambiguous line of authority and responsibility for ES&H oversight. The SRSO manager annually reviews and approves the ISM system and contractor assurance system description updates. SRSO has implemented an effective and formal program for the measurement and communication of contractor performance.

Technical Assessment Program. SRSO has a formal technical assessment program, has developed and implemented a multi-year assessment schedule, and has an annual assessment plan in place. As discussed above, CDNS reviews in 2005 identified a need for more rigorous assessments of nuclear safety. Within the last six months, SRSO has concentrated on improving the technical quality and rigor associated with assessments (e.g., technical, Facility Representative, and vital safety system assessments), and the technical quality of recent SRSO technical assessments is generally adequate. SRSO vital safety system assessments were noted as exhibiting strong technical quality. SRSO has also established a process to ensure that SRSO managers are accountable for accomplishing planned assessments on schedule and that changes in plans are approved by senior SRSO management. The technical assessment program procedure requires that findings must be tracked and resolved through the contractor's site tracking, analysis, and reporting (STAR) program and includes provisions for review of corrective action plans. The recent formal findings were adequately tracked to closure using the STAR process. When fully implemented, the SRSO "Quarterly Assessment Review and Reporting" procedure is an appropriate mechanism for trending and analysis and for continuous improvement of the SRSO oversight program.

Notwithstanding the positive attributes, some aspects of the technical assessment program are not fully or effectively implemented. SRSO does not routinely accomplish and document reviews of contractor self-assessment results as required by several SRSO procedures (e.g., SV-PRO-008, -011, and -029). In addition, current processes do not fully ensure that some assessments that are required by directives or rules are included in the multi-year plans/schedules. A contributing factor is that SRSO processes do not ensure that SRSO division directors are sufficiently involved in reviewing and approving assessment plans (e.g., purpose, scope, criteria, or review approach) and approving final assessment reports.

Finding #10. SRSO does not adequately or routinely accomplish and document reviews of contractor self-assessment results as required by SRSO procedures and does not ensure that some required assessments are planned and scheduled.

Although the technical quality of NNSA/SRSO assessments is generally improving, SRSO Facility Representative assessments did not identify deficiencies associated with potential chemical exposures during tritium maintenance activities, or potential beryllium contamination issues during metallographic operations. SRSO has conducted five assessments of Tritium Maintenance Organization maintenance during the past six months. These assessments did not identify the types of deficiencies in hazard identification and analysis that have been identified during this Independent Oversight inspection. SRSO did not identify any deficiencies in tritium facility work packages or the work control process. Additionally, SRSO did not identify any deficiencies associated with postings or hazard controls in the movement of materials from the materials testing facility to an adjacent facility. These results indicate that SRSO reviews are not sufficiently focusing on industrial hygiene and work control issues in some cases.

Facility Representative Program. The SRSO has implemented a formal FR program. With the recent addition of two previously qualified individuals, SRSO is positioned to provide sufficient coverage for existing tritium operations and for the startup and operation of the new tritium extraction facility. The lack of technical quality and rigor associated with the conduct and documentation of FR assessments was identified in the February 2004 Independent Oversight inspection and the July 2005 CDNS review. Independent Oversight review of a sample of FR assessments indicates a significant improvement in technical rigor and quality in the most recent (i.e., the past few months) FR assessments.

Although some recent improvements are evident, there are a number of process and performance weaknesses in the FR program:

- There is no auditable basis for the national quarterly performance metrics that are reported to the FR program manager at Headquarters. The numbers forwarded to satisfy DOE-STD-1063-2000, *Facility Representatives*, requirements are estimates. These metrics are utilized at senior levels of the Department, and are forwarded to the DNFSB. SRSO has reported they have a path forward to fix this problem.

- A periodic self-assessment of the FR program, as required by SV-PRO-010, *SRSO Facility Representative Program*, was not accomplished in 2005 and is not scheduled for accomplishment in the 2006-2008 Annual Assessment Plan.

- The SRSO FR in interim qualification is acting as a packaging and transportation subject matter expert (SME) and conducted the S/RID 13 packaging and transportation technical assessment. Both DOE-STD-1063-2000 and SV-PRO-010 indicate that FR functions are expected to be full-time assignments, and administrative, programmatic, and collateral duty assignments are to be minimized.

- Monthly FR assessment plans issued by the Operations Division director are not consistent in the level of technical rigor required for the conduct of FR assessments.

Finding #11. The SRSO Facility Representative program does not meet some requirements of DOE-STD-1063-2000, *Facility Representatives*, or SV-PRO-010, *SRSO Facility Representative Program.*

Quality Assurance. SRSO has developed and implemented a generally adequate QA program and a generally compliant QA program manual. The QA program manager has developed a reasonable schedule for planned QA activities, based on available resources. Quality assessments performed by SRSO personnel are satisfactory in technical quality and rigor. CDNS and two annual staffing studies have identified the need for additional QA staff, and SRSO is working with NNSA Headquarters on this issue.

Operational Awareness. SRSO performs a variety of operational awareness activities, such as FR daily assessments and walkthroughs, management walkthroughs, frequent meetings with WSRC, and weekly construction safety walkthroughs. Issues arising from operational awareness activities are routinely handled at the weekly Defense Programs status meeting, which is attended by contractor and SRSO managers, SMEs, and SRSO FRs. The status meeting and associated processes have been improved since 2004. At the request of SRSO, meeting minutes are now maintained and are approved by an SRSO manager. An issues management database has been developed and is used to track issues and related actions. Open items (including a history of the issues) are provided along with the agenda at the start of the meeting, and SRSO management review and approval is required to close items.

However, few operational awareness activities are documented in a manner that allows for tracking and trending, and the processes are not covered by procedures (or other documented processes). SRSO recently implemented a module to capture operational awareness results in the site issues management and technical assessment system (SIMTAS), but this database has not been populated. Some operational awareness information is being collected by individual staff members (e.g., notebooks or stored e-mail). SRSO is evaluating integrated software solutions (e.g., Pegasus and an off-the-shelf product) that have the capability to capture operational awareness data.

Corrective Action Tracking. The SRSO tool for corrective action tracking—the executive correspondence and action tracking system (ECATS)—is governed by an adequate procedure and is adequately implemented. Corrective action tracking has generally improved at SRSO since the 2004 Independent Oversight assessment. However, ECATS is not integrated with other SRSO issues management systems or the contractor's STAR corrective action tracking tool. In addition, the ECATS tool has some limitations in supporting relationships to follow-on corrective actions that have caused SRSO to use informal spreadsheets to track the history of corrective actions (e.g., the CDNS database maintained by the senior technical advisor). New office integrated software being considered by SRSO has the potential to address this issue.

Both DOE Order 470.2B, *Independent Oversight and Performance Assurance Program*, and DOE Order 414.1C, *Quality Assurance*, require causal analysis and effectiveness reviews in the closure of Independent Oversight findings. SRSO performed effectiveness reviews against the February 2004 Independent Oversight findings and identified additional corrective actions that would be required to fully address and prevent recurrence of the findings. However, there was no documented evidence that causal analysis was conducted to ensure that corrective actions were adequate. Additionally, effectiveness reviews are not sufficiently addressed in SRSO procedures.

Technical Qualification Program. SRSO has a number of experienced personnel with good technical backgrounds. However, the technical qualification program (TQP) is not effectively managed or implemented. SRSO assessments of the TQP have either not been performed or are not documented. Files and records have not been maintained in an orderly fashion, in part because of several changes in responsibility for this effort. The current TQP manager is sorting through inherited records and does not have sufficient understanding of and information about previous qualification history of technical staff personnel. The memorandum of understanding with the NNSA Service Center is inadequate to establish a clear understanding of the shared roles, responsibilities, authorities, and accountabilities with regard to the SRSO TQP. For example, responsibilities for managing SRSO TQP records at the Service Center are not defined. Specific deficiencies with qualifications of SRSO personnel include:

- The Operations Division director has been at SRSO since March of 2005 and has not been assigned a qualification standard. He manages the efforts of the FRs and other technical personnel.

- The Operations Division director approved the evaluation associated with the re-qualification of two SRSO FRs although this director has never been qualified as FR or senior technical safety manager, and is not on the SRSO qualifying official list.

- There are no technical personnel at SRSO assigned to qualify under the safety system oversight functional area qualification. This is a long-standing problem that was identified in the 2004 Independent Oversight inspection and the December 2004 Federal technical capability program assessment. Staffing analysis conducted by SRSO in 2004 and 2005 identified a staffing shortage in this required program, but actions were not initiated until recently (i.e., posting positions for new hires).

Finding #12. The SRSO technical qualification program does not meet the requirements of DOE Order 360.1B, *Federal Employee Training*, or DOE Manual 426.1-1A, *Federal Technical Capability Manual*, in the areas of assessments and records management.

Self-assessment Program. SRSO has developed and implemented a formal self-assessment procedure and is conducting self-assessments of SRSO programmatic and line management oversight processes. However, there are a number of weaknesses in the self-assessment program and its implementation. The annual self-assessment of the SRSO annual assessment plan required by the SRSO self-assessment procedure and the periodic FR self-assessment required by DOE-STD-1063-2000 were not accomplished in 2005 and are not scheduled for 2006 through 2008. There is no requirement to develop a plan (purpose, scope, etc.) for each major self-assessment activity, and there is no requirement to analyze deficiencies individually and collectively to identify causes and prevent recurrences. Not all concerns or issues identified in self-assessments are entered or tracked to closure in ECATS. In addition, scheduled self-assessments (per the annual assessment plan) do not provide for sufficient coverage of SRSO programmatic and line management oversight processes within a reasonable time frame.

Finding #13. The SRSO self-assessment process does not meet some requirements of SV-PRO-012, *SRSO Self-Assessment*, or NNSA guidance on the process.

Employee Concerns Program. SRSO does not have its own ECP but historically has used the SR ECP. The SR manager has agreed to provide employee concern services to SRSO, and a memorandum of understanding was signed by the SRSO manager and the SR manager. However, the memorandum does not adequately define the shared roles, responsibilities, authority, and accountability for the program (see SR Employee Concerns Program in Section D.2.1).

D.2.3 WSRC Feedback and Improvement Systems

Assessments

SRS has established the framework for a comprehensive safety self-assessment program comprised of safety inspections/walkthroughs, management work observations, topical self-assessments, functional area evaluations, facility and organizational management evaluations of performance, and a robust program of independent facility and organization assessments.

Requirements for a formal assessment program, including mandatory assessments (e.g., contractually required) and management discretionary assessments, have been defined in an institutional procedure. Since the 2004 Independent Oversight inspection, WSRC has made a significant addition to their assessment program by adding a performance analysis element to their self-assessment program that provides for structured, periodic management evaluations of assessment and event-based issues management data to identify trends and focus future self-assessment activities. The Technical and Quality Services group conducts a quarterly institutional-level performance analysis. In addition, each business unit is required to perform this important analysis of their data at least semi-annually. The institutional analyses, approved by the Performance Analysis Advisory group and the WSRC management council of senior managers, were comprehensive and rigorous reviews that identified a number of recurring events, adverse trends, and conditions to be subjected to focused monitoring. Performance analysis findings have resulted in a new "recurring" category of ORPS reports and in new issues being entered into the site tracking system for further analysis and corrective actions.

Each of the organizations evaluated by the Independent Oversight team had developed assessment schedules for FYs 2004, 2005, and 2006, and many assessment activities are planned, scheduled, and performed to evaluate the adequacy of material condition, ES&H programs and processes, and safety performance. A prominent and positive aspect of each assessment schedule was extensive observation of work evolutions, and coaching programs that have managers observing work activities and interacting with operators and crafts, including on weekends and backshifts. As evidenced by documentation and in interviews with Independent Oversight inspectors, WSRC management clearly recognizes the value of a robust self-assessment program and supports and communicates those expectations to their organizations. In addition to organizations' scheduled assessments, since late 2003, the WSRC president has also directed each business unit to establish and implement a "simple process for management presence in the field on a frequent and meaningful basis." Although not administered by a formal process, performance records for management field observations are maintained and reported for all managers, and the WSRC president continues to closely monitor management field presence. Tritium facilities and SRNL have developed special, user-friendly, computer-based assessment documentation tools for assessors to input a wide variety of assessment activities and to support tracking of performance. Senior management with responsibility for H-Canyon conducts a formal evaluation and grading of the quality and effectiveness of the report of every observed evolution performed to provide feedback and improve performance. Management in two organizations reviewed by the Independent Oversight team were effectively using monthly meetings by teams of managers, called Corrective Action Review Boards (CARBs), to regularly evaluate performance and focus assessment activities and management monitoring. Minutes from these meetings, documents related to safety initiatives taken in response to identified focus areas, and observation of a CARB meeting by Independent Oversight inspectors reflected a proactive and aggressive approach by management to identifying and resolving process and performance weaknesses that are hindering safety performance.

WSRC continues to conduct comprehensive and rigorous multi-discipline team evaluations of individual projects, organizations, and safety programs by Independent Facility Evaluation Boards. These teams annually conduct approximately 12 scheduled assessments and another 12 "assist visits" at the request of facility managers. These assessments typically address organization and administration, including management systems, and a set of functional areas, including maintenance, operations, radiological control, engineering, ES&H and QA, and training.

Although the self-assessment program at SRS has been strengthened and many productive assessment activities are being implemented, implementation of self-assessment program elements is not yet fully mature in all areas and needs continued management attention. The breadth and depth of self-assessments varied in quality in all organizations evaluated. Quality problems identified by the Independent Oversight team included inadequate descriptions of sample size or what was reviewed to support the conclusions, unchallenging or insufficient delineation of assessment criteria and performance measures, unclear descriptions of results as findings or observations, and deferral of the assessor's performance adequacy decisions to subsequent management reviews. While many individual assessments are performed, many are tightly focused on a single document, criterion, or activity component, or lack sufficient rigor in evaluating performance or compliance. Few assessments, other than those conducted by the Facility Evaluation Board, evaluate the performance of management systems or crosscutting functional areas across an organization. As an example, for one organization, although confined space permits for individual facilities are reviewed on an annual basis as required by the Occupational

Safety and Health Administration (OSHA), they are performed on an individual facility basis rather than collectively to reflect overall program implementation. In another organization, a common set of criteria was used to evaluate a topical area by each of the organizational groups, but an analysis of the collected results was not scheduled or documented as an assessment. Although many individual assessments reflect reviews of lockout/tagout documentation and field conditions, the program does not fully meet the requirement for an OSHA-required annual review with each authorized employee to ensure that they understand their responsibilities as detailed in the energy control procedure. In general, few in-depth or team assessments are performed. Although many assessments are performed, with many individual data points, an accurate picture of an organization's overall performance is difficult to demonstrate. In some cases, scheduled assessments have not been performed or were delayed (see Finding #14).

Although performance analyses were thorough and productive at the institutional level, it was not evident that the individual business unit analyses provided the same level of rigor or resulted in identifying trends or refocusing assessment and oversight activities. In one organization, the performance analyses repeatedly identified that a lack of quality input to the STAR system prevented effective analysis, but failed to document and manage this issue in accordance with the site issues management process. There was no evidence that management took actions to address this concern or other recommendations cited in the reports. (See Finding #14.)

As discussed in Appendix E, WSRC HCP has an extensive and vigorous program of self-assessments and independent assessments that cover various aspects of safety system engineering. However, WSRC has not fully assessed the important design authority responsibilities and functions relating to monitoring, trending, and assessing safety systems, and there are some weaknesses in the processes for identifying and correcting deficiencies related to engineering design and the authorization basis. (See Finding #14 and Appendix E findings.)

Issues Management

WSRC has revised and improved the issues management and corrective action process, and has established a robust centralized tracking tool that supports effective management of issues and facilitates data analysis. The basic elements of the revised program and STAR tracking tool are sound, with requirements for categorization and evaluation of significance, corrective actions, and verification/validation based on a graded categorization. The new system is a significant improvement over the previous tracking tool and has resulted in consolidation of numerous tracking systems, a problem prevalent at the time of the 2004 Independent Oversight inspection. Over 4,000 event- and assessment-related issues were put into the STAR database in CY 2005, indicating that WSRC assessments are identifying process and performance deficiencies and are using the institutional tracking tool in management of resolutions. The Independent Oversight team reviewed a sample of completed issues from STAR and observed that most were adequately evaluated, with appropriate corrective and preventive actions identified and tracked to completion. As discussed above, several organizations have established CARBs, consisting of managers who periodically evaluate significant issues and perform evaluations of issues management data to drive management priorities and self-assessment topics.

WSRC has established institutional procedures for occurrence reporting and investigating abnormal events (i.e., the process for conducting critiques). Each of the line organizations evaluated by the Independent Oversight team has recently developed internal processes to keep track of abnormal events and critiques, typically using a local database to log events and details of the disposition. These databases provide a locally centralized collection of information regarding all types and significance levels of incidents and events to support analysis and trending as well as tracking of critiques, entry into STAR, and follow-up investigations.

Although many issues and corrective actions are being documented in STAR and managed to completion, weaknesses in the new process and tracking tool, inconsistent and potentially non-conservative implementation by line organizations, and insufficient oversight have hindered WSRC in taking full advantage of this management system in addressing safety issues. WSRC has not provided adequate definitions, examples, guidance, or training on the four significance categories in the new issues management process. Because the distinctions between the terms used for the four significance categories (i.e., "significant," "moderate," "minor," and "some" impact on safety) are not further defined, consistent and accurate categorization by the various users and organizations is problematic. For issues identified as Significance Category 1 or 2, the process requires root cause determinations, corrective actions to prevent recurrence of the specific problem, and corrective action effectiveness reviews. For Significance Category 1 issues, the issues management process also requires extent-of-problem evaluations and verification that corrective actions address similar concerns. The distribution of issues among the categories indicates that organizations are categorizing almost all issues in the lowest two significance categories. Of almost 4,000 non-ORPS issues put into the STAR database in CY 2005, none were categorized as Significance Category 1, and only four were categorized as Significance Category 2. Only one of the Significance Category 2 issues resulted from a self-assessment; therefore, only 4 of approximately 4,000 non-ORPS issues were subject to root cause determinations, corrective actions to prevent recurrence of the specific problem, and corrective action effectiveness reviews. No non-ORPS issues in 2005 required an extent-of-problem evaluation. In 2005, the cross-functional Facility Evaluation Board and individual organizations performed thousands of assessments, but these assessments resulted in only four issues that were identified to have more than a "minor" impact on safety. This distribution of issue significance classifications would indicate non-conservative categorization. Non-conservative significance categorization leading to insufficient analysis and management was an issue raised by the 2004 Independent Oversight inspection. Further, the Independent Oversight team identified a number of issues in assessments and performance analyses that met reporting criteria but were not input to the STAR database. The accuracy and appropriateness of the significance categorization of issues have not been included in Facility Evaluation Board or institutional implementation effectiveness self-assessments.

Although the institutional procedure for event investigation in general provides adequate instructions for conducting critiques, including a critique minutes template, it does not adequately describe criteria for when a critique should or must be conducted, or details such as who should or must attend the critique. Individuals who are trained as critique directors are not always effective in facilitating the critique or in mentoring management during the critique process. Line organizations have not established formal local policies or procedures for thresholds or processes for determining when a critique is required, or requirements and expectations of organization management. As a result, the quality and rigor of the critiques reviewed by the Independent Oversight team varied significantly in each of the organizations evaluated. Critiques as reflected in critique minutes are not consistently performed in a rigorous and complete manner. The significance of events resulting in critiques varied between organizations, and the events and issues identified during event critiques were not always input to the STAR database to support the trending and analysis of non-ORPS events, as required by site procedures and the DOE ORPS manual.

Corrective actions for several findings from the 2004 Independent Oversight inspection were not fully effective in addressing the safety issues and preventing recurrence. In response to the finding about inadequacies in the site unreviewed safety question process, procedure, and implementation, WSRC noted that any corrective actions would be defined after a consensus had been reached on the resolution of various issues. However, the finding was closed locally and in the DOE corrective action tracking system without further action, justification, or an effectiveness review. WSRC is currently in the process of revising the procedure, and the authorization basis manager indicated that the finding would be reopened to ensure that all of the identified Independent Oversight team issues are addressed. The corrective actions for the translation of controls into work documents were not fully effective, as detailed in Appendix C. In addition, progress was made on the finding about exposure assessments, but some weaknesses persist and much work remains. In addition, weaknesses in significance categorization and overall issues management identified in the 2004 report have not been fully addressed.

Finding #14. WSRC self-assessment and issues management programs have not been consistently effective in evaluating performance, identifying deficiencies, and ensuring effective corrective actions to prevent recurrence.

Injury and Illness Investigation and Prevention

OSHA recordable and DOE reportable occupational injuries and illnesses are logged, categorized, investigated, and reported as required by OSHA and DOE requirements, although attention is required in documenting the evaluation and disposition of non-recordable, first-aid cases. WSRC has established an excellent safety record for OSHA recordable injuries and illnesses when compared to the rest of the DOE complex, with generally favorable trends.

Management at all levels clearly demonstrated full and continuing engagement with processes and initiatives to protect workers and reduce occupational injuries and illnesses. WSRC managers, safety personnel, and DOE have frequent and scheduled interactions regarding new incidents and periodic status reviews. Injury and illness statistics are subjected to continual analysis and are communicated or available on the intranet to line management and senior managers. Individual injuries and statistics are discussed at senior management and organizational staff meetings. The expectations for reporting occupational injuries to supervisors and getting medical treatment are communicated in initial and annual refresher employee training. Institutional procedures adequately describe the responsibilities and processes for conducting critiques and for reporting, responding, investigating, and recording injuries and near misses.

A sample of occupational injury and illness case files reviewed by the Independent Oversight team reflected many high-quality critiques and evaluations/investigations of OSHA recordable injuries, with appropriate corrective and preventive actions and dissemination of lessons learned and other notifications to SRS employees. Safety engineers in each organization are actively involved in investigating and managing injury events and communicating information to other safety engineers and the institutional ES&H staff responsible for reporting recordable injuries and illnesses.

Although occupational injury statistics at WSRC are excellent and investigations of recordable injuries and associated corrective actions are generally well done and appropriate, a few weaknesses in process and performance were identified. The WSRC process does not require any formal investigation of occupational injuries and illnesses that are determined to not meet the OSHA requirements for recording and reporting (i.e., cases that are treated with first aid only, as defined by the OSHA regulations). However, injuries in this category can often still be serious or be near misses or precursors to more serious injuries or exposures, occurring due to weaknesses in ISM work control elements. Formal investigations of these events, and determinations as to whether corrective or preventive actions are warranted, are appropriate in reducing the likelihood of future injuries. During this Independent Oversight inspection, the industrial safety organizations initiated, on a trial basis, a checklist for safety engineers to evaluate and document the level of investigation needed and linkage to any corrective/preventive actions.

Corrective and preventive actions on WSRC and formal DOE OSHA recordable reporting forms and safety department master case files often do not clearly document sufficient line investigation or the corrective/preventive actions taken. Discussions with field safety engineers and review of local documentation on a sample of cases indicated that appropriate investigations had been performed and corrective actions had been identified, but full documentation of final investigation and corrective action details is typically omitted so that reporting time requirements can be met.

Lessons Learned

WSRC continues to implement a well-established and robust lessons-learned program, with a user-friendly database of information on the intranet, sharing of lessons learned with the DOE complex, generally well-documented specific corrective actions, and process improvements to continuously strengthen the implementation and effectiveness of this program. The institutional lessons-learned group screens a large population of items from many sources for applicability to SRS, and documents the items screened. When appropriate, formal evaluations or other actions are required of SMEs and/or field organizations, with feedback monitored and tracked to completion. Independent Oversight's review of a sample of documentation at the institutional level and in various line organizations indicated that, in most cases, organizations are conducting good evaluations and inspections, with formal documentation of results, and oversight by organization coordinators. Several organizations were using the STAR database to ensure tracking of needed actions. WSRC has established a comprehensive, user-friendly, searchable intranet database tool for developing or locating lessons learned. In 2004, WSRC instituted a new "first alert" process to quickly communicate highly significant events to senior management and organization lessons-learned coordinators.

Notwithstanding the overall strength of the SRS lessons-learned program, several weaknesses were identified in its implementation. Organizations lack internal procedures or instructions on how the lessons-learned program is to be implemented in their facilities. Although the assisted hazards analysis process specifies that applicable lessons learned should be identified, there is no documentation that a search was performed or of the results. Documentation demonstrating lessons-learned distributions and evaluations/inspection details was sometimes limited to electronic mail and was not always adequately organized, complete, or retrievable. In one organization, no records related to lessons learned could be located for the first nine months of 2005 (a period in which there were two personnel changes in lessons-learned coordinators).

There is little feedback from line managers to project lessons-learned coordinators, or monitoring by the coordinators, on actions taken for lessons learned issued without directed actions, although feedback is requested. Likewise, little feedback on lessons learned is provided from project lessons-learned coordinators to the site organization.

In one case, inadequate bolting material for the rated pressure of a laboratory pressure vessel identified by WSRC personnel last summer during interactions with the equipment vendor, for which the vendor provided replacement parts, was not identified by site personnel as a lesson to be shared with the DOE complex until questioned by Independent Oversight team inspectors. In another case, although a lesson learned concerning workers' exposure to fumes from a combination of hydrochloric and nitric acids at another DOE site was distributed to SRS personnel working with the same materials, it was not appropriately reviewed and addressed because it was presented and viewed as a case of late reporting rather than an issue of work controls involving hazardous materials.

Employee Concerns

WSRC continues to implement an effective and active ECP that appropriately evaluates and resolves ES&H-related concerns. An institutional procedure and a detailed departmental procedure clearly define employee concerns processes and requirements, including those for an alternate dispute resolution process. The ECP office has also drafted a new process for managing differing professional opinions, with significant input from engineering and technical managers and SMEs. Both the initial and annual computerized general employee training required of all SRS workers include an ECP module, and the ECP program is advertised periodically in the SRS daily intranet "newsline." The ECP is also communicated by posters on bulletin boards in numerous facilities throughout the site. The ECP office makes monthly status reports to the SR manager and to WSRC senior management, including the WSRC president.

The Independent Oversight team reviewed a sample of safety-related concerns received in 2004 and 2005 and concluded that WSRC had adequately documented the concerns and their resolution, including communication of findings to the concerned individual. Investigations were thorough and appropriate, and ES&H-related concerns are managed and evaluated by experienced ES&H professionals who have significant experience with site organizations, facilities, and processes. An external team "technical assistance review" of the ECP was requested by SR and conducted in July 2005.

Other Feedback and Improvement Processes

An extensive and effective worker-owned, behavior-based safety observation program that is encouraged and supported by management has been established at SRS, providing real-time feedback to workers on at-risk or safe behaviors, and collective identification and correction of safety performance weaknesses. Expanding the number of trained observers and the number of different individuals conducting observations, and improving the substance of observations, are goals and focus areas of the organizations reviewed by Independent Oversight. WSRC has also demonstrated leadership in improving safety performance throughout the DOE complex through their significant involvement in the efforts of the Energy Facilities Contractors Group (e.g., developing ISM implementation guidance and tools).

D.2.4 Implementation of DOE Policy and Order 226.1

DOE issued DOE Policy 226.1, *Department of Energy Oversight Policy*, in June 2005 to establish a single policy that addressed an integrated and coordinated approach to DOE oversight and contractor assurance systems (referred to as "integrated management") in the areas of ES&H, security, cyber security, emergency management, and business operations. DOE Order 226.1, *Implementation of Department of Energy Oversight Policy*, which provides specific requirements for implementing the new policy, was issued in September 2005. The order requires DOE program offices, field elements, and sites to comply with the new policy and order by September 15, 2006.

The intent of the new policy and order is to build on existing DOE oversight and contractor assurance processes while enhancing the strategic approach to the design and coordination of oversight and assurance activities by the DOE program office, DOE field elements, and site contractors. The new policy and order impose new or more stringent requirements in certain areas where DOE and contractor feedback and improvement programs have historically not been consistently effective, such as issues management. The new order also emphasizes a strategic and documented approach to developing and implementing a comprehensive, rigorous, and risk-based program of contractor self-assessments and management assessments, complemented by a coordinated and risk-based program of DOE line management oversight that includes a baseline assessment program that considers the effectiveness of the contractor assurance system, and a judicious balance of baseline assessments, operational awareness activities, targeted reviews for areas of weakness, and self-assessments of DOE line management performance and activities. The DOE line management oversight role is to be performed primarily by the DOE field elements, but with sufficient involvement of the DOE program offices and the NNSA and Energy, Science and Environment central technical authorities (for higher hazard nuclear facilities).

Independent Oversight selected implementation of DOE Policy and Order 226.1 as a focus area because the DOE requirements in this area are relatively new and require significant coordination among the DOE line management (program offices and field elements) and contractors to ensure that implementation of the new requirements is well coordinated and effective. To assess this area, Independent Oversight interviewed EM/SR, NNSA/SRSO, and WSRC personnel and reviewed various documents and procedures, with particular emphasis on implementation guidance issued by EM and NNSA, and resulting efforts by SR, SRSO, and WSRC.

EM/SR

As part of the DOE implementation plan for DNFSB Recommendation 2004-1, EM is directing its field offices to implement a number of actions that are related to the implementation of DOE Order and Policy 226.1, such as revising their QA plans (which are one element of a comprehensive oversight program) and developing site plans to improve feedback elements. These actions are being monitored and tracked as part of the 2004-1 implementation plan. However, SR personnel who were interviewed were not aware of any specific directions from EM regarding implementation of DOE Policy and Order 226.1.

Consistent with the DOE Order 226.1 provisions, the EM QAPP identifies the need for an integrated assessment program and indicates that the EM management system is consistent with the principles and functions of the new DOE oversight policy and order. Further, the proposed FY 2006 EM assessment plan requests feedback to avoid schedule conflicts and provide better integration of DOE assessment plans. However, EM has not performed a gap analysis of their present Headquarters oversight processes and procedures to the requirements of DOE Order 226.1, and has not developed an implementation plan that addresses integrated management and that will ensure their compliance with the requirements by September 15, 2006.

SR has performed an assessment of feedback and improvement processes and a gap analysis for DOE Order 226.1. The gap analysis is currently in draft and awaiting management approval and recommends the development of action plans to address the gaps and needed improvements. SR indicated that its staff members are working to revise their assessment program implementing procedures in response to their draft gap analysis and recognize that SR's QA plan and integrated safety management system (ISMS) will also need some revisions. Implementation of DOE Order 226.1 is an ISMS commitment for FY 2006. The SRS ISMS is generally adequate, but considerable work is needed to meet the expectations of DOE Policy and Order 226.1, particularly with respect to the strategic approach to an integrated oversight program for ES&H as well as other areas, such as security.

SR has many of the elements of a line management oversight program, as defined in DOE Policy and Order 226.1, including assessments and an FR program. As discussed in Appendix D, these elements are operating at varying levels of effectiveness. However, considerable effort is needed to establish the strategic approach defined in DOE Order 226.1. For example, the technical assessment program needs to establish consistency in process and strategy for defining the integrated baseline assessment program across the multiple SRS organizations.

NNSA/SRSO

NNSA is directing its site offices to take actions as part of the DOE implementation plan for DNFSB Recommendation 2004-1. Those actions are related to the implementation of DOE Order and Policy 226.1 and are being monitored and tracked as part of the 2004-1 implementation plan. NNSA required its sites to assess their situation relative to a set of DOE Order 226.1 criteria and to develop plans to improve feedback and improvement processes to address Commitment 25 of the approved implementation plan for DNFSB Recommendation 2004-1. The criteria promulgated under NNSA Deputy Administrator for Defense Programs (NA-10) signature on November 14, 2005, were derived from the DOE Order 226.1 requirements.

Although some actions have been taken, NNSA (including the CDNS) and SRSO have not performed a comprehensive gap analysis of their present processes and procedures to the requirements of DOE Order 226.1, and have not developed an implementation plan for integrated management to ensure compliance with the new order by September 15, 2006. NNSA (NA-124) indicated that they have performed some reviews of the new order but that documentation of the results was not finalized. NNSA Headquarters does not currently have provisions for some elements that will be needed under DOE Order 226.1, such as a rigorous issues management process or a strategic process for baseline oversight assessments. NNSA has issued a QA plan and an implementation plan for the development of most of the appendices that define the associated NNSA QA processes (which are elements of the broader oversight program); most of the appendices will not be developed until later in 2006, and are not scheduled to be implemented until 2007.

SRSO has many of the elements of a line management oversight program, as defined in DOE Policy and Order 226.1, including assessments and an FR program. In addition, SRSO annually reviews the WSRC submittal of their contractor assurance system, which is a DOE Order 226.1 requirement. As discussed in Appendix D, the SRSO oversight elements are operating at varying levels of effectiveness. However, considerable effort is needed to establish the strategic approach defined in DOE Order 226.1. For example, SRSO's issues management process is not as rigorous as the DOE Order 226.1 provisions, and considerable coordination with SR and the contractor will be needed because of SRSO's position as a site office on a site for which EM is the lead program office and the contractor reports to EM.

WSRC

WSRC has many of the elements of a line management oversight program, as defined in DOE Policy and Order 226.1, including assessments and issues management processes. As discussed in Appendix D, these elements are generally adequate, but some weaknesses are evident. WSRC recognizes that continued efforts are needed in ES&H and other applicable areas (e.g., security, cyber security, emergency management, and business operations) to establish a comprehensive strategic approach for integrated management, as defined in DOE Order 226.1.

SR and WSRC revised the SRS S/RID to incorporate DOE Order 226.1 requirements in the contract in December 2005. WSRC has performed an assessment of their current status of compliance with the order requirements and drafted a compliance assessment and implementation report, which will be finalized and submitted to SR. WSRC indicates that few changes in WSRC programs are anticipated to meet the DOE Order 226.1 provisions. A contractor assurance system description document will be incorporated into the WSRC QA management plan for DOE approval.

Summary

While many aspects of a DOE Order 226.1-compliant DOE oversight program are in place, EM/SR and NNSA/SRSO do not have a comprehensive strategy for their integrated management oversight program that considers baseline requirements, the effectiveness of the contractor assurance program, and operational risks and priorities. WSRC has an approved contractor assurance system and has analyzed the new requirements to identify gaps. At this stage, EM/SR and NNSA/SRSO have taken some actions to ensure compliance by the milestone, but the approach is not systematic or managed as a formal project, with clear expectations and milestones.

D.3 Conclusions

EM and SR have the elements of an effective oversight program in place, and most aspects are functioning adequately. Some EM and SR oversight functions are particularly detailed and comprehensive, such as the processes for review and approval of S/RIDs. Most assessment and operational awareness reports were of high quality and provided useful feedback about safety performance. However, some of the SR processes have not been fully and effectively implemented, such as the employee concerns and self-assessment programs. In a few areas, such as EM assessments of SR safety system oversight, SR assessments of its ECP, and SR reviews of work planning and control, the oversight activities have not focused sufficiently on performance to identify implementation deficiencies. Most significantly, SR safety system oversight has not been effective in assessing safety systems and identifying deficiencies in safety system design and authorization bases.

NNSA and SRSO have made improvements in their line management oversight program in several areas, including the technical quality of assessments, communication of operational awareness results, and corrective action tracking processes. However, NNSA and SRSO do not have adequate procedures and processes in some areas, contributing to deficiencies in the planning of assessments, FR program implementation, the TQP, and self-assessments. Some ongoing actions appropriately address current deficiencies, but additional attention is needed in a number of areas to ensure that process and performance deficiencies are addressed.

WSRC has made progress in the process for and the performance of the various elements of safety feedback and improvement. The framework of a comprehensive safety assessment program has been established and is comprised of safety inspections/walkthroughs, management work observations, topical self-assessments, functional area and facility/organizational management evaluations of performance, and comprehensive independent facility/organization assessments. WSRC has established new and improved institutional issues management and corrective action processes and a robust tracking tool. Many safety issues are documented and evaluated, with corrective actions developed, implemented, and tracked to closure. WSRC has also established and implemented a robust lessons-learned program, with a user-friendly database of information on the intranet, sharing of lessons learned with the DOE complex, and generally well-documented, specific corrective actions. WSRC total recordable and lost time occupational injury rates are excellent when compared to industry and DOE peers. OSHA recordable and DOE reportable occupational injuries and illnesses are logged, categorized, investigated, and reported as required by OSHA and DOE requirements, although attention is required in documenting the evaluation and disposition of non-recordable, first-aid cases. Lastly, WSRC has established an effective ECP that appropriately evaluates and resolves concerns related to ES&H. An active behavior-based safety program involves managers and workers in one-on-one work observations and performance analysis to identify and correct unsafe behaviors and conditions.

Notwithstanding the many positive aspects of the WSRC feedback and improvement program, implementation of the self-assessment program elements is not yet fully mature in all areas. The issues management program is not always identifying and correcting root causes of deficiencies in such areas as hazards analysis. In addition, issues management process weaknesses remain, implementation of these new processes is not fully mature, and institutional and organizational oversight and monitoring of performance is not fully sufficient. Most significantly, WSRC feedback programs in the area of essential safety systems have not adequately assessed the design and authorization basis for the facilities and systems at the H-Canyon and HB-Line, and there are deficiencies in the design and authorization basis in these areas.

While many aspects of a DOE Order 226.1 DOE oversight program are in place, significant effort remains to ensure that EM/SR, NNSA/SRSO, and the SRS contractor will meet policy and order expectations by the September 15, 2006, milestone. EM/SR and NNSA/SRSO need to adopt a more systematic and project-oriented approach to implementing the DOE Order 226.1 requirements for ES&H as well as other applicable areas (e.g., security, emergency management, and cyber security) in accordance with the integrated management approach.

D.4 Ratings

EM is the lead secretarial office for SRS and most site activities are under EM and SR direction, and SR provides contractual direction to WSRC. Consistent with Independent Oversight's normal practice, the effectiveness of the oversight and contractor assurance system for these organizations is evaluated collectively because the tiers of the oversight/assurance system are intended to be complementary and coordinated. However, NNSA and SRSO are evaluated separately because they are in a different DOE line management chain and use different oversight processes.

EM/SR/WSRC Feedback and Continuous Improvement Processes .... NEEDS IMPROVEMENT
NNSA/SRSO Feedback and Continuous Improvement Processes....................................NEEDS IMPROVEMENT

D.5 Opportunities for Improvement

This Independent Oversight 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.

EM/SR and NNSA/SRSO

1. **Establish and implement a project management approach to DOE Policy and Order 226.1 implementation.** Specific actions to consider include:

    - Evaluate the adequacy of existing gap analyses at the Headquarters, field element, and contractor levels.
    - Perform an additional gap analysis if existing gap analyses are not sufficiently rigorous or comprehensive.
    - Use a project management approach and techniques to develop a set of actions, milestones, completion dates, and organizational and individual assignments, including interfaces and resource loading.
    - Assign a Headquarters manager to lead the project, and assign points of contact at each field element and contractor organization to coordinate needed actions.
    - Ensure that the strategic approach and implementation strategy encompass security, cyber security, and emergency management as well as ES&H.
    - Ensure that Wackenhut Services, Incorporated (WSI)-SRS is included in the strategic approach to DOE Policy and Order 226.1.
    - Require monthly reports to Headquarters and field element senior managers on the status, progress, and challenges of the implementation effort.
    - Evaluate contractor implementation plans for DOE Order 226.1 to ensure that management expectations are met.
    - Provide additional direction to contractors on implementation, as needed, based on evaluation of contractor plans.

EM

1. **To ensure consistency and facilitate integration of programs, provide guidance to field organizations on expected revisions of their assessment programs, training and qualification programs, QA programs, and ISM systems to meet the requirements of DOE's oversight policy and order**.

SR

1. **Revise the technical assessment program implementing procedure and charge the ETMB and Technical Assessment Program Committee to develop and establish a consistent strategy and process for SR organizations to define and coordinate their inputs to an integrated SR baseline assessment program.**

2. **Revise the self-assessment program to improve the value of assessments performed; establish program performance indicators and enhance schedule discipline; establish processes to ensure that all aspects of SR's activities are adequately assessed every three years; and efficiently integrate self-assessment and independent assessment plans and schedules with other planned EM, SR, and external assessments.**

3. **Consider establishing a Self-Assessment Program Standing Committee under the ETMB to provide oversight and promote continuous improvement.**

4. **Work with the ETMB to develop a promotional campaign for the new web-based SIMTAS to promote its acceptance and use by the SR staff.**

SRSO

1. **Enhance the SRSO technical assessment program.** Specific actions to consider include:

- Require the responsible division director to review and approve each individual assessment plan prior to beginning the technical assessment, and to review and approve completed assessments.

- Revise the list of DOE directive- and CFR-required assessments to ensure that a comprehensive set of assessments is included in the multi-year assessment plan.

- Ensure that contractor self-assessment information (in addition to SRSO assessment results) is reviewed and analyzed for tailoring the SRSO oversight program in accordance with SRSO procedures and NNSA guidance.

2. **Perform a comprehensive self-assessment of the SRSO FR program, in accordance with DOE-STD-1063-2000 and SV-PRO-010.** Improve the planning associated with the conduct of FR assessments to improve coverage and to support continuing improvement in technical quality.

3. **Evaluate current SRSO processes for the capture of operational awareness data in a fashion that will help identify trends and that will support continuous improvement of the SRSO oversight program**. Consider adding a process that produces a weekly FR/SME report to be shared with SRSO managers, NA-124, and the contractor at the Defense Programs status meeting, and utilized collectively as part of the quarterly roll-up report. Additionally, SRSO should consider formalizing the Defense Programs status meeting and using the associated minutes and issues tracking in the body of evidence considered in the quarterly roll-up.

4. **Incorporate a graded-approach causal analysis in the generation of corrective action plans in accordance with requirements in DOE Order 414.1C and DOE Order 470.2B**.

5. **Expedite a comprehensive self-assessment of the TQP to the requirements of DOE Order 360.1 and DOE Manual 426.1-1B**. Work with the Service Center to achieve an adequate understanding and agreement of the shared roles and responsibilities associated with the TQP.

6. **Review and revise memoranda of understanding between SRSO and SR and between SRSO and the Service Center to address responsibilities associated with a periodic effectiveness review of the agreements**.

7. **Design and implement a self-assessment program in accordance with NNSA guidance and DOE Order 414.1C.** Ensure that division directors "own" the SRSO self-assessment process in a team fashion, assessing other division directors' areas of responsibility.

WSRC

1. **Further strengthen the self-assessment program to ensure that safety programs, processes, and performance are being appropriately and rigorously evaluated based on a structured analysis of activities, conditions, and risks.** Specific actions to consider include:

   - Review the allocation of resources and distribution of assessment activities to ensure an appropriate balance between individual, tightly focused reviews with small samples, and more in-depth, team assessments of topical areas that reflect performance in management systems and functional areas across the organization.

   - Provide routine mentoring and monitoring of assessment quality, and consider using a grading system, such as that used in the HCP group, to provide specific feedback to assessors and improve performance and assessment value.

   - Ensure that organizational performance analyses are formally presented to management, with resulting issues input to the STAR database and managed in accordance with the site issues management process.

2. **Strengthen the issues management process and implementation to ensure the consistent capture, classification, analysis, and management of safety deficiencies to effective resolution.** Specific actions to consider include:

   - Review the established thresholds in the institutional issues management procedure for identifying the extent of problems, causal analysis, identification of actions to prevent recurrence and recurrence of similar deficiencies, and effectiveness reviews to ensure that safety issues are being sufficiently evaluated and resolved.

- Provide definitions, examples, guidance, and training for establishing significance categorization to promote more consistent and accurate classification and resulting issues management.

- Conduct a sitewide assessment of a large sample of significance classifications of findings from management assessments. Establish a temporary monitoring process to promote accurate and consistent classification and disposition.

- Line organizations should consider establishing a means to reiterate, monitor, and enforce the requirements and expectations for use of the STAR database to document and drive management of safety issues.

- Where not already in place, consider establishing line organization CARBs, with empowered representatives to promote rigorous and consistent management of safety issues.

- Strengthen institutional procedures and establish organizational implementation instructions that provide for consistent identification of events and incidents that require critiques, the documentation of these events and incidents and any resulting issues in the STAR database, and specific expectations regarding attendees, documentation, and approval of critique minutes. Consider the training and use of critique facilitators to ensure consistent and robust critiques.

3. **Strengthen the occupational injury and exposure investigation and reporting processes to ensure that potential precursor events are thoroughly documented and analyzed, with causes determined and appropriate preventive actions identified and implemented.** Specific actions to consider include:

   - Consider revising or supplementing the DOE injury and illness investigation form to better support documenting incidents, investigation details (including causal analysis), and corrective/preventive actions. Incorporate the elements of ISM into the documentation.

   - Establish/strengthen institutional oversight processes and controls to ensure that the incident descriptions, investigation details, and corrective/preventive actions are rigorously completed and documented by line supervisors and industrial safety representatives, including the use of the STAR database to manage resulting issues.

   - Establish a means to document the evaluation of non-OSHA recordable injuries and illnesses that require only first aid but may be preventable due to deficiencies in conditions and work control practices.

4. **Enhance the documentation of lessons-learned program activities to provide evidence that required actions are taken, and ensure that local lessons learned are reviewed for communication to others where appropriate.** Specific actions to consider include:

   - Where not already employed, use the STAR database tool to communicate and track the completion of evaluations and actions for lessons learned.

   - Establish more formal documentation of the review and consideration of lessons learned during hazards analysis and work planning activities, including identification of the lessons reviewed or lessons to be applied, and a signature or initials of the work planner.

APPENDIX E
ESSENTIAL SYSTEM FUNCTIONALITY

E.1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight (Independent Oversight) evaluated essential system functionality (ESF) for selected safety systems at the Savannah River Site (SRS) HB-Line. The systems selected were the safety-related ventilation and explosion prevention systems. Independent Oversight also evaluated the various programmatic functions associated with ensuring that these and other safety systems are capable of performing their safety functions with a high level of confidence commensurate with their importance to safety, such as configuration management, the unreviewed safety question (USQ) program, maintenance, and operations. Two of the 2006 focus areas (quality assurance in engineering and configuration management programs and processes, and safety-system component procurement) are closely related to ESF and are discussed in this appendix. Feedback and improvement systems as applied to the evaluated safety systems were also reviewed; the results are considered in the overall evaluation of feedback and improvement systems, as discussed in Appendix D.

The ventilation system review focused primarily on the safety-class structures, systems, and components (SSCs) that provide confinement for the HB-Line, including the H-Canyon ventilation exhaust system, which maintains both the H-Canyon and the HB-Line at a negative pressure relative to the outside environment and filters all building exhaust through high-efficiency sand filters. It performs these functions during normal operation and accidents, when it is a primary contributor in maintaining the radiation exposures below the evaluation guidelines derived from DOE Standard (STD) 3009-94, *Preparation Guide for U.S. DOE Nonreactor Nuclear Facility Documented Safety Analyses*, Appendix A.

The major components reviewed in the H-Canyon exhaust system included the sand filters, the exhaust fans, the exhaust fan dampers, the stack, the ventilation system interlocks, the tornado dampers, and the essential supporting systems, such as the H-Canyon exhaust fans emergency diesel generators, and the exhaust fan damper backup air supplies. Components within the scope of review of the explosion prevention safety systems included process air compressors, air purge dissolvers, hold and filtrate tanks, process air purge vessels, and acidity monitoring instruments and interlocks. For the explosion prevention system, the process air system supplies purge air to the process vessels that could generate hydrogen, to prevent the accumulation of flammable quantities of hydrogen in their vapor spaces. Constant dilution of the hydrogen by the purge airflow maintains the accumulation below flammable quantities. Purge airflow rates for vessels have been established to keep hydrogen concentrations below 25 percent of the lower flammability limit.

The purpose of an ESF assessment is to evaluate the functionality and operability of selected SSCs that are essential to safe operation of the facility. The review criteria are similar to the criteria for the Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2000-2 implementation plan reviews; however, the Independent Oversight reviews also include technical evaluations of the selected SSCs' design, engineering, configuration management, operation, maintenance, surveillance, and testing. Additionally, these reviews address a facility's authorization bases (ABs) and related programs, such as the USQ program. ESF assessments are performed at a very detailed technical level that includes review of system calculations that are the bases for the systems' designs and safety analyses; the documented safety analyses (DSAs) and other related AB documents, such as technical safety requirements (TSRs) and the fire hazards analysis (FHA); drawings; specifications; vendor documents; facility-specific technical procedures; facility walkdowns; and interviews with system engineers, design engineers, maintenance and testing engineers, operators, technical managers, and other technical support personnel. The primary focus of these reviews is verification that the systems' designs and ABs are technically correct, consistent, and in accordance with applicable codes, standards, regulations, and DOE orders, and that the systems are fully capable of performing their design safety functions.

E.2 Results

E.2.1 Configuration Management Programs and Supporting Processes (including the Quality Assurance in Engineering and Configuration Management Programs Focus Area)

Independent Oversight reviewed Washington Savannah River Company (WSRC) procedures for engineering design and configuration management, including such key areas as component classification and identification, design drawings, calculations and/or analyses, design modifications, engineering specifications, and document control. In general, these processes are adequately defined and documented in Conduct of Engineering Manual E7.

The Nuclear Process Technical Baseline Control section of the manual addresses the appropriate key subjects for engineering processes applicable to the H-Completion Project (HCP). The individual procedures in this section of the manual are logically organized, have a common format, and provide the appropriate depth and detail. The procedures include useful flowcharts graphically illustrating the process flow, and web links to referenced procedures and documents. The procedure steps are clearly identified, logically sequenced, and provide an appropriate level of detail, direction, and references to other procedures and guides. For example, the processes that require review are referenced to the "Technical Reviews" procedure. Various desktop guide documents also aid in using the procedures. The examples below demonstrate the thoroughness and rigor of many of the engineering processes.

- **Procedure 2.30, Drawings.** This procedure provides clear and specific details covering the full range of steps on how to initiate, review, and approve new drawings, or revise existing drawings, for each drawing type. A flowchart with logic steps (Yes or No) is used to aid in the preparation, review, approval, and control of the various types of drawings. The document control steps are clearly identified and logically sequenced.

- **Procedure 2.05, Modification Traveler.** This procedure provides specific flowcharts that address the logic steps required to be performed based on whether a commercial or nuclear modification is being implemented and addresses the types of design inputs and the commercial risk level for modifications costing more than $50,000.

- **Procedure 2.06, Temporary Modification Control.** This procedure contains detailed flowcharts that guide the process implementation and addresses expected duration, identification of affected SSCs, facility operations manager approval, required technical reviews, configuration management, and operations control of the modification.

- **Procedure 2.31, Engineering Calculations.** This procedure clearly addresses preparation, review, approval, and control of major calculations, use of calculation software, and use of calculations by others.

To verify the adequacy of implementation of the WSRC procedures, Independent Oversight reviewed the most recent major modification project—Upgrade Canyon Exhaust Systems, F and H Area. However, the team could not perform a full verification of the modification process implementation because the contractor could not retrieve full modification packages during the entire two-week duration of the inspection. Only the design outputs and test acceptance criteria documents were made available. The design input documents provided to the Independent Oversight team were limited to the functional design criteria, which is a high-level design requirements document used to generate specific design inputs. The contractor attributed the inability to retrieve the design inputs to the age of the project, which was started some time in the late 1980s or early 1990s, and it was performed in phases by a number of different design contract organizations. Furthermore, at the time of the major design effort, the current configuration management system was not in place. Nevertheless, the fact that historical design documents are not readily retrievable indicates weaknesses in the document control system.

Although most of the reviewed procedures and processes correctly translated requirements into institutional procedures, there were two instances where procedures did not rigorously define processes that clearly satisfied regulatory requirements. However, the Independent Oversight team's review of these exceptions did not identify a non-conforming condition or an unanalyzed configuration. The deficiencies are discussed in detail below to provide the necessary background to support opportunities for improvements in these areas.

- **One part of a key institutional work procedure did not explicitly require a formal USQ document prior to performing work.** A recent contractor's self-assessment at HCP identified a configuration management concern resulting from a USQ not being performed as required by the facility's engineering procedure. Section 5.2 of design change form procedure 2.37 allows for authorized field work on potential safety-related components that have been taken out of service, de-energized, or de-pressurized. It relies on the design authority to approve the work to proceed on non-operable equipment at risk for 15 days, considering USQ criteria, but only requires the USQ to be completed before the modified SSCs are returned to service. WSRC self-identified the deficiency, but no immediate compensatory actions were taken to temporarily change the design change form procedure. WSRC did not believe that immediate changes were necessary because they did not view the procedure as outside the 10 CFR 830 rule, and no instances had been reported previously that indicated that a USQ review before turnover identified a non-DSA requirement compliance issue. In contrast, Independent Oversight's review indicates that the procedure is outside the intent of the USQ process provisions of 10 CFR 830.

- **Elements of the justification for continued operation (JCO) process and the supporting DOE safety evaluation report (SER) process do not fully address the requirements of 10 CFR 830**. The JCO is described in WSRC Facility Safety Document Manual 11Q, Procedure 1.0, as a way "to provide an interim Safety Basis for operation either for a discovery situation where a Potential Inadequacy in the Safety Analysis is declared or when a one time activity of limited life is proposed." This procedure states that for proposed activities, "JCOs may be prepared for one-time short term (months rather than years) operations." This section goes on to state: "For either type of JCO, the JCO must specify closure requirements so that when the short-term operation is completed … the JCO can be retired, the Safety Basis returned to normal, and operational constraints removed without the need for further approvals." 10 CFR 830 and DOE-STD-3009-94 do not specifically define a JCO process. The Independent Oversight team's review of the WSRC JCO process determined that the process, as implemented by WSRC and accepted by the Savannah River Operations Office (SR), includes an annual review but not an annual update requirement. Also, the scope of the SER reviews was not rigorously defined and/or documented (see Finding #18). Specific concerns are as follows:

    - Multiple JCOs are permitted by the JCO procedure and are currently approved and in effect for some facilities. However, the procedure does not require performance of a full review of the DSA and the other JCOs as part of the review process for a new one-time-activity JCO. Similarly, SERs issued for each JCO do not document the full review of the DSA and other JCOs. The annual DSA update by WSRC does not include a mandatory requirement for review of the JCOs in effect at the time, nor do the annual SERs. Both the JCO initiation and SER approval processes use an expert-based assumption that the requirements of one JCO do not overlap with another JCO. Examples that one JCO affects another were not found, but the potential exists and should be addressed during the approval process.

    - The JCO-initiated DSA and any required hardware changes are approved by SR; however, the process does not require a USQ review or SR approval for JCO closure. Since the process allows for other JCOs to be issued subsequent to the JCO being closed, the pre-approval for the closure may lead to an introduction of a positive unreviewed safety question determination (USQD). Examples of a positive USQD introduced by JCO closures were not found, but the potential exists.

During the inspection, Independent Oversight reviewed many HCP system documents, including electrical and mechanical drawings, schematics, logic diagrams, component identification, calculations, and engineering specifications, that indicated that in general the engineering procedures associated with these documents are being followed. One exception was noted with the control of a few critical safety components that had inadequate configuration attributes. For example, the components were not identified on design drawings, did not have unique component names and numbers assigned, or had not been assigned normal positions in controlled plant procedures and periodically verified in those positions to ensure that they would be correctly configured to perform their safety functions. The H-Canyon exhaust fan emergency diesel fuel filter isolation valves are examples of such a situation. Although the positions of these valves are critical to the operability of the diesel generators, they were not shown on the fuel system piping and instrumentation diagram, were not assigned unique identifiers, and were not tagged, and their normal positions were not controlled by any procedure.

Summary

The configuration management aspects of the process for generating and controlling design documents are noteworthy and can be used as a positive example for the DOE complex. The process is well thought out and web-link driven, which allows for efficient implementation with minimal errors. However, the WSRC staff's inability to retrieve full modification packages for the most recent major modification of the canyon exhaust systems could be indicative of weaknesses with the document control system. Although most of the reviewed procedures and processes correctly translated regulatory requirements, there were two cases of procedures not fully addressing the regulatory requirements in the design change form procedure and the JCO approval process. Many system engineering documents were found to comply to the requirements provided in the Conduct of Engineering manual.

E.2.2 Engineering Design and Authorization Basis

With a few exceptions, the systems reviewed were generally well designed and robust with respect to their normal operating functions. However, weaknesses and discrepancies related to their accident prevention and mitigation functions were identified in the ABs, design engineering processes, translation of the design and ABs into technical procedures and practices, and configuration management. Many of these weaknesses call into question the capability of the affected SSCs to fully perform their intended safety functions.

Authorization Basis Weaknesses

- **H-Canyon exhaust stack failure because of design basis seismic or tornado events.** For the design basis tornado and seismic events, the H-Canyon final safety analysis report (FSAR) indicated that the canyon exhaust stack would remain standing. However, available stack structural calculations indicated that it may collapse during both events. Such a collapse could cause failure of the safety-class canyon exhaust fans or sand filters, which had not been analyzed.

  For the design basis seismic event, the FSAR indicated that, although the stack's brick liner would collapse, the reinforced concrete shell would survive. The FSAR deemed this as acceptable, because the rubble could be removed, and the canyon exhaust system could be restored to service at 48 hours after the event. The resultant exposures for this scenario, with a filtered ground-level release, were analyzed to be within DOE-STD-3009-94 evaluation guidelines. Contrary to this scenario, the available stack structural calculations indicated that the stack shell would likely collapse due to interactions with the brick liner, and further detailed analyses were recommended, but had not been performed.

  For the tornado event, the FSAR indicated that winds up to 180 mph "…are considered credible at SRS," and that the design basis tornado was 178 mph. However, another safety analysis report (SAR) statement indicated that the design basis tornado frequency was "Extremely Unlikely," which contradicted previous FSAR statements. The FSAR statements were also inadequate with respect to the available stack structural calculations, which indicated that the stack was only qualified for wind velocities up to 117 mph. Although no failures requiring the mitigative capabilities of the canyon exhaust system were cited for severe wind events, the failure of the stack, the exhaust fans, and the sand filter as a result of this event, which could render the canyon exhaust system incapable of performing its normal confinement functions for an extended period after the event, were not discussed in any AB documents. These safety concerns were determined to be a potentially inadequate safety analysis (PISA) on February 10, 2006; steps were taken to ensure that the facility has remained and would remain in a safe condition, and an occurrence reporting and processing system (ORPS) report was issued. This item was considered to have operability ramifications. (See paragraph after Finding #16.)

- **Indeterminate operability of safety-class batteries for design basis conditions.** The design basis capacity performance requirements for the safety-class H-Canyon exhaust fans' emergency diesel generator starting batteries and emergency switchgear control batteries are not defined or required to be tested by the FSAR, the TSRs, or the TSR bases. The design basis capacity requirements stated in the procurement specification for these components are that that the diesel generator starting batteries be capable of starting the units five times, without rest between starts, for the full starting time (10 seconds), at 20˚F, and that the switchgear batteries be capable of 83 amps discharge for one minute and 5 amps discharge for the next five hours, also at 20˚F. Although routine testing of the diesel generators demonstrates the abilities of these batteries to perform under as-found conditions, typically well above 20˚F, the batteries' abilities to meet the design basis performance requirements is not routinely tested and is not presently known. The current TSR bases-required inspections for the diesel generator starting batteries are only for voltage, corrosion, electrolyte level, and specific gravity, and there are no specific requirements beyond "inspection" for the switchgear batteries. None of the required or actual inspections performed are capable of detecting capacity degradation, which occurs with use and age. This item was considered to have operability ramifications. (See paragraph after Finding #16.)

- **Unanalyzed H-Canyon leakage path.** There is a separate branch into the canyon exhaust system from the Building 299H (a decontamination facility) exhaust system on the inlet side of the safety-class H-Canyon exhaust sand filters. For accidents that could result in the loss of the normal H-Canyon exhaust flow and the loss of normal flow from Building 299H, such as a design basis seismic event, a direct, non-filtered leakage path exists from H-Canyon to the environment through the Building 299H exhaust line. This potentially significant leakage path (in terms of size compared with the analyzed paths) is currently unanalyzed in the FSAR or elsewhere. This concern was also addressed by PISA and ORPS processes. This item was considered to have operability ramifications. (See paragraph after Finding #16.)

- **Inadequate H-Canyon emergency diesel fuel day-tank volume TSR bases.** The H-Canyon TSRs require that the day tanks contain greater than or equal to 400 gallons of fuel, and the bases state that this is the required amount to provide operation for eight hours at "required load." The term "required load" is not clearly defined anywhere in the AB, and there was no calculation supporting the 400 gallons value. Additionally, the bases use other undefined terms in their discussion of this subject, such as "necessary loads" and "available demand loads." Although the only safety-class loads supported by the diesel generators are the H-Canyon exhaust fans, there are numerous other loads attached to the emergency busses, some of which are automatically sequenced onto the busses upon automatic start, plus loads that could be manually closed to the busses by the operators after start. The units should be capable of supporting all of these loads for a loss-of-normal-power event to ensure that the units do not trip and thereby do not support the safety-class loads, and the required fuel volume for eight hours of operation should be at the consumption rate associated with this loading level. Additionally, the tank volume required should account for unusable volume and potential air entrainment, with allowances for such factors as tank heel, vortexing, and tank slope. This item was considered to have operability ramifications. (See paragraph after Finding #16.)

- **Inadequate HB-Line backup diesel generator fuel day-tank volume TSR bases.** HB-Line TSRs require that the day tanks contain greater than or equal to 350 gallons, and the bases state that this amount is required "…to ensure that the diesel can operate for 8 hours at required load." As with the H-Canyon TSR, "required load" is not defined, and there are no documented analyses that consider all factors, such as tank heel, vortexing, and tank slope, in establishing the TSR limit. Based on Independent Oversight's review of diesel loading data, vendor's fuel consumption data, and estimates of unusable tank fuel volume, the Independent Oversight team concluded that no operability concern exists.

- **Inadequate TSR bases for the safety-class canyon exhaust fan damper backup air receiver low-pressure limit.** The backup air receivers are required to be capable of operating these dampers (two for each receiver) for any combination of four strokes (a stroke is a full damper movement in either the open or the closed direction) after loss of the normal non-safety air supply. The 90 pounds per square inch gauge (psig) TSR low-pressure limit is based on a calculation whose results were significantly non-conservative with respect to test results, and the test results were from poorly controlled, non-representative tests to determine the pressure loss for each damper stroke and the minimum stroking pressure. The bases also did not clearly define the mission time for the system or account for leakage or temperature changes during this time. No valid analyses or tests currently exist to support the TSR minimum allowable pressure. To address this concern, the WSRC staff initiated the "new information" process, which documents the review of the condition to determine whether a PISA should be declared, and whether the facility should be placed in a safe condition, as required by 10 CFR 830.

- **Invalid canyon exhaust fan damper surveillance test method allowed by TSR bases.** In lieu of actually stroking each damper in both directions at the lowest pressure that could be experienced for the loss-of-normal-air-supply event, the TSR bases allow stroking one of the four dampers for one stroke and calculating whether sufficient air remains to perform three more strokes. The allowed substitute method is non-conservative with respect to the TSR requirement to "Perform a FUNCTIONAL TEST on the H-Canyon Fan Damper operation upon loss of Instrument Air" in that it only verifies the actual functional condition of one damper, and this verification is at a pressure well elevated above the minimum operating pressure that should form the basis for the 90 psig TSR low-pressure limit.

- **Non-conservative limiting condition of operation (LCO) time to restore inoperable backup power supply.** HB-Line LCO 3.4.1 requires that the backup power system be restored to operable status within 72 hours should it become inoperable. This power source is required to assure that for loss-of-normal-power events, power can be restored to the process air compressors, which are required to provide hydrogen dilution air for the vessels listed in Table 3.3.1-1 for plutonium processing or 3.3.1-2 for neptunium processing. For the process air compressors, LCO 3.3.1 requires, in part, that an alternate method for the dilution of hydrogen be provided, and Table 3.3.1-1 lists completion times that correspond to the completion times to reach the hydrogen mixture lower flammability limit without dilution—for some vessels, as low as 18 hours. Therefore, the LCO time to restore an inoperable backup power supply is non-conservative with respect to the minimum time at which its safety function would be required, and inconsistent with the LCO time for providing an alternate dilution method.

- **No documented bases for the AB assertion that one canyon exhaust fan can maintain the canyon at a negative pressure for design basis events.** H-Canyon TSR basis 3.3.1 asserts that one canyon exhaust fan can maintain the canyon at a negative pressure for design basis accidents to mitigate radioactive releases and maintain exposures within the DOE-STD-3009-94 evaluation guidelines. However, there are no documented analyses or tests demonstrating this capability for design basis conditions, which should include normal wind conditions that could generate localized negative external building pressures. This item was considered to have operability ramifications. (See paragraph after Finding #16.)

- **Performance requirements in the TSR bases for an alternate diesel generator are inconsistent.** The H-Canyon TSR bases require adequate fuel for seven hours at "full" power, while the LCO requires eight hours at "required" power.

The AB documents contained a number of weaknesses in requirements and their bases, including inadequate detail, depth, or specificity to allow a user to fully and confidently understand commitments, performance requirements, and capabilities for safety-related SSCs. This situation was reflected at the highest level and in the most severe cases by the weaknesses noted above, some of which called into question the capabilities of the affected SSCs to fully perform their intended safety functions. Some of these factors contributed to technical weaknesses that were identified in the actual designs and in the translation of the designs and the AB into facility technical procedures and practices, as described below. The number and significance of the errors, ambiguities, inconsistencies, and unsupported or insufficiently supported positions or claims that were identified in the H-Canyon and HB-Line AB documents for the relatively limited scope of safety systems that were addressed calls into question the overall quality, depth, accuracy, and validity of the ABs for these facilities. In addition, an extent-of-condition evaluation is needed to determine the full extent of deficiencies with the H-Canyon, HB-Line, and other SR nuclear facility AB documents.

Finding #15. The H-Canyon and HB-Line authorization basis documents contain discrepancies and inadequacies, which resulted in their not providing adequate assurance that some safety-related ventilation and explosion prevention structures, systems, and components will perform their intended safety functions under design basis accident conditions.

Design Engineering Weaknesses

- **Emergency diesel generator components not adequately analyzed for damage from natural events.** Although the H-Canyon exhaust fan emergency diesel generators are, in general, well protected from wind and seismic events, the two exhaust stacks and one set of fuel oil day-tank vents outside the building are not. For these events, these components are subject to failure because of the potential impact of falling utility poles that are located just outside the building. The most significant potential consequences could be crimping of these pipes, causing unintended engine shutdowns or, in the worst-case scenario, engine failure. The WSRC staff initiated the "new information" process to address this concern. This item was considered to have operability ramifications. (See paragraph after Finding #16.)

- **Seismically induced fire in fan building not considered.** Section 7.4 of the functional design criteria for the canyon exhaust systems project specifically required considering that "Those SSCs whose failure could impact the function of higher classification or safety-class SSCs shall be supported and anchored for the Natural Phenomena Hazard loads associated with the higher SSC's classification." Review of the natural phenomena hazard-induced interactions calculations, the FHA, and discussions with the contractor determined that a seismically induced fire in the fan building (292-H) was not considered in the design. Such a fire could be initiated in the non-seismically supported energized electrical cables in close proximity to the safety-class SSCs. Damage to their insulation as a result of the seismic event could lead to a fire that could disable the safety-class SSCs credited to mitigate the event. Therefore, the project's functional design criteria were not met, and as a result the facility could be outside its analyzed accident basis. The WRSC staff initiated the "new information" process to address this concern.

- **H-Canyon and HB-Line supply fan breakers not classified as safety-class.** The H-Canyon and HB-Line supply fan starters are required to perform the active safety-class functions of interrupting power to their respective fans upon their control logics' detection of low exhaust tunnel vacuum and positive facility pressure, respectively. However, neither of these two components is classified as safety-class. This item was considered to have operability ramifications. (See paragraph after Finding #16.)

- **Non-conservative emergency diesel generator fuel oil pump net positive suction head calculation.** The net positive suction head calculation is non-conservative for the canyon exhaust fan diesel generator fuel pumps in that: (1) It does not account for pressure drop through the fuel filters and attendant fittings; (2) it does not consider the full pump flow rate for the systems' recirculation design, only the engines' consumption rates; and (3) it uses a non-conservative fuel temperature of 100˚F (the unit procurement specification identifies 110˚F as the design temperature). This item was considered to have operability ramifications. (See paragraph after Finding #16.)

- **Lack of instrumentation for monitoring HB-Line vessel hydrogen concentration.** The HB-Line scrap dissolvers use process air to dilute the hydrogen generated by the process in order to prevent the vessel atmospheres from reaching the lower flammability limit. However, no instrumentation is provided in the design to monitor the hydrogen concentration directly, such as hydrogen concentration monitors in the vessels, or indirectly, such as dilution airflow monitors that would allow verification of the required airflow. Additionally, although an initial baseline test of the dilution air flow was performed, no periodic re-testing is being performed to verify that the intended flow is still being provided. The Independent Oversight team recognizes that hydrogen measurement technology is limited and that the HB-Line engineering staff has attempted to identify acceptable hydrogen monitoring equipment but determined that available technologies were not suitable. This item was considered to have operability ramifications. (See paragraph after Finding #16.)

Weaknesses in the Translation of the Design and AB into Procedures and Processes

- **Non-conservative diesel generator load testing.** In addition to the AB concerns with the definition of the "required loads" for the H-Canyon diesel generators (identified above), all current surveillance test procedures contain loading acceptance criteria that allow test loading of only 200 kilowatts, which is well below the value required to support even the two safety-class canyon exhaust fans for each diesel generator whose motors have a nameplate rating of 300 horsepower (224 kilowatts) each. This item was considered to have operability ramifications. (See paragraph after Finding #16.)

- **Non-conservative test procedure for the H-Canyon exhaust fan damper backup air supplies.** In addition to the above-noted AB concerns with the inadequately supported bases for the TSR minimum allowable backup receiver pressures of 90 psig and the invalid alternative test method for the dampers, which were translated into the test procedure, the procedure also contained other significant non-conservatisms. In performing the one stroke that is the basis for acceptance, after isolation of the receiver from the normal air supply, the procedure requires starting with any pressure above the current low-pressure alarm setpoint, 95 psig, instead of the lowest pressure (72 psig), which is the basis for the TSR low-pressure limit. Also, because normal operating pressures can range up to approximately 105 psig, this even higher pressure may be the actual starting pressure for the test. Therefore, the starting pressure for the test stroke is extremely non-conservative. Additionally, the procedure's minimum acceptable pressure at the end of the stroke is 83 psig. Therefore, the procedure considers a stroke that consumes up to 22 psig of receiver pressure to be acceptable, whereas the only available test results (previously discussed as inadequate) indicated an average normal pressure consumption of approximately 1.75 psig. Therefore, the acceptance criteria for this first stroke are unacceptable with respect to all currently known test data. This testing also indicated that the minimum pressure at which the dampers would stroke was 72 psig. With up to 22 psig consumed on the first stroke, the current test procedure implies that the other three dampers would be considered operable when there is only an 11 psig margin total available for the three remaining required strokes, which also is non-conservative. This item was considered to have operability ramifications. (See paragraph after Finding #16.)

- **Non-conservative sand filter testing.** In the current H-Canyon exhaust system configuration, approximately 150,000 cubic feet per minute (cfm) enter the filters from H-Canyon. In addition, another branch on the system at the sand filters entrance (discussed above with respect to an unidentified leakage path) supplies approximately 22,000 cfm from Building 299H (a decontamination facility). Whenever the TSR-required sand filter efficiency surveillance tests are performed, a test medium is injected into the airstream from H-Canyon, and the concentration of this test medium in the airstream is measured at a point downstream of the injection point. However, this measuring point is upstream of the branch from Building 299H. Therefore, the measured concentration is significantly higher than the actual concentration entering the sand filters, because concentration entering the filters is diluted by the flow from Building 299H. Similarly, on the outlet side of the filters, the total flow is collected in large plenums above the filters and routed to a discharge tunnel that routes the flow to the suction sides of the exhaust fans, where the downstream sample point is located. However, there are several large hatches on the sand filter roofs and the outlet tunnel for which the sealing may be questionable. Any leakage into the filter outlet airstream from the atmosphere (the filter outlet side is at a negative pressure relative to the atmosphere) would dilute the outlet flow and cause the outlet sample to indicate a concentration lower than the actual outlet concentration. Comparison of these two measured concentrations is used to calculate the filter efficiency, and both of these dilution sources would indicate better-than-actual filter efficiency. Therefore, the current actual filter efficiency is unknown and is less than the currently calculated results. The WSRC staff initiated the "new information" process to address this concern. This item was considered to have operability ramifications. (See paragraph after Finding #16.)

- **Inadequate procedures and provisions for refueling the emergency diesel generator day tank.** The LCO for the emergency diesel generator day-tank capacity of eight hours at "required" load is based on being capable of refueling the tank from a truck delivery post-accident. However, no procedures are currently in place that ensure that such deliveries would be initiated and completed in sufficient time to replenish the fuel within eight hours, possibly under adverse post-accident conditions.

- **Non-optimal emergency diesel generator fuel filter lineup.** Currently, the canyon exhaust fan diesel generator duplex fuel filters (two in parallel) are both lined up for operation (both inlet and outlet valves open). This lineup defeats the normal purpose of the parallel configuration (to allow one to be cleaned while the other is in operation). Although there are no specific formal requirements regarding this lineup, the correct configuration to accomplish the design purpose is one filter in standby (inlet and outlet valves closed or only one of these valves closed) and the other in operation (both valves open). Although the filters are routinely cleaned at 675 hours of normal running time or 12 months, their loading rate under accident conditions could be considerably higher than for normal operation due to agitation of the supply system by the event itself (e.g., for a seismic event) or by delivery of agitated sediment-laden fuel from a delivery truck. With the current system lineup and maintenance approach, the filters should be capable of not just supporting diesel generator operation at 675 hours, but also having sufficient additional capacity to support the accident mission at that point in time. Currently, neither the accident mission time nor the required margin is defined, and the current actual margin is unknown. Additionally, these filters have no differential pressure instrumentation; therefore, their loading cannot be ascertained with the engines running during an accident. Further, there were no procedural controls for the positions of the filter isolation valves.

Finding #16. Weaknesses in the design engineering of the H-Canyon exhaust system and its essential supporting structures, systems, and components and in the translation of the design and the authorization bases into facility operating procedures/practices and surveillance testing procedures and practices are such that the capabilities of these structures, systems, and components to fully perform design safety functions under design basis accident conditions are not sufficiently assured.

All of the items noted above that were identified as having potential operability ramifications were addressed by the WSRC staff in the following manner:

- Compensatory measures or analyses were identified or established that would ensure that, even if the SSCs for which these ramifications existed failed to function as required in a design basis accident, the resultant consequences would be within the current safety basis limits. These measures included prohibiting introduction of irradiated fuel to the H-Canyon dissolvers, prohibiting introduction of new feedstock to the HB-Line, prohibiting charging to HB-Line dissolvers until airflow testing is completed, correcting canyon exhaust fan damper testing procedures and correctly retesting dampers, and performing preliminary enveloping calculations that provided reasonable assurance of being within the current safety basis until more extensive detailed calculations can be completed.

- All such items were entered into one or more of various facility issue identification and tracking processes to ensure that appropriate documentation, notification, and processing would be performed as required by regulations and facility procedures. These processes included the "new information" process, the PISA process, and the problem reporting process.

H-Area Engineering Supporting Elements

For HB-Line programmatic processes, the supporting technical elements of the organization have the necessary nuclear safety attributes, such as strong procedures for the processes within the facilities, rigid adherence to procedures, and generally good technical qualifications of personnel. This was exemplified by the engineering support for the HB-Line process safety-significant functions and design. For example, the HB-Line Phase I process line is designed to generate nitrate solutions of plutonium and uranium from scrap materials received in solid form. The process has the functional requirement to receive, prepare, dissolve, filter, and transfer solutions. This process is accomplished by introducing prepared and assayed scrap into vessels containing nitric acid, heating and treating the acid for complete product dissolution, filtering the dissolved product, and then educting the product with dilute nitric acid to the appropriate H-Canyon vessel. The Independent Oversight team determined that characterization of material prior to processing is comprehensive and generally well done. Based on the results of the characterization, the amount of material to be added to the dissolvers is determined based on purge air capability. Based on review of the vessel vent computer model and confirmatory flow testing under various system lineups, more than ample purge air is available for maintaining the less than 25 percent lower flammability limit of hydrogen in dissolvers. Additionally, appropriate procedures exist to place HB-Line process vessels into a safe state upon a loss of H-Canyon exhaust fans.

However, the Independent Oversight team determined that some of the necessary nuclear safety attributes were weak at the detailed level for facility safety systems. The number and nature of the technical discrepancies that were identified above indicate that engineering and configuration management programs and processes intended to assure that such technical discrepancies would not occur were not being executed with the rigor, attention to detail, and questioning attitude necessary to ensure reliable performance of accident prevention and mitigation functions. The needed questioning attitude was not demonstrated with regard to the AB, considering the number and nature of the identified discrepancies in this area. (Independent Oversight has found this area of weakness to be common across the DOE complex.) There were indications that some of these weaknesses may have been, in part, related to a lack of open and frequent communication between the various technical groups, such as between Systems Engineering, the Authorization Basis group, and Design Engineering. This was exemplified in the discrepancies related to one group being responsible for generating requirements or analyses and another for translating those requirements into procedures and practices. The feedback and improvement processes may need to be clarified and strengthened at these interfaces to ensure that each organization formally reviews the inputs, outputs, and usage of all interfacing organizations. The limited hands-on nuclear design engineering experience of the organization may have contributed to some of these weaknesses. (See the discussion in Section E.2.6 and the weakness in HCP processes to identify and correct AB weaknesses.)

Finding #17. The Design Engineering, Systems Engineering, and Authorization Basis organizations have not applied sufficient rigor, attention to detail, and a questioning attitude in addressing the HCP facility authorization bases and safety-system designs and their translation into technical procedures and practices.

Summary. While many aspects of the contractor's engineering and configuration management programs were comprehensive and well defined, and systems reviewed were well designed and robust for normal operations, numerous weaknesses and discrepancies were identified with respect to their accident prevention and mitigation functions. AB documents contained too many discrepancies in requirements and their bases to allow a user to fully and confidently understand commitments, performance requirements, and capabilities for the safety-related SSCs reviewed. A number of the identified discrepancies called into question the capabilities of the affected SSCs to fully perform their intended safety functions. The number and nature of the technical discrepancies identified for the safety systems reviewed indicate that the engineering design program and processes were not being executed with the rigor, attention to detail, and questioning attitude necessary to assure reliable performance of accident prevention and mitigation functions, and warrant increased management attention and action for these systems and other SRS systems that could be subject to similar concerns.

E.2.3 Surveillance and Testing

10 CFR 830 requires that surveillances and tests be defined in the TSRs. The TSRs must ensure that

safety SSCs and their support systems required for safe operation are maintained, that the facility is operated within safety limits, and that limiting control settings and LCOs are met.

The team observed the performance of a number of TSR-required surveillances and tests at HB-Line and reviewed a sample of completed tests. The sample of surveillance and testing procedures reviewed were well written, clear, and contained appropriate direction, including associated data sheets and forms. The last two years of surveillance results for the safety-related ventilation, emergency diesel generator, and explosion prevention devices were performed on time, and the data sheets were appropriately filled out.

The group of instrument control technicians, maintenance workers, and operators properly executed the observed surveillances and tests, and various operations logbook entries noted successful completion, including correct responses to expected alarms. Workers and supervisors were observed to conduct TSR-required surveillances and testing using sound Conduct of Operations methodology and techniques, and pre-job briefings were satisfactory. HB-Line operators, first-line managers, and others were knowledgeable of the selected safety systems and surveillance procedures, and technicians demonstrated familiarity with the details of calibrations and functional tests that they perform.

However, weaknesses were noted with the performance and acceptance criteria of some important surveillance tests such that the tests do not fully validate the readiness of the safety-related system (see Finding #16).

- **Lack of rigor between the TSR bases and surveillance test for the dissolver chute for the HB-Line Phase I scrap recovery process.** The JCO "Alternate Hydrogen Control for Phase I Scrap Recovery Processing" for HB-Line revised the TSRs and surveillance requirements for the air purge dissolvers (RD-13 and RD-14) in LCO 3.3.2A. The surveillance requirement (SR 4.3.2.2A) was changed to verify that there is no obstruction to restrict purge airflow at each dissolver charge chute. This surveillance is required every 12 hours and was included in the "Scrap Recovery (Phase I) PAO Field Round Sheet." The dissolver charge chute is enclosed in a glovebox above the dissolver and makes a straight pipe run of about two feet to the top of the dissolver. Because the visual inspection is conducted outside the glovebox without visual aids (i.e., mirrors and special lighting), an inspection of the entire pipe is not feasible. The current inspections verify that no foreign material is at the top of the chute but are not able to ensure that no obstructions exist throughout the pipe, as required by the surveillance TSR. Although this was the intended inspection, the associated TSR basis does not provide additional information to resolve the discrepancy.

- **Non-conservative diesel generator load testing.** The H-Canyon diesel generators load surveillance test has an incorrect acceptance criterion that allows test loading of only 200 kilowatts, which is well below the value required to support even the two safety-class canyon exhaust fans for each diesel generator whose motors have a nameplate rating of 300 horsepower (224 kilowatts) each. (See Section E.2.2.)

- **Non-conservative test procedure for the H-Canyon exhaust fan damper backup air supplies.** The H-Canyon exhaust fan damper backup air supply surveillance test acceptance criterion is based on one stroke of a damper versus the required four strokes; the starting pressure is not at the minimum permitted; and the acceptance criterion for pressure drop for the one stroke, 22 psig, is non-conservative. (See a detailed discussion of these deficiencies in Section E.2.2.)

- **Non-conservative sand filter testing.** The acceptance criterion for the sand filter surveillance test has not taken into account the dilution from the Building 299H exhaust line upstream of the sand filter downstream of the inlet test point, and air leaks in the ventilation line downstream of the sand filter but prior to the outlet test point. These factors could make the test results incorrectly non-conservative. (See a detailed discussion of these deficiencies in Section E.2.2.)

Summary

The surveillance procedures are well written and controlled. The surveillances are being performed when appropriate and are generally completed in a rigorous manner. Weaknesses were also noted with the performance and acceptance criteria of some surveillance tests, including dissolver chute testing, diesel generator load testing, exhaust fan damper backup air supply testing, and sand filter testing. These surveillance tests did not fully validate the readiness of these safety-related systems.

E.2.4 Maintenance and Safety System Component Procurement

Maintenance

Independent Oversight's review of maintenance focused on several aspects of the HCP programs for maintaining safety systems, including preventive, corrective, predictive, and life-cycle maintenance, as well as the material condition of the systems. In addition to interviewing personnel responsible for maintenance activities, Independent Oversight reviewed the adequacy of maintenance procedures, documentation of performed maintenance activities, condition assessment surveys and deferred maintenance, and procurement processes.

The HCP maintenance program was adequately implemented in a number of areas, including corrective, preventive, and predictive maintenance; maintenance history; post-maintenance testing; and use of vendor manuals. The components selected for review at H-Area were generally in good physical condition and were periodically inspected in accordance with established maintenance and engineering requirements. For example, walkdowns and visual inspections of selected H-Canyon ventilation exhaust and emergency electrical power system safety components showed only minor degradation and were in good working condition, and components were operating correctly. In some cases, safety system components have recently been upgraded, such as the H-Canyon exhaust system, to address end-of-life concerns and to improve reliability for system performance. With the exception of a few isolated cases noted in the H-Canyon ventilation exhaust system fan house, corrective maintenance was identified and completed in a timely manner, and housekeeping was adequate. The corrective maintenance backlog was small and well managed, and the master equipment list is comprehensive and up to date.

The major contributor to the reliability and good material condition of H-Canyon and HB-Line safety system components is a mature preventive and predictive maintenance program. Safety-system component preventive maintenance was well defined, effectively translated into maintenance procedures, and closely tracked and performed as required within specified frequencies. Extensive condition-based monitoring of preventive and predictive maintenance activities is being conducted to monitor safety system components' performance and degradation. For example, vibration analysis and bearing temperature monitoring is used extensively to monitor safety-related fans/motors and compressor performance.

Reliability-centered maintenance methodologies, such as use of failure modes and effects analysis and fault-tree analysis, are used as part of the preventive maintenance optimization program to make determinations on expected system and equipment reliability, resulting in a set of well-defined preventive and predictive maintenance activities focused on condition monitoring. A number of the safety system components have gone through the preventive maintenance optimization program, including the H-Canyon exhaust system, HB-Line ventilation system, and process air compressors. In most cases, degradation of safety system components is being identified early to prevent inadvertent failure. Infrared thermography is also used extensively to monitor the condition of electrical components.

Maintenance work packages reviewed were clear, concise, and properly classified. Installation instructions and post-maintenance testing and acceptance criteria were adequately specified, and maintenance and testing equipment requirements are appropriately identified. Detailed and standardized preventive maintenance work packages, including work instructions and procedures, are used extensively and were developed through the preventive maintenance optimization program efforts. System engineers review and concur on work orders performed on their assigned system as part of the work order closure process. Review of completed work packages identified no significant deficiencies.

System engineering manual procedures have established processes and mechanisms, such as system health reports and structural integrity reports, to formally document on a periodic basis system engineers' assessments of the overall material condition of assigned systems. Structural integrity reports include the structural evaluation of system components, inspection test frequencies, and consolidated work history. For example, reports prepared for the HB-Line glovebox exhaust system were informative and provided a basis for current predictive and preventive maintenance activities on system components, including recommended actions to address identified performance problems. While system health and structural integrity reports provide an excellent mechanism for summarizing overall safety system performance, their quality and completeness varied for the safety system components reviewed (see Section E.2.6).

System engineers were knowledgeable of their individual system components' configuration, operation, and maintenance requirements, and coordinated well with maintenance personnel. System engineers are well integrated into the maintenance work control processes and work directly with H-Area maintenance personnel to assist in establishing post-maintenance testing requirements, trouble-shooting equipment problems, and trending equipment and system performance. System engineers have available and routinely use vendor manuals for their assigned system components.

Maintenance history is captured and maintained in a system that permits timely retrieval for a specific component. The HCP maintenance organization uses the Passport system for work package generation and control. Maintenance history requirements for preventive and corrective maintenance are typically specified by the system engineers and/or the preventive maintenance engineering organization directly in work orders, and most work orders reviewed typically included work instructions to craft personnel for addressing maintenance work history requirements. Review of Passport system printouts and interviews with system engineers indicate that maintenance history on safety system components selected for review is being captured and is readily retrievable. System engineers are readily using maintenance work history data for trending, preparation of system health and structural integrity reports, and investigation into equipment performance problems. Bearing temperature and vibration analysis trending is used extensively to detect equipment condition and performance problems to help direct lubrication needs.

WSRC, with SR approval, has taken a graded approach to implementing a condition assessment survey process to determine deferred maintenance priorities. Rather than formally conducting periodic (e.g., once every five years) condition assessments on facilities and buildings and inputting the results into the DOE condition assessment information system, WSRC relies on its ongoing facility condition inspection processes, including system health performance and structural integrity programs, the preventive maintenance program, and assessment processes (e.g., housekeeping audits and Facility Evaluation Board [FEB] assessments), to identify deferred maintenance needs and priorities. Deferred maintenance estimate reports are maintained annually through the facilities information management system from backlog maintenance work order reports in Passport. While this approach can be effective, not all relevant facility condition needs are being fully captured to determine prioritization of deferred maintenance, in part because of the lack of maturity and the inconsistency in some facility condition inspection processes. For example, system health and structural integrity reports do not fully address the disposition of recommendations of vendor inspections for the H-Canyon sand filter roof and exhaust stack, and did not reflect needed future replacement of one of the H-Canyon exhaust fans when a previous upgrade project was not fully funded and implemented. Because none of these items resulted in the issuance of work orders that would be reflected in the Passport system, these items were not captured in the facilities information management system as part of deferred maintenance. WSRC issued a site tracking analysis and reporting (STAR) deficiency item during this Independent Oversight inspection when it was found that the sand filter roof replacement project was not being formally tracked in a prioritization list and was not reflected in system engineering facility condition reports. This deferred maintenance weakness is mitigated to a degree because H-Canyon and HB-Line were expected to be shut down during fiscal year (FY) 2006; however, because the current mission has been extended to FY 2011, tracking of deferred maintenance warrants a higher priority. In addition, WSRC had recently initiated a project to formally evaluate safety and process system component reliability needs to support the extended new H-Canyon and HB-Line mission requirements.

Safety System Component Procurement

Independent Oversight's review of safety system component procurement focused on several aspects of HCP's programs for procurement of equipment, materials, and services, including processes for determining and documenting procurement and quality assurance requirements for procured items; dedicating and documenting evaluation of new and/or replacement of commercial grade items for use in safety-class or safety-significant applications; and establishing and applying procurement-level and quality assurance controls for purchased items and services, including the identification, evaluation, and prevention of suspect/counterfeit items (S/CIs). In addition to interviews with personnel responsible for procurement activities, including responsible engineers, Independent Oversight reviewed the adequacy of engineering and procurement procedures, and documentation of performed procurement activities for safety-class and safety-significant component applications.

The HCP procurement program was adequately implemented in a number of areas, including engineering processes for technical evaluation of new and/or replacement items; processes for component dedication and like-for-like items; and processes for component acceptance, including receipt inspection, S/CI review, and acceptance testing. Safety-system component procurement processes were well defined, effectively translated into engineering and quality assurance procedures, and well integrated into maintenance work control processes.

Reviewed maintenance work packages adequately demonstrated that components and services procured for safety-related applications in systems in the scope of this inspection were obtained in accordance with the contractor's quality assurance program. Selected corrective and preventive maintenance work packages reviewed included the work instructions' quality assurance/quality control hold points to verify procurement requirements for installed items prior to installation and to ensure that the item was obtained in accordance with the contractor's quality assurance program requirements. Selected corrective maintenance work packages reviewed for the canyon exhaust system contained sufficient records that adequately demonstrated that procured materials were appropriately classified at the PL-1 or PL-2 procurement level, with a dedication/bill of materials, and receipt inspection results.

WSRC Engineering Procedure 3.46, "Replacement Item/Commercial Grade Item Dedication," adequately defines an acceptable methodology for dedicating and documenting requirements for evaluation of new or replacement commercial grade items to determine their suitability for use in safety-class or safety-significant applications, in accordance with quality assurance program requirements. The procedure requires engineering technical evaluation and identification of critical characteristics (e.g., properties or attributes) for acceptance, and selection and verification of the defined characteristics provide reasonable assurance that the commercial grade item will perform its intended safety function. Review of selected maintenance work packages requiring installation of new and/or replacement parts in the H-Canyon exhaust system and HB-Line process air system contained appropriate engineering/design documentation via replacement item evaluation/commercial grade dedication or receipt inspection criteria package forms, as required by engineering procedure. The receipt inspection criteria package forms electronically reside within the WSRC field material tracking system.

Maintenance work packages requiring installation of replacement parts in safety-class and safety-significant systems included appropriate documentation of evidence that ensured that vendor-supplied items that had been ordered were received in acceptable condition. For example, the maintenance work package for the removal and installation of a replacement safety-class pressure relief valve in the H-Canyon ventilation exhaust instrument air system contained appropriate documentation from the valve vendor, including a certificate of conformance, and material test reports for the valve received. In accordance with procedure, an approved engineering receipt inspection criteria package form was included in the work package documenting engineering-critical characteristics for acceptance for quality control receipt inspection as part of the dedication of the replacement valve.

Processes and procedures for material and equipment procurement included controls to prevent the introduction of suspect and/or counterfeit parts into safety systems. WSRC has established a controlled parts list, which includes parts and suppliers that require special control because of a prior history of S/CIs, defective items, or items that may represent a safety hazard. Receipt inspections for procured items and services include comparison of the bill of materials to the controlled parts list as well as inspections of procured equipment for S/CIs. Maintenance work packages for H-Canyon and HB-Line safety system components that required parts replacement contained forms documenting receipt inspections that included evidence of SC/I inspection of replacement parts as part of the procured item. Typically, this evidence was included as part of the receipt inspection criteria package form mentioned above.

Mechanisms have been established to ensure that controlled parts, materials, and equipment are used in the correct application and provide required quality assurance traceability after issuance from storage. In accordance with WSRC Maintenance Procedure 8.20, "Work Control Procedure," a work order bill of materials is required for all safety-class and safety-significant work packages if materials are being used as part of the work order. Bill of materials forms are generated and tracked using the WSRC field material tracking system. When a bill of materials form is issued, the receipt inspection criteria package is traced electronically to the work order via the bill of materials. All work packages reviewed for H-Canyon and HB-Line systems contained bill of materials forms, which provide traceability of controlled parts, materials, and equipment that were dedicated in a safety-related application. In addition, shelf-life requirements of stored materials are addressed in bill of materials forms, providing a mechanism to ensure that stored materials are not installed in safety-related applications beyond their shelf life.

Summary

The selected safety system components at the HCP are generally in good physical condition, and appropriate corrective and well-defined and extensive preventive maintenance is being scheduled and performed to assure the components' continued integrity, operability, and reliability. Maintenance program implementation is effective in several areas, including work package quality, post-maintenance testing, and maintenance history. The predictive and preventive maintenance programs are comprehensive and effective and constitute a noteworthy practice. Some improvements are needed in the consistency of implementation of some aspects of the facility condition inspection processes and their integration to fully support the management of deferred maintenance and reporting into the facilities information management system. Safety system procurement processes are well-defined and are being effectively implemented for procured items to ensure that they meet quality criteria and are appropriate to the intended application for safety-related SSCs.

E.2.5 Operations

The Independent Oversight team evaluated operating procedures and operator training for the HB-Line safety-related ventilation and explosive prevention components. Independent Oversight also reviewed the knowledge and capability of the operators and facility supervisors to operate HB-Line under normal conditions and to take appropriate actions in abnormal and accident conditions.

HB-Line has two control rooms, Phase I and Phase II. The Phase II control room is operated via a distributed control system (computer system) that provides detailed displays of the system parameters on various screens and provides user-friendly warnings, alarms, and controls for the operators.

The other technology fully implemented at HB-Line is an electronic operator rounds system that generates information that is collected via a tablet computer. One feature of the software allows supervisors to selectively review safety-related items, and once data is collected and verified, it is sent to Engineering and others for analysis and trending. The electronic rounds system also automatically generates messages that serve as tailored notes, warnings, and error messages if the user is using the device incorrectly, makes out-of-expected-range entries, or encounters other problems. The Independent Oversight review indicated that the electronic operator rounds program is working very well.

WSRC has established an appropriate set of operation procedures (normal operations, alarm response, follow-up procedures, round sheets, etc.) to support required safety functions. Normal operations and alarm response and follow-up procedures were clear and concise and contain appropriate actions and supporting information. Interviews and observations adequately confirmed that when an operating abnormality occurs, operators refer to the appropriate alarm response procedure(s), while the first-line supervisor or other management representative refers to the TSRs. The alarm response procedures are laid out well, and operator actions are clear and concise.

The operations training program for HB-Line is partially electronic and partially paper-based. It is detailed, thorough, and appropriate, and is administered by professional trainers as well as subject matter experts. A training simulator that replicates the Phase II control room is used extensively for training. Operators receive over 100 hours of training on this simulator and also receive training on responding to abnormal events and accidents. Detailed and easy-to-follow training is also provided on the electronic operator rounds system. HB-Line has adequately defined qualification requirements for its operators, and qualified operators have completed and documented the necessary qualifications.

The purpose of operational procedures, training, and system controls is to provide the tools and knowledge for proper operation of the safety systems. A representative group of HB-Line operators, including auxiliary, process, and control room operators, were able to accurately describe process and support systems on which they are qualified. All operators and supervisors with responsibilities for the safety features reviewed demonstrated good knowledge of the operation of the respective process or support systems. Interviews, control room observations, and Phase II control room simulator exercises demonstrated that these personnel understood system functions, operating procedures, abnormal conditions, response procedures, and system interfaces. No significant operator errors were observed in control room operations or in training settings. Operators demonstrated their familiarity with items that are important to safety. For example, Phase II operators knew the function of each refractometer sub-system, which is to close the inlet valve to its associated ion-exchange resin column if the nitric acid concentration is too high in the cold feed tank, and knew the upper concentration that must not be exceeded to prevent explosions. They also were familiar with the calculations in the procedure that ensure that the correct volumes of reagents are added to the column feed tank. Another example is that process operators were well aware of the function of the purge air injected into the process vessels, the functioning of the rotameters that monitor flow rate, and the potential consequence of failure to supply sufficient purge air flow. They were aware that the time limit for responding to loss of purge air flow depends on the liquid level in the process vessel.

During the review, Independent Oversight observed H-Area nuclear criticality training that was performed to address issues associated with the H-Area July 2005 stand-down in response to several nuclear safety-related occurrences. The training provided a presentation of the lessons learned from the 1978 Idaho Chemical Processing Plant uncontrolled criticality event. The training underscored Conduct of Operations and SRS administrative systems that help prevent a similar occurrence at SRS. The importance of procedure compliance, formal communications, and professionalism were stressed to personnel from the operations, maintenance, radiological control, engineering, training, and procedures organizations. The training demonstrated the importance of each team member's role in preventing uncontrolled criticality events.

Summary

WSRC has established effective procedures, electronic tools, and training for the safety systems reviewed such that technicians, operators, and supervisors are well prepared to monitor, calibrate, and operate the systems and associated support systems and take appropriate action in an emergency. No weaknesses were identified in procedures, electronic systems, or operator knowledge.

E.2.6 ESF Feedback and Improvement

The Independent Oversight team reviewed the WSRC and SR processes in place to ensure that deficiencies in engineering procedures and/or products, including the key areas of engineering design and configuration control, surveillance testing, maintenance, and operations, are identified, tracked, analyzed, and corrected. The results of the review of feedback and improvement are considered in the evaluation of the overall feedback and improvement program (see Appendix D).

WSRC

Safety System Engineering Function and Assessments. The primary responsibility for maintaining cognizance of a system performing essential safety functions rests with the "design authority" for that system. The WSRC engineering manual adequately describes the design authority functions and provides guidance for collecting, monitoring, and analyzing appropriate performance data to ensure the reliability and availability of safety systems. HCP design authorities for safety systems satisfy the training and qualification requirements established by WSRC for system engineers, and they demonstrate ownership in managing the design and configuration of the systems to which they have been assigned. The design authorities also support various operations, maintenance, and design modification activities associated with their systems. HCP requires the design authority to periodically prepare "system health reports" based on the results of monitoring and tracking system performance, and to present the reports to senior engineering management in a meeting involving maintenance and operations personnel, as appropriate. The design authorities routinely submit problems and deficiencies with their systems for entry into the STAR system.

HCP Engineering has a vigorous program of periodic self-assessments to evaluate and enhance the effectiveness of its system engineering processes. The self-assessments include management and team observed evolutions, coaching team observations, targeted assessments, functional area assessments, and other project assessments. These assessments cover various aspects of safety system engineering, such as the technical baseline, design changes, system modification, functional classifications, and safety documentation. In addition, the engineering program is subject to independent readiness assessments and FEB assessments.

There are a few deficiencies in HCP's operational awareness of systems and self-assessments:

- HCP has not conducted a focused self-assessment on the implementation and execution of HCP's design authority responsibilities and functions. The major responsibilities of the design authorities are detailed in DOE Order 420.1A, as well as in the WSRC engineering manual. These include maintaining system reliability and operability; monitoring, evaluating, and reporting equipment performance results; and periodically validating the applicable safety-basis commitments. The engineering manual (Procedure 1.10, Section 4.6.1) explicitly sets an expectation for performing self-assessments to ensure that all elements of the procedure are addressed.

- Schedules for a few safety system health assessments have been delayed significantly. While these assessments for safety systems are expected to be completed annually, the most recent assessment of safety-class emergency diesel generators was performed in April 2004, and the most recent assessment for the H-Canyon ventilation system was performed in October 2004. The next assessment for the latter system is not scheduled to be performed until October 2006 (a two-year interval). The assessment schedule for 2006 had not been finalized for each safety system at the time of this Independent Oversight inspection.

- The qualification requirements for a design authority do not include demonstrating performance of adequate system health assessments and reports. Also, while the engineering manual identifies the elements of a system health assessment, system design authorities are not specifically trained on assessing safety system performance.

- The variation in the level of detail and rigor in the safety system health reports may not be commensurate with their safety significance; for example, there is no clear relationship between the detail and rigor of reports and the potential for degradation and maintainability, or the results of applicable structural integrity analyses and system viability analyses.

Identification, Analysis, and Correction of Problems and Deficiencies. HCP uses the STAR database extensively to collect and analyze various types of problems and deficiencies identified through assessments and occurrences. WSRC's company-level procedure on performance analysis focuses on identifying recurring issues. The follow-up and closure of identified commitments receive significant management attention. In particular, HCP has established the Corrective Action Review Board (CARB), which evaluates the effectiveness of corrective actions and highlights on a quarterly basis a list of major deficiencies (core issues) for focused attention.

Although HCP has been collecting and analyzing the results of various self-assessments in the centralized STAR system, the effectiveness of the analysis of such assessments is limited in terms of identifying and correcting some of the principal problems underlying HCP's core issue on "Authorization Basis Technical Rigor." For example, several weaknesses in AB implementation and management of criticality safety controls were identified through FEB review and reportable occurrences during 2005. The STAR database indicates that the source for any one of the Significance Category 2 (moderate impact) open issues for HCP is either a DOE reportable occurrence or the FEB review. Some of the reportable occurrences were related to issues previously identified by the FEB (e.g., management of criticality controls for H-Canyon sumps). Subsequently, HCP implemented corrective actions to improve the knowledge and implementation of the safety basis (e.g., training on working knowledge of the safety basis and ensuring that all procedures are correctly and fully listed in the AB implementation plan). However, as noted by the FEB in a recent follow-up visit, the HCP did not fulfill its commitment to develop and implement an action plan to address weaknesses and further detail the strategy to strengthen safety basis management. The numerous examples of weaknesses in developing the safety basis of important safety systems, which have been identified in this inspection, also indicate that safety basis related issues are not being identified and corrected. The corrective actions taken lacked the necessary technical depth, and a significant opportunity to make improvements was lost. (See Section E.2.2 and associated findings, and Appendix D.)

There are certain limitations in HCP's self-assessment processes for identifying, analyzing, and characterizing significant deficiencies. The WSRC management policy on its corrective action program does not require the evaluation of the extent of condition of problems, existence of similar problems, or the potential applicability of corrective actions to other facilities or systems unless they have been assigned to Significance Category 1 ("significant" impact). Also, root causes may not be identified unless an occurrence or issue is placed in Category 1 or 2 ("significant" and "moderate" impacts, respectively). Out of approximately 350 open issues applicable to HCP at the time of this assessment, there were no Category 1 items and only about eight Category 2 items; most of the problems were either Category 3 or 4 ("minor" and "some" impacts, respectively), and thus were not always examined for pervasiveness and wider applicability. The core issues, which may be expected to receive the highest level of overall HCP management attention (e.g., "Authorization Basis Technical Rigor"), were in Category 3. Examples of Category 3 and 4 deficiencies that could have benefited from an extent-of-condition evaluation include the following: (1) the failure of a safety component nearing its end of life, where the corrective action indicates that improved preventive maintenance could prevent similar failures, and (2) problems associated with glovebox prefilters, where the evaluation, corrective actions, and lessons learned would be applicable to other facilities.

Further, the discrepancies and deficiencies for which corrective actions are straightforward may be corrected and closed without documenting the nature of the problem or its cause, and determining whether additional corrective actions are warranted (e.g., the need to increase maintenance frequency for a class of equipment, rather than performing a single repair or replacement). Thus, the opportunities for understanding the causes of problems are reduced. Also, problems may not always be sufficiently characterized to identify their deeper causes, such as the need for a broader review of the technical basis underlying limiting conditions and surveillance assumptions, or for enhanced training or procedures.

There are also several examples of corrective actions that do not appear appropriately broad considering the significance of the problems. A recent example is the discovery that work was performed on a cooling water nozzle described in the safety basis without completing the necessary USQ document, which is contrary to HCP requirements for implementing design changes. An important causal factor for this problem was that the asset information management system used in processing design changes implements the site design change form procedure, which incorrectly allows work to be initiated prior to formal USQ document approval. The corrective actions that were identified following discovery of the problem did not call for suspending (or even reporting to the appropriate site authority) the erroneous site procedure, nor did it identify the need to modify implementation of the design change form for HCP. Other examples of insufficient corrective measures include instances discussed above where the extent of condition is not adequately addressed. (See Appendix D and Finding #14, which encompasses the above-noted weaknesses in the WSRC processes above.)

SR

SR initiated its safety system oversight (SSO) program for defense nuclear facilities over two years ago and has assigned two qualified SSO engineers to HCP facilities (one each to the H-Canyon and HB-Line). The approach used by SR in implementing its SSO program is for the SSO personnel to serve as general engineers who would be cognizant of most or all safety systems regardless of the primary field of their engineering expertise. For example, the individual responsible for SSO at H-Canyon is a mechanical engineer who is assigned about 36 safety systems, several of which are electrical or instrumentation and control systems. Exceptions are the radiation and nuclear incident monitoring systems, which have been assigned to another engineer with expertise in those areas.

The expectation that routine vital safety system assessments will be conducted for HCP facilities is stated in the annual assessment plan issued by the SR Assistant Manager for Nuclear Material Stabilization Project. The plan addresses the oversight assessments under various programs, including the Facility Representative and technical assessment programs. SR's site issues management and technical assessment system (SIMTAS) database provides formatted criteria and lines of inquiry for documenting SSO assessments and event investigations. A number of HCP-related assessments and investigations have been documented in the SIMTAS database.

In November 2005, SR took the initiative to obtain an independent review of its overall SSO program that focused primarily on programmatic aspects of the SSO, such as the qualification program and performance requirements. The review identified a few deficiencies as well as some positive aspects and concluded that the SSO function was effectively implemented. The independent review was not specifically focused on the HCP and did not specifically examine SSO activities to assess the H-Canyon and HB-Line safety systems or associated safety-basis documents, and therefore did not specifically examine some of the elements that were reviewed by Independent Oversight on this inspection.

There are several indications that the HCP SSO program is not adequately defined or adequately implemented as required by the SR functions, responsibilities, and authorities procedure (SRM 306.1.1B) and DOE Manual 426.1-1A:

- SSO program implementation is not consistent with guidance in DOE Manual 426.1-1A that SSO should be considered the primary function of assigned personnel. Also, the approach of assigning a large number of diverse types of facility safety systems to SSO personnel serving as general engineers, as mentioned above, could duplicate several functions of Facility Representatives and does not ensure that each safety system will receive the needed technical oversight by a specialist in the applicable engineering field. SSO personnel assigned to HCP typically devote about 15 percent of their time to the primary SSO functions, such as maintaining oversight of the contractor's safety system engineering performance and performing periodic assessments and evaluations of equipment configuration and condition. Their primary responsibilities are to lead and coordinate the review of safety basis documents and issues, coordinate resolution of comments, prepare SERs, and obtain their approval. They are also responsible for assisting Facility Representatives at their facility on engineering issues as they arise.

- Several major HCP safety systems (e.g., HB-Line glovebox ventilation and explosion prevention systems) have not received a documented DOE system performance assessment. In 2005, most of the documented reviews by SSO were follow-up reviews of reported occurrences and other issues rather than proactive system assessments.

- Significant observations in SSO reviews or system assessments have not always been followed up. For example, an issue about an inadequate technical basis for assumptions in an HB-Line LCO regarding the availability of normal electric power has received little action from the contractor and remained open in the STAR system for over eight months (see Section E.2.2).

- There is no specific schedule for any system assessments to be performed, nor have any HCP systems been selected or prioritized for a focused review or general assessment.

- Although SSO personnel assigned to HCP devote a major portion of their time to AB review and oversight activities, there are significant weaknesses in AB development and implementation by the contractor, as indicated in the independent review by WSRC's FEB and the results of this Independent Oversight inspection (see Sections E.2.1 and E.2.2, and associated findings). Also, SR oversight did not assure that the contractor developed and implemented an effective corrective action plan in response to FEB AB-related findings. These deficiencies indicate that SR's oversight of the safety basis for HCP facilities has not been sufficiently effective.

- There is no description of, or guidance on, how SSO duties, responsibilities, and functions should be executed, especially taking into account the major AB work responsibilities of SSO personnel and the number and diversity of systems assigned to them. For example, there is little guidance on the scope, extent, and duration of periodic evaluations or the approach to selecting appropriate systems or topics for review.

- Protocols do not appear to be in place for the HCP SSO personnel to be routinely informed of WSRC design authorities' system health assessment presentations and other pertinent periodic performance analyses and assessments performed by HCP Engineering.

Finding #18. SR has not adequately implemented the safety system oversight functions for HCP facilities.

Summary. WSRC HCP has an extensive and vigorous program of self-assessments and independent assessments that cover various aspects of safety system engineering. However, it has not fully assessed the important design authority responsibilities and functions relating to monitoring, trending, and assessing safety systems. Also, there are some weaknesses in the HCP processes for identifying and correcting deficiencies related to engineering design and the AB. SR has recently qualified its two engineers assigned to the HCP facilities under its SSO program and has conducted some oversight investigations and assessments. However, the program is not adequately defined or described, and implementation of the SSO and AB review and oversight functions for HCP facilities is inadequate.

E.3 Conclusions

The configuration management aspects of the process for generation and control of design documents are noteworthy and can be used as a positive example for the DOE complex. With few exceptions, most of the reviewed procedures and processes correctly translated regulatory requirements. The processes are well thought out and web-link driven, which allows for efficient implementation with minimal errors. However, while many aspects of the contractor's engineering and configuration management programs were comprehensive and well defined, the number and nature of the technical discrepancies identified for the safety systems reviewed indicate that the engineering design program and processes are not being executed with the rigor, attention to detail, and questioning attitude necessary to assure reliable performance of accident prevention and mitigation functions, and warrant increased management attention and action. An extent-of-condition evaluation is needed to determine the full extent of deficiencies with the H-Canyon, HB-Line, and other SR nuclear facility AB documents.

The surveillance procedures are well written and controlled, and are being performed and completed in a rigorous manner; however, a few surveillances did not fully demonstrate the readiness of some safety-related systems due to inadequacies that resulted in incorrect test criteria. Operating procedures, electronic systems, and operator training for the safety systems reviewed were effective such that technicians, operators, and supervisors are well prepared to monitor, calibrate, and operate the systems and associated support systems and take appropriate action in an emergency. Safety system components are generally in good physical condition, with appropriate corrective and preventive maintenance being scheduled and performed to assure the components' continued integrity, operability, and reliability. Some improvements are needed in the consistency of implementation of some aspects of the facility condition inspection processes and their integration to fully support the management of deferred maintenance and reporting into the facility information management system. In addition, safety system procurement processes are well defined and are being effectively implemented for procured items to ensure that they meet quality criteria and are appropriate to the intended application for safety-related SSCs.

WSRC HCP has an extensive and vigorous program of self-assessments and independent assessments covering various aspects of safety system engineering. Some aspects of the contractor's system engineering program have not been fully assessed, and there were weaknesses in the feedback processes to identify and correct major deficiencies related to engineering design and the AB. Although SR is making progress in the qualification of SSO engineers assigned to the HCP facilities and has conducted some oversight investigations and assessments, HCP SSO program, overall, is not adequately defined or described, and HCP's implementation of the SSO and AB review and oversight functions for its facilities is inadequate.

E.4 Ratings

Configuration Management Programs and Supporting Processes .... EFFECTIVE PERFORMANCE
Engineering Design and Authorization Basis .... SIGNIFICANT WEAKNESS
Surveillance and Testing ....NEEDS IMPROVEMENT
Maintenance and Procurement.. EFFECTIVE PERFORMANCE
Operations .... EFFECTIVE PERFORMANCE

E.5 Opportunities for Improvement

This Independent Oversight 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. **Evaluate and define the strategy for implementing the SSO program at HCP and other nuclear facilities consistent with DOE guidance, and provide more specific expectations and guidance on SSO program implementation.** Address the following elements:

   - The priorities for reviewing H-Canyon and HB-Line ventilation safety-related systems for design, AB, and surveillance testing rigor and technical adequacies
   - The scope and extent of periodic evaluations of systems versus the assessment and oversight of the work performed by the contractor's cognizant system engineers
   - The approach to prioritization of systems and selection of system parameters to be monitored
   - The frequency and duration of monitoring and assessment efforts to ensure that all safety systems are adequately covered
   - Documentation of system information and assessment results
   - Protocols for ensuring cognizance of pertinent contractor activities and initiatives
   - Processing and follow-up on issues and recommendations.

2. **Revisit the DOE Order 430.1B implementation strategy to consider a graded (e.g., facility by facility) approach to full implementation of DOE Order 430.1B requirements based on long-term facility mission requirements.**

   - Determine which SRS facilities have long-term mission requirements.
   - Review the current deferred maintenance information for the long-term mission facilities, and perform a field verification to establish the usefulness of the existing information.
   - Establish priorities for each facility and revise deferred maintenance information, as appropriate.

WSRC

1. **Revise Procedure 2.37 (in Manual E7) to explicitly require a formal USQ screen prior to field work authorization**.

2. **Revise the JCO process.** Ensure that it requires:

   - Documentation of the entire DSA review, including all outstanding JCOs when a new JCO is initiated
   - Documentation of the review of all outstanding JCOs during the annual DSA review
   - A USQD review and/or SR approval prior to JCO closure.

3. **Require the "core" engineering personnel at each facility to be knowledgeable in the facilities' ABs to improve the quality of engineering products and USQDs.**

4. **Initiate a focused, concerted project to review and improve the quality, depth, accuracy, and validity of the ABs at H-Canyon, HB-Line, and other SRS nuclear facilities**. While some elements and aspects of the items below had already been identified by WSRC staff as areas needing additional attention, the project should seek to rigorously and comprehensively accomplish the following:

   - Identify all statements of capability, capacity, performance, and endurance with regard to all important-to-safety SSCs.
   - Identify, locate, and place under document control all calculations, analyses, and tests that support the AB statements.
   - Perform thorough technical reviews of each of these supporting documents to verify their accuracy, validity, applicability, and rigor; and where they are found deficient, perform corrections, additional analyses, and additional tests to correct these deficiencies.
   - Where such supporting documentation cannot be identified and located, generate new analyses and tests that will support these statements.

- Where AB statements, terms, and capabilities are unclear, ambiguous, conflicting, inconsistent, inaccurate, or inadequate to clearly and completely define the critical functions and missions, including mission times, durations, and roles of important-to-safety SSCs, revise these documents as required to correct these deficiencies.

- Re-review all accident and event scenarios to assure that the scenarios considered truly envelop the worst-case scenarios in all aspects—in terms of both probability and consequences, and in terms of the capabilities of the safety-related SSCs to prevent and mitigate those scenarios. Ensure that all events within event-type bins of apparent lesser severity or consequences do not in fact create circumstances where current analyses or equipment capabilities are not enveloping.

5. **Institute a concerted project to review the designs of the SSCs at H-Canyon and HB-Line and at other SRS nuclear facilities to verify that they are indeed capable of performing their design safety functions, for both normal operating and accident conditions.** At minimum, this project should include the following:

   - Review and validation of all basic design drawings, such as piping and instrumentation diagrams, one-line diagrams, and elementary drawings

   - Review of all supporting design calculations and analyses for accuracy, applicability, completeness, and rigor to assure their quality

   - Verification of SSCs' compatibilities and capabilities with respect to interfacing and supporting SSCs and the SSCs they support

   - Detailed walkdowns of SSCs to verify that actual hardware and conditions are as described in the designs and the ABs.

6. **Initiate a focused, concerted project to review all facility technical procedures and practices relating to safety SSCs, beginning with the TSR surveillance test procedures, to verify that they correctly and completely translate the requirements of the AB and the SSCs' designs**.

7. **Establish and apply high standards of rigor, attention to detail, and a questioning attitude to all safety-related endeavors**. Specific actions to consider include:

   - Maintain ongoing, close communication with and integration of all facets of the nuclear organization.

   - Revise training protocols and management emphasis for system engineers, design engineers, AB engineers, facility technical managers, and other technical personnel to instill a culture of constantly questioning and challenging all nuclear safety aspects of their respective areas of responsibility and of interfacing organizations that support or are supported by their organization.

   - Conduct a comprehensive self-assessment of all significant design authority functions and responsibilities, especially as they relate to safety systems.

8. **Improve the consistency of facility condition processes and their integration to fully support the management of deferred maintenance and reporting into the facility information management system, consistent with the overall objectives of real property life-cycle asset management contained in DOE Order 430.1B.** Specific actions to consider include:

   - Review engineering procedures and guidance for SSC performance monitoring and the structural integrity program to improve standardization of reporting requirements.

   - Ensure that expectations for the inclusion of work history captures the results of vendor inspections and the completion status of upgrade projects, including the disposition of recommended actions, as appropriate. Consider providing model report examples for system engineers to follow as part of procedural guidance.

   - Require System Engineering to periodically review the facility information management system database for assigned SSCs to ensure that all deferred maintenance is accurately captured.

9. **Improve the description, categorization, and analysis of problems, deficiencies, and issues identified in various types of internal reviews and self-assessments.** Specific actions to consider include**:**

   - Provide training on conducting safety system assessments.

   - Develop clearer criteria and guidelines for categorizing the significance of problems, deficiencies, and issues. Evaluate the benefits of additional significance categories and sets of criteria different from those used for reportable occurrences, which could provide more effective groupings for guiding determinations about the extent of conditions, causal analyses, and corrective actions (the purpose of issue or deficiency categorization may not be served if almost all issues fall into a single category).

   - Provide direction and guidance to personnel conducting reviews and recommending corrective actions to include a sufficient description of the nature and cause of problems and deficiencies observed, even though the corrective action may be simple and straightforward, and to routinely consider the potential for similar problems and their causes to exist in other systems or facilities when providing recommendations for corrective actions to prevent recurrence.

   - Ensure that sufficient detail is available on specific corrective actions in the STAR system when commitments that involve developing an action plan are closed for major problems or issues (e.g., HCP core issues).

   - Ensure that distinct types of issues and problems (from the standpoint of their causes) observed in a single review (e.g., senior supervisory) are analyzed separately and not lumped together as a single STAR item.

   - Consider periodically reviewing operating experience and incorporating the lessons learned from other projects and DOE sites relative to the methods used in performance analysis for identifying recurring issues.

- Consider staffing FEBs and other technical evaluation teams with senior-level engineers who have hands-on nuclear design experience and hands-on field engineering applications experience. Use such engineers to increase the depth and detail of the technical evaluations of the AB, the designs, and the translation of the AB and the designs into facility technical procedures and processes.

APPENDIX F
MANAGEMENT OF SELECTED FOCUS AREAS

F.1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight (Independent Oversight) inspection of environment, safety, and health (ES&H) at the Savannah River Site (SRS) included an evaluation of the effectiveness of the Office of Environmental Management (EM), National Nuclear Security Administration (NNSA), Savannah River Operations Office (SR), Savannah River Site Office (SRSO), and Washington Savannah River Company (WSRC) in managing selected focus areas. Based on previous DOE-wide assessment results, Independent Oversight identified a number of focus areas that warrant increased management attention because of performance problems at several sites. During the planning phase of each inspection, Independent Oversight selects applicable focus areas for review based on the site mission, activities, and past ES&H performance. In addition to providing feedback to EM/SR, NNSA/SRSO, and WSRC, Independent Oversight uses the results of the review of the focus areas to gain DOE-wide perspectives on the effectiveness of DOE policy and programs. Such information is periodically analyzed and disseminated to appropriate DOE program offices, sites, and policy organizations.

The focus areas selected for review at SRS and discussed in this appendix are:

- Environmental management system (EMS) and pollution prevention programs (see Section F.2.1)
- Workplace monitoring of non-radiological hazards (see Section F.2.2)
- Safety management for protective force training (see Section F.2.3).

One focus area—the status of DOE Policy 226.1 and DOE Order 226.1 implementation—is closely related to feedback and improvement processes and is discussed in Appendix D (see Section D.2.4). Two focus areas (quality assurance in engineering and configuration management programs and processes, and safety system component procurement) are closely related to essential system functionality and are discussed in Appendix E. The focus areas are not rated separately, but results of the review of the focus areas are considered in the evaluation of integrated safety management (ISM) elements in Appendices C, D, and/or E, where applicable.

F.2 Results

F.2.1 Environmental Management System and Pollution Prevention Program

Executive Order 13148, *Greening the Government Through Leadership in Environmental Management*, and DOE Order 450.1, *Environmental Protection Program*, required DOE sites to implement an EMS by December 31, 2005. Independent Oversight selected the EMS as a focus area for 2006 to provide feedback to DOE management on the effectiveness of implementation of the new EMS program by line organizations at DOE sites across the complex. At SRS, Independent Oversight evaluated the SR program management and oversight for EMS activities and the WSRC EMS program structure at the Savannah River National Laboratory (SRNL), the H-Canyon, and the tritium facility. Independent Oversight also evaluated implementation of key EMS elements at SRNL.

SR

The EMS at the site is mature; the site obtained International Organization for Standardization (ISO) 14001 certification by a third-party registrar for the EMS in 1997. In 2005, SR determined that SRS fully conformed to the EMS requirements of DOE Order 450.1 and that the requirements were reflected in the site contract and the integrated safety management system (ISMS)/EMS. SR notified the Office of Environmental Cleanup and Acceleration (EM-20) that the SRS met the DOE Order 450.1 requirements for policy, implementing procedures, and establishment of "significant aspects" (a set of activities that are regulated or could impact the environment and that need to be monitored or controlled) for waste minimization and compliance with environmental requirements. In addition, based on their determination that the EMS fully met DOE Order 450.1 requirements, SR concurred with the WSRC decision to not continue third-party certification.

The SR Environmental Quality Management Division (EQMD) oversees the EMS and has assigned an environmental lead to each SR line organization. In coordination with NNSA/SRSO, the EQMD also oversees environmental aspects of NNSA's tritium activities and has assigned an environmental lead for the tritium facilities. In addition, an EQMD lead is designated as SR's technical expert for the EMS. EQMD appropriately sets expectations and priorities and provides effective oversight of the EMS and other environmental activities. SR's EQMD subject matter experts (SMEs) regularly participate on WSRC environmental assessments, which are generally effective in identifying and correcting environmental deficiencies (see Appendix D). SR environmental managers and staff also participate in weekly meetings with their WSRC counterparts to resolve environmental concerns and ensure continued compliance. These weekly meetings are comprehensive and include discussion of environmental compliance and pollution prevention, both of which have been identified as EMS-significant aspects by WSRC. EQMD and the SR Facility Representative (FR) adequately coordinate their respective efforts to ensure that EQMD environmental SMEs are involved in evaluating environmental compliance concerns and EMS implementation.

WSRC

In implementing the EMS, WSRC has incorporated environmental compliance and pollution prevention into SRS institutional manuals and procedures, and has developed significant institutional environmental aspects for waste minimization and compliance with environmental requirements. SRNL, H-Canyon, and tritium organizations have integrated EMS elements into their respective research and development, facility maintenance, and operations activities as part of their ISM program. These organizations have also established appropriate processes for review of work packages by environmental professionals. For example, at H-Canyon, the environmental compliance authority (ECA) and the generator certification official review work packages (if waste other than sanitary trash is identified in the assisted hazards analysis [AHA] question set) to ensure that waste and environmental requirements are incorporated into the AHA/safe work permit or the work instruction.

ECAs also support environmental compliance efforts as part of the EMS-significant aspects. For example, when tritium facility environmental monitoring data showed an increasing trend in air emissions, the ECA reviewed operations and identified process changes in facility operations that minimized emissions. Similarly, Independent Oversight's evaluation at SRNL showed that the EMS-significant aspect for environmental compliance has been effective and that ECAs provide appropriate environmental support and expertise for SRNL laboratory and research activities, including the Aiken County Technology Laboratory, which must meet additional environmental lease requirements. For example, the ECA for hazardous waste compliance at the SRNL reviews the environmental evaluation checklist to ensure that hazardous waste requirements are specified in the experiment package, confirms that Resource Conservation and Recovery Act (RCRA) requirements are met at hazardous waste facilities, and assists waste generators with proper management of hazardous waste.

As one of the EMS-significant aspects, SRNL, H-Canyon, and tritium organizations have established pollution prevention goals that call for each organization to reduce low-level waste, hazardous waste, mixed waste, and transuranic waste streams by 10 percent from the forecasted amounts. These organizations have taken a number of appropriate actions to meet their goals, such as incorporating pollution prevention/waste minimization into operations, and establishing organizational-level technical procedures. For example, the H-Canyon *Solid Low-Level Waste and Green is Clean Waste Handling Procedure* provides for extensive waste minimization actions and uses the "Green is Clean" program to ensure that non-radioactive waste from nuclear facilities is not contaminated or treated as low-level waste. Independent Oversight observed workers at H-Canyon actively using the "Green is Clean" cans as part of the work activities, indicating that the program is effective. H-Canyon has also developed extensive waste minimization plans that discuss the organizations involved, the requirements, the methods and programs to be used, a waste minimization checklist, and an example of a project to reduce waste. At SRNL, the environmental evaluation checklist includes requirements to evaluate ways to reduce or eliminate the waste generated during experiments. As part of the development for the new tritium extraction facility, a process waste assessment was performed to evaluate the disposal path for each expected waste stream and to consider waste minimization and alternatives for reducing waste generation during the concept stage. As a result of these actions, the organizations are achieving their established goals. In addition, in fiscal year 2005, WSRC received national awards for pollution prevention and met or surpassed cumulative goals set by DOE.

Summary

The EMS has been implemented pursuant to DOE Order 450.1 and incorporated into line operations by WSRC for both EM and NNSA activities at SRS. SR provides effective oversight for EMS-significant aspects (including the NNSA activities) by participating in contractor assessments and frequently interacting with WSRC environmental management and staff. The EMS is mature, and related requirements have been fully integrated into line operations. Pollution prevention programs have been implemented within line organizations at SRS, and waste reduction goals are being achieved, which has resulted in SRS receiving a number of awards and national recognition.

F.2.2 Workplace Monitoring of Non-Radiological Hazards

DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, establishes requirements for line management to ensure that workplace monitoring has been effectively implemented for Federal and contractor workers, including subcontractors. Worker exposures to chemical, physical, biological, or ergonomic hazards are to be assessed through appropriate workplace monitoring (including personal, area, wipe, and bulk sampling), biological monitoring, and observations. Monitoring of results must be formally recorded, and documentation should include: (1) the tasks and locations where monitoring occurred, (2) identification of workers monitored or represented by the monitoring, (3) identification of the sampling methods and durations, and control measures in place during monitoring (including the use of personal protective equipment), and (4) any other factors that may have affected sampling results. The new Occupational Safety and Health Administration (OSHA) rule creates enforceable provisions in the area of workplace monitoring, and further emphasizes the need for effective workplace monitoring programs.

During this inspection, the Independent Oversight team reviewed work activities at SRNL, tritium facilities, and H-Canyon in which workers could be exposed to chemical, physical, biological, and ergonomic hazards. In addition, the team reviewed the current state of the WSRC non-radiological worker exposure program as defined in procedures, instructions, and various presentations. The team also reviewed the status of corrective actions with respect to the 2004 Independent Oversight review in which there was a finding related to the WSRC exposure assessment program.

WSRC Exposure Assessment Program

The WSRC exposure assessment program is defined in WSRC Manual 4Q1.1, Procedure 101A, “Exposure Assessment,” which is intended for use by the WSRC Industrial Hygiene staff for assessing workers’ potential for occupational exposures, and to define similar exposure groups. This WSRC procedure provides the WSRC expectations for providing characterization of chemical, physical, and biological agents identified in the workplace, which represents a reasonable exposure potential. This procedure also describes the methods for qualitative evaluation of hazardous chemicals and re-evaluations of the workplace. In addition to Procedure 101A, there are a number of WSRC procedures in the WSRC 4Q and 8Q Manuals that also provide requirements for workplace exposure assessments as a basic element of the work activity (e.g., laser use and chemical use). Collectively, these procedures provide a basic foundation for the conduct of workplace exposure assessments.

As a result of the 2004 Independent Oversight inspection, a finding on the WSRC exposure assessment programs was issued, stating that “WSRC is not analyzing and documenting occupational exposures to some hazards (noise, hazardous chemicals, and beryllium) in accordance with the requirements of DOE [Order] 440.1A and site requirements.” Subsequent to this finding, WSRC issued four corrective actions that resulted in improvements to the exposure evaluation process, plans, procedures, and protocols. These actions were completed in late 2004, and the finding was closed in December 2004. In January 2006, the WSRC Industrial Hygiene manager conducted a self-assessment of the four corrective actions and the effectiveness of their implementation. As a result of the self-assessment, WSRC Industrial Hygiene management concluded that "while procedure revisions and staff training have resulted in great improvements in the consistency and quality of the documentation package, there remain opportunities for improvement in execution of the Exposure Assessment Process." The Independent Oversight inspection team concurs with the WSRC conclusion, and most of the additional improvement plan recommendations to be completed during calendar year 2006 are appropriate.

With respect to improvements to the overall exposure assessment program, a number of actions, either completed or in progress, are potentially significant for improving the quality, data management, and effectiveness of the WSRC exposure assessment program. For example, since the 2004 Independent Oversight inspection, the Industrial Hygiene forms database has been implemented to provide a mechanism for recording, retrieving, managing, and trending data important to exposure assessments, such as sample data and workplace characterization. The eleven electronic forms that constitute the Industrial Hygiene database are provided in a searchable, user-friendly database, which is available to the Industrial Hygiene staff for recording and trending, and to line management, including medical staff, for retrieval and review. In another example, the Industrial Hygiene Department has obtained the management resources and tools to critically review the allocation of Industrial Hygiene resources across the site to best allocate the limited number of industrial hygienists and technicians to those potential workplace exposure activities that present the greatest risk. The Industrial Hygiene Department has also used these new risk management resources to evaluate the effectiveness of the medical surveillance program with respect to recording, trending, and evaluating worker exposures. Several opportunities for improvements in the medical surveillance program have been identified as a result of this review. The WSRC AHA process has also improved the capabilities of line management to involve Industrial Hygiene in work activity reviews. Currently the AHA process requires an Industrial Hygiene review for 31 specific types of work activities, ranging from microwaves and lasers to highly toxic chemicals.

Although progress in the development of the exposure assessment program is evident, much work remains at the exposure assessment program level. The Industrial Hygiene forms database is new, and procedures for use of the database, application of the forms, and consistent sitewide implementation have not yet been completed. A number of WSRC-identified exposure assessment program improvement items also need to be completed. Conducting exposure risk assessments at the facility and site level to determine which industrial hygiene risks pose the greatest potential for health risks has just begun, with the "mining" of data now available though the AHA process.

Implementation of the Exposure Assessment Program

Although there has been progress at the facility and work activity levels with respect to implementing the WSRC exposure assessment program (a work in progress), there are considerable gaps in the identification, analysis, and particularly the documentation of worker exposures to chemical, physical, biological, and ergonomic hazards. Fully implementing and maintaining a workplace exposure and monitoring system, as envisioned in DOE Order 440.1A, for the diverse types of work at SRS is a significant challenge, but one that is critical to ensure that workers and line managers are fully aware of the hazards and health effects to which they are exposed and the magnitude of those hazards.

During this Independent Oversight inspection, the team identified several workplace exposures from the limited number of work activities at SRNL, the tritium facility, and H-Canyon that were not identified, analyzed, and/or documented. For example:

- Airborne hazards from chemicals for several work activities at H-Canyon are being assumed, but the magnitude of the hazard or worker exposures has not been adequately analyzed or documented to justify the hazard control (i.e., plastic air suits).

- The beryllium sampling and exposure data and the beryllium sampling plan for work conducted do not adequately support the current workplace exposure controls in one facility.

- Worker exposures to welding fumes in the tritium Building 248-H welding shop were not adequately evaluated.

- At SRNL, the sand/bead blasting filters in Buildings 749-A and 723-A did not have a hazards analysis when performing maintenance or cleaning, and the worker exposures to dust are currently not known. Similarly, the potential aluminum dust hazard from a polishing operation in Building 749-A had not been recognized and was subsequently not analyzed by Industrial Hygiene. In addition, the potential lead exposure hazards from benchtop soldering work without local ventilation in the robotics lab had not been identified by line management or analyzed by Industrial Hygiene.

In addition, several other concerns were identified with the implementation of workplace exposure monitoring, specifically:

- Many of the Industrial Hygiene assessments being performed in the field are not being documented in either the Industrial Hygiene forms database or in work packages. As a result there is no record of the requirement for an exposure assessment, no record of the exposure assessment being conducted, and no requirements resulting from that assessment (e.g., local ventilation controls). One field industrial hygienist indicated that typically only 10 percent of his Industrial Hygiene exposure evaluations are documented because of an increasing workload and limited resources.

- In some cases, the workplace exposure data, when documented, contains errors or omissions that question the validity of the results (e.g., personal protective equipment observed during sampling was not correctly indicated on the form, there were clerical errors in documenting beryllium swipe samples, and no documentation existed for calculations that were performed to support photo-ionization detector results).

- For several activities, particularly work performed in shops (e.g., machine shops), recent worker exposure or qualitative risk assessment data does not exist, or is not current with respect to changing work and facility conditions (e.g., SRNL Buildings 749 and 723).

- In a number of examples, line management and workers were not knowledgeable of their exposures to some hazards, and lacked an understanding of how and when to use the local ventilation systems to minimize their exposures.

- In some cases, there is over-reliance on area or short-term monitoring using a direct-reading instrument with limited sensitivity in lieu of full-shift monitoring of the workers' breathing zone.

Summary

Overall, there has been progress in the continuing development of the WSRC exposure assessment program since the 2004 Independent Oversight review. Several ongoing or planned initiatives related to the Industrial Hygiene forms database, the implementation and mining of risk metric data from the new AHA process, improvements in the inclusion of medical exposure data in the medical surveillance program, and planned Industrial Hygiene management initiatives will result in a more robust and effective exposure assessment program. However, many challenges lie ahead, particularly in the implementation of workplace monitoring and documentation of exposure assessments in support of work activities. Concerns with workplace exposure monitoring have also been expressed by SR to WSRC during monthly performance evaluation meetings. Continued management attention is required to ensure the development and implementation of a more effective workplace exposure assessment program.

Finding #19. SRS non-radiological workplace exposures have not been sufficiently analyzed and/or documented for some facilities and for a number of work activities as required by DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees.*

F.2.3 Safety Management for Protective Force Training

Because of previously identified weaknesses and the challenges associated with the 2005 Design Basis Threat and "elite force" concept, Independent Oversight identified a need for an increased focus on safety management involvement in protective force training. The DOE corrective action plan for addressing weaknesses identified in the Inspector General's report committed Independent Oversight to examine selected aspects of protective force training from a safety management perspective during Independent Oversight ES&H inspections.

At SRS, the protective force is managed by Wackenhut Services, Incorporated (WSI)-SRS under a direct contract to SR. Within SR, the Office of Safeguards, Security and Emergency Management sets expectations, prioritizes tasks, allocates funding, and conducts oversight of WSI-SRS activities, and its emergency management and protection team (EM&PT) is responsible for performing line management oversight of the protective force to ensure effective operational performance, quality assurance, cost effectiveness, and effective safety management controls in accordance with the 2006 SR performance management plan.

SR actively oversees the protective force training program, primarily through two members of the EM&PT—a Senior Facility Representative and a protective force training specialist. Both individuals have extensive military experience and are thoroughly integrated into the WSI-SRS training process and activities. Their experience and involvement is particularly beneficial as WSI-SRS enhances its tactical capabilities to meet the 2005 Design Basis Threat. The EM&PT effectively implements its oversight responsibilities through various activities, such as review of the annual WSI-SRS training plan, review and annual update of any memoranda of agreement with local law enforcement, review and approval of job task analysis documentation submitted by WSI-SRS, and review of protective force procedures, self-assessment reports, facility walkdowns, drill and exercise scenarios, and force-on-force proposals. In addition, the Facility Representative and security specialist spend many hours in the field observing protective force training and are engaged in WSI-SRS safety meetings and committees, encompassing range safety, protective force equipment design and purchase, training objectives, and feedback and improvement committees. Through interactions with Office of the Assistant Secretary for Environmental Management (EM-1), the Office of Security and Safety Performance Assurance, and WSI-SRS, the EM&PT has emphasized the need to prevent worker injuries and accidents as the protective force increases tactical training objectives at the security police officer (SPO) II and III levels. Accordingly, the EM&PT has focused on reviewing new training lesson plans, walking down proposed training sites, reviewing accident/incident investigations, and attending planning sessions to ensure that safety is incorporated into all training objectives.

Based on a selective review of protective force training documentation for training activities scheduled during the Independent Oversight data collection visit, management system descriptions and executive and safety committee minutes demonstrated a recognition and commitment to the principles of ISM. Hazard and risk assessments concerning the firing range were consistent with DOE Standard 1091-96, *Firearms Safety*. Training documents (e.g., lesson plans for the observed protective force training, safety checklists, scenario descriptions, and consolidated risk assessment forms that described hazards and controls for ranges) demonstrated conformance with the formal safety process. SR and WSI-SRS management and instructors demonstrated that proposed protective force training and/or equipment would be fully evaluated before training was performed in the field.

WSI-SRS management provides for professional safety support and monitoring at several levels within the organization. The performance assurance and safety division managers and staff support occupational safety and health, environmental protection, performance assurance, and quality assurance programs. In addition, the training division has several safety-related positions to support the range officers, and training instructors, including fitness instructors, coordinate and evaluate fitness regiments for individual employees to ensure safe and effective fitness training. The safety and quality organization regularly performs audits and assessments of training, equipment, and performance. The audit outcomes are shared with SR, and corrective actions are tracked and evaluated for completion. Industrial Hygiene performs monitoring as required by the DOE firearms safety standard and ensures that lead and noise sampling is performed and evaluated.

Independent Oversight observed evolutions of two situational training exercise (STX) modules, which were developed to help SPO II forces improve tactics that will better address the evolving security mission. The first training module included use of dye marking cartridges (paint balls) and work on small team tactics (e.g., taking cover, communicating observations, tactical movements, and small arms fire under a variety of conditions). The second module was a live-fire exercise that emphasized tactical movements. In both modules, the lesson objectives and safety briefings were effectively communicated to the training class, which was closely supervised (i.e., one instructor for each trainee for the duration of the lesson). The dye marking cartridge weapons and munitions were treated as live-fire weapons, and the range safety precautions were in effect during the training course. Visitors and trainees were checked for live ammunition before entering the training grounds. For the live-fire exercise, WSI-SRS substituted simulated weapons during the tactical movements to preclude an accidental weapons discharge. The range master designed a challenging and realistic course and effectively incorporated safety through such measures as frangible rounds, self-resetting targets, and state-of-the-art hearing protection. First-aid equipment and emergency communication were in place and effective at the firing range during Independent Oversight's walkdown.

Summary

EM, SRO, and WSI-SRS have integrated a formal safety process into protective force training at SRS. SR has established a skilled protective force team that provides oversight and direction to protective force training conducted at SRS. WSI-SRS has established a formal safety program that includes management plans, procedures, safety committees, risk analysis documentation, lesson plans, and safety briefings to ensure training effectiveness and safety. Firing range instructors are experienced and certified as required by DOE standards, and demonstrated effective and innovative incorporation of safety measures. Observations of protective force training indicated that safety was a high priority and was effectively incorporated into lesson plans.

F.3 Conclusions

EM/SR and WSRC have devoted appropriate attention and resources to implementing the EMS and safety of protective force training, and these programs are generally comprehensive and effective. Similarly, EM/SR and WSRC have devoted significant attention to improving the exposure assessment program and have made considerable progress. However, there are some implementation weaknesses and challenges associated with implementation of workplace monitoring and documentation of exposure assessments in support of work activities.

F.4 Opportunities for Improvement

This Independent Oversight 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.

WSRC

1. **Improve line management accountability and the tools for conducting non-radiological workplace exposure assessments.** Specific actions to consider include:

    - Include accountability for ensuring the conduct and documentation of workplace exposure assessments in each line manager's performance appraisal.
    - Require line managers to develop as low as reasonably achievable (ALARA)-type goals for conducting and documenting exposure assessments.
    - Ensure that Industrial Hygiene resources assigned to line management are sufficient and allocated based on health risks to workers.
    - Include workplace exposure assessments as a self-assessment to be conducted by line managers.
    - Continue efforts to complete and implement the recovery plan for medical surveillance, and develop effective linkages to worker exposures.

2. **Continue efforts to improve the development of the SRS exposure assessment program and the effectiveness of implementation in the field.** Specific actions to consider include:

    - Ensure that the planned Industrial Hygiene improvement initiatives for the exposure assessment program are completed.
    - Enhance the implementation and use of the Industrial Hygiene forms database.
    - Improve the documentation of field risk and exposure assessments and workplace monitoring in work packages and Industrial Hygiene records.

WSI-SRS

1. **Continue to emphasize the identification and reduction of training activities that could cause injury or illness.** Specific actions to consider include:

    - Maintain awareness of potential hazards and controls from risk assessments, lessons-learned databases, and technical documents.

- Ensure that personal protective equipment is available and properly utilized by trainees.

- Encourage SMEs to evaluate training lesson plans and actual training evolutions for potential hazards and controls.

2. Evaluate the need to monitor for impact and impulse noise levels from firearms and pyrotechnic devices used in training exercises and qualification examinations.

Abbreviations Used in This Report (Continued)

ESF	Essential System Functionality
ETMB	Executive Technical Management Board
FEB	Facility Evaluation Board
FHA	Fire Hazards Analysis
FR	Facility Representative
FRAM	Functions, Responsibilities, and Authorities Manual
FSAR	Final Safety Analysis Report
FY	Fiscal Year
HAP	Hazard Assessment Package
HCP	H-Completion Project
HEPA	High-Efficiency Particulate Air
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
JCO	Justification for Continued Operation
JHA	Job Hazards Analysis
LCO	Limiting Condition of Operation
MSDS	Material Safety Data Sheet
NDE	Non-destructive Evaluation
NNSA	National Nuclear Security Administration
OESH	SR Office of Environment, Safety and Health
ORPS	Occurrence Reporting and Processing System
OSHA	Occupational Safety and Health Administration
PISA	Potentially Inadequate Safety Analysis
PPE	Personal Protective Equipment
QA	Quality Assurance
QAPP	Quality Assurance Program Plan
R&D	Research and Development
RCO	Radiological Control Operations
RCRA	Resource Conservation and Recovery Act
RWP	Radiation Work Permit
SAR	Safety Analysis Report
S/CI	Suspect/Counterfeit Item
SER	Safety Evaluation Report
SIMTAS	Site Issues Management and Technical Assessment System
SME	Subject Matter Expert
SPO	Security Police Officer
SR	Savannah River Operations Office
S/RID	Standards/Requirements Identification Document
SRNL	Savannah River National Laboratory
SRS	Savannah River Site
SRSO	Savannah River Site Office
SSCs	Structures, Systems, and Components
SSO	Safety System Oversight
STAR	Site Tracking, Analysis, and Reporting
SWP	Safe Work Permit
TMO	Tritium Maintenance Organization
TQP	Technical Qualification Program
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question
USQD	Unreviewed Safety Question Determination
VSDS	Visual Survey Data System
WSI	Wackenhut Services Incorporated
WSRC	Washington Savannah River Company