Volume I

Inspection of
Environment, Safety,
and Health Management
at the

Nevada Test Site

October 2002

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

INDEPENDENT OVERSIGHT
INSPECTION OF
ENVIRONMENT, SAFETY, AND HEALTH MANAGEMENT
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NEVADA TEST SITE

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Acronyms

AHJ	Authority Having Jurisdiction
ALARA	As Low As Reasonably Achievable
BN	Bechtel Nevada
CAS	Condition Assessment Survey
CBD	Chronic Beryllium Disease
CBT	Computer-Based Training
CFR	Code of Federal Regulations
cm^2	Square Centimeter
CRD	Contract Requirement Document
CREATES	Computerized Requirement Evaluation, Assessment, and Technical Evidence System
DAF	Device Assembly Facility
D&D	Decontamination and Decommissioning
DMMP	Dimethyl Methylphosphonate
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DRI	Desert Research Institute
DTRA	Defense Threat Reduction Agency
DX	Dynamic Experimentation
ECD	Environmental Compliance Department
EM	Office of Environmental Management
EMSD	Environmental Management System Description
EPA	Environmental Protection Agency
ES&H	Environment, Safety, and Health
ETS	Environmental Technical Support
FAM	Functional Area Manager
FIMS	Facility Information and Management System
FR	Facility Representative
FRAM	Functions, Responsibilities, and Authorities Manual
FY	Fiscal Year
GPS	Global Positioning System
HAZMAT	Hazardous Materials
HEPA	High Efficiency Particulate Air
HSC	HAZMAT Spill Center
ISM	Integrated Safety Management
IT	International Technology Corporation
JHA	Job Hazard Analysis
JSA	Job Safety Analysis
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
M&O	Management and Operating
MOU	Memorandum of Understanding
mrem	Millirem
MSDS	Material Safety Data Sheet
NIOSH	National Institute of Occupational Safety and Health
NNSA	National Nuclear Security Administration

Acronyms (Continued)

NTO	Nuclear Test Operations
NTS	Nevada Test Site
NV	Nevada Operations Office
OA	Office of Independent Oversight and Performance Assurance
ORPS	Occurrence Reporting and Processing System
OSHA	Occupational Safety and Health Administration
OTS	Oversight Tracking System
PAAA	Price Anderson Amendment Act
PHA	Process Hazards Analysis
PSM	Process Safety Management
PTHR	Pre-Task Hazard Review
QA	Quality Assurance
Radcon	Radiological Control
REOP	Real Estate/Operations Permit
RMAD	Reactor Maintenance Assembly and Disassembly
RWP	Radiation Work Permit
SAIC	Science Applications International Corporation
SEP	Support Execution Plan
SERB	Senior Electrical Review Board
SNL	Sandia National Laboratories
SME	Subject Matter Expert
SUDB	Site Use Development Board
TMP	Test Management Plan
WCO	Waste Certification Official
WGS	Waste Generator Services
WSI	Wackenhut Services Incorporated
WSS	Work Smart Standard

INDEPENDENT OVERSIGHT INSPECTION OF ENVIRONMENT, SAFETY, AND HEALTH MANAGEMENT AT THE NEVADA TEST SITE

VOLUME I

1.0 INTRODUCTION

The Secretary of Energy's Office of Independent Oversight and Performance Assurance (OA) conducted an inspection of environment, safety, and health (ES&H) and emergency management programs at the National Nuclear Security Administration (NNSA) Nevada Test Site (NTS) in September and October 2002. The inspection was performed as a joint effort by the OA Office of Environment, Safety and Health Evaluations and the Office of Emergency Management Oversight. This volume discusses the results of the review of the NTS ES&H programs. The results of the review of the NTS emergency management program are discussed in Volume II of this report, and the combined results are discussed in a summary report.

NTS is located approximately 65 miles north of Las Vegas, Nevada, and encompasses approximately 1,375 square miles. The site is located in a high desert basin and is surrounded by wildlife ranges and the Nellis Air Force Base military gunnery range. Nuclear weapons tests were conducted at NTS from 1951 until the 1992 nuclear weapons testing moratorium.

The current mission of NTS includes supporting the NNSA stockpile stewardship program, which encompasses performing subcritical experiments in support of nuclear weapons stockpile verification efforts and maintaining NTS facilities and infrastructure. NTS also performs activities in the areas of environmental management (e.g., decontamination and decommissioning, waste management, and environmental technology development); national security response (e.g., emergency response to weapons of mass destruction); and defense and civil technologies (e.g., conventional explosives testing, characterization of hazardous material spills, and emergency response training). NTS activities involve various potential hazards that need to be effectively controlled, including exposure to external radiation, radiological contamination, explosive materials, chemicals, and various industrial physical hazards associated with testing activities and facility operations (e.g., machine operations, high-voltage electrical equipment, pressurized systems, and noise).

The NNSA Office of the Deputy Administrator for Defense Programs is the cognizant secretarial office for NTS. As such, the Office has overall Headquarters line management responsibility for programmatic direction, funding of activities, emergency management, and ES&H at the site. The U. S. Department of Energy (DOE) Headquarters Office of Environmental Management is responsible for directing and funding certain activities at NTS (including certain waste management activities). At the site level, the NNSA Nevada Operations Office (NV) has line management responsibility for NTS operations and safety.

NTS is operated by Bechtel Nevada (BN), under contract to NNSA. NNSA national laboratories, including Los Alamos National Laboratory (LANL) and Lawrence Livermore National Laboratory

(LLNL), perform experiments at NTS and are responsible for operations of the U1a Facility and the Device Assembly Facility (DAF), which are used to support nuclear weapons stockpile stewardship.

Throughout the evaluation of ES&H programs, OA reviewed the role of NNSA organizations in providing direction to contractors and conducting line management oversight of contractor activities. OA is placing more emphasis on the review of contractor self-assessments and NNSA line management oversight in ensuring effective ES&H programs. In reviewing NNSA line management oversight, OA focused on the effectiveness of NNSA and NV in managing NTS contractors, including such management functions as setting expectations, providing implementation guidance, allocating resources, monitoring and assessing contractor performance, and monitoring/evaluating contractor self-assessments. Similarly, OA focuses on the effectiveness of the contractor self-assessment programs. DOE orders require contractors to establish self-assessment programs that review all aspects of ES&H performance.

The purpose of the ES&H portion of this inspection was to assess the effectiveness of selected aspects of ES&H management as implemented by NTS under the direction of NV. The ES&H portion of the inspection was organized to evaluate three related aspects of the integrated safety management (ISM) program:

- Implementation of selected guiding principles of ISM by NV and NTS contractors
- NV and NTS contractor feedback and continuous improvement systems
- NTS implementation of the core functions of safety management for various work activities.

The OA inspection team used a selective sampling approach to determine the effectiveness of NV and NTS in implementing DOE requirements. The approach involved examining selected institutional programs that support the ISM program, such as NV and BN assessment programs. To determine the effectiveness of the institutional programs, the OA team examined implementation of requirements at selected NTS organizations and facilities. Specifically, OA reviewed work at DAF in support of subcritical nuclear experiments at the U1a Facility; decontamination and decommissioning work at the Reactor Maintenance Assembly and Disassembly (RMAD) building; hazardous chemical tests and operations at the Hazardous Material Spill Center (HSC) as part of the DOE work-for-others program; construction activities; facility and utility maintenance; and environmental monitoring.

In March 2002, NV was notified that a sub-contract employee stationed in the North Las Vegas "B" complex was diagnosed with Chronic Beryllium Disease (CBD). This individual had been working in the B-1 building since 1998. The building was converted into office space in 1994 and had been a machine shop that processed beryllium copper alloys from the 1970s to 1994. As a result of the CBD case, BN instituted an Industrial Hygiene sampling and voluntary medical testing (LPT blood test) program to determine the potential sources of beryllium contamination and the number of sensitized individuals in the "A" and "B" building complexes. Throughout this series of events, NNSA, NV, and BN consulted with teams of experts from both inside and outside DOE to help interpret sampling results, understand risks to current building tenants, and formulate actions to protect the health of all workers. In July 2002, the NV site manager requested that NNSA commission a formal investigation. On August 22, 2002, the NNSA Administrator authorized an investigation and established an investigation team, comprised of DOE and National Institute of Occupational Safety and Health (NIOSH) beryllium experts, to evaluate the beryllium issue at the North Las Vegas complex and to assess implications for other DOE sites within 90 days. The OA inspection team determined that it would not interrupt or duplicate the efforts of the ongoing beryllium team investigation and therefore did not evaluate the beryllium issue at the North Las Vegas facilities.

As discussed throughout this report, the NTS ISM program has improved significantly, and NV and NTS contractors have established an effective institutional framework for the ISM program. The

implementation of the ISM program is at various stages of maturity and effectiveness across NTS facilities and projects. Although improvements are warranted in some areas, NV and NTS contractors have an understanding of the current deficiencies and, in most cases, have appropriate ongoing or planned initiatives to address them.

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

2.0 RESULTS

2.1 Positive Attributes

Several positive attributes were identified in the institutional work control systems. Many aspects of ISM implementation at the facility and activity level were also particularly effective.

NV has demonstrated leadership and initiative in improving ISM processes and performance at NTS. NV has established clear expectations and direction to NTS contractors and facility users through published orders and policies, and performance-based contract incentives related to ISM. NV has led by example by establishing an NV lessons-learned program, conducting an internal ISM performance survey, and partnering with NTS contractors and facility users in continuous improvement initiatives, such as the ISM Council and the Lessons Learned Implementation Team. NV has established requirements for safety oversight by the NV staff in an Oversight Manual and Facility Representative program procedures. NV senior management demonstrated a good understanding of the status of NTS facilities and ES&H issues. NV's willingness to perform self-critical evaluations, including the use of outside expertise, has resulted in NV self-identifying weaknesses and developing corrective actions. The NV Manager, who assumed that position in fiscal year 2000, has been instrumental in providing leadership and direction that have resulted in significant improvements in ISM within the NV organization and at NTS. For example, the NV Manager has brought in external experts to perform program reviews and develop recommendations for improvement in many ES&H areas.

The NTS ISM program has improved significantly and is continuing to improve. The NTS ISM program has improved significantly since the 1999 Headquarters independent oversight safety management inspection, which identified a number of systemic weaknesses in the ISM program. With few exceptions (e.g., issues management), NV and BN have appropriately addressed the deficiencies and weaknesses identified during that evaluation. Through the implementation of its ISM program, NTS has established a good framework of institutional management systems (e.g., roles and responsibilities) and work processes (e.g., procedures and hazards analysis). Although still maturing, the implementation of the Real Estate/Operations Permit (REOP) process and associated work authorization controls provides for a major improvement in safety at NTS. In addition, BN developed and implemented a well-documented electrical safety program, appointed a knowledgeable electrical Authority Having Jurisdiction to interpret code requirements and review variances, and chartered a Senior Electrical Review Board to oversee electrical safety at the site. NV and BN have also made substantial progress on resolving safety concerns associated with legacy high-voltage electric cable. Configuration control has been established through walkdowns, some energized sections have been de-energized, and cable locations have been marked with warning signs, reducing the potential hazards to workers. BN has upgraded all work control procedures and has implemented a sitewide work control system to enhance work definition, planning, and execution. With support from NV, BN Site Services has been proactive in upgrading the site electric power distribution system; as a result, the hazards associated with unplanned loss of electrical power have been reduced. BN has implemented a NTS performance-based safety program facilitated by management and run by workers to improve job-related behavioral safety. NV and BN personnel displayed a good understanding of the remaining weaknesses and, in most cases, have ongoing or planned initiatives to address them. Senior NV and BN management demonstrated a willingness to be self-critical and a commitment to continuous improvement.

Subcritical experiments are performed in accordance with rigorous safety processes. Most aspects of the REOP process have been notably effective for subcritical experiments at DAF. The implementation of the REOP process is effective and mature in these programs, and roles and responsibilities are clearly defined and understood. BN and the national laboratories have effectively coordinated their efforts and have established well-defined organizational interfaces. Experiments in

these facilities are well documented and involve a number of clearly identified notification and authorization steps by NV, NNSA, and the national laboratories' management chain. The LANL subcritical experiment review process is extensive and includes hazard identification and reviews by LANL, LLNL, and NV at various points in the development process. A comprehensive bounding hazard analysis is developed and reviewed by multiple ES&H disciplines. The experiment plan, including the hazard analysis and the project execution plan, also receives an extensive review prior to approval by the multi-disciplined Safety Evaluation Panel, which is chaired by NV. Checklists are used extensively to implement facility operational safety requirements and to perform operational checks before allowing work with special nuclear materials or high explosives. These checklists are comprehensive, logically arranged, and ensure that building-specific systems and equipment, such as cranes, ventilation, utilities, and safety systems, are operational and ready for use. Furthermore, facility managers and technicians are experienced, well trained, and knowledgeable of facility hazards, and NV Facility Representatives have a strong presence in the NTS DAF.

Pre-test review activities for tests conducted at HSC are rigorous and include facility workers, NV staff, independent reviewers, and test agency staff. Pre-test reviews include a safety evaluation panel, numerous pre-start checklists, test briefings, and hazards training. For example, during the week before the commencement of the Divine Invader tests, a variety of pre-test reviews were conducted by NV, BN, and the customer–the Defense Threat Reduction Agency (DTRA). BN staff at HSC conducted a pre-job briefing on the preparatory activities for staging the test. A formal Safety Evaluation Panel meeting was held before the test, providing an opportunity for DTRA and its subcontractors to present the details of the upcoming tests to a board of independent testing and ES&H subject matter experts, NV line managers, and other test participants and observers. The NV Facility Representative for HSC is actively involved in the planning and conduct of testing and in the daily, routine work activities at HSC.

BN waste management practices are well defined and effectively implemented at NTS. BN has implemented rigorous controls to ensure that waste going either to the site's disposal areas or off site for treatment and/or disposal meets applicable waste acceptance criteria. The BN Waste Generator Services organization evaluates waste streams using a comprehensive set of procedures. Additional quality control is provided by the presence of a Waste Certification Official during waste packaging. This individual is independent of the Waste Generator Service organization and the generator, thus providing another level of review to verify that the generated waste meets the approved waste stream requirements.

2.2 Program Weaknesses

Although the framework for the NTS ISM program is sound, weaknesses were identified in some aspects of requirements implementation for certain types of work activities. In addition, certain aspects of NV and BN feedback and improvement systems need additional improvement.

NV and BN have not effectively implemented ES&H roles, responsibilities, and interfaces for the REOP process as applied to work-for-others programs, and have not ensured sufficient identification and documentation of standards and requirements for work-for-others programs. The REOP process, as described in NV procedures, establishes an adequate mechanism for defining work scope, evaluating risk, establishing facility-level controls and a safety envelope, and providing internal and external project reviews before work is authorized to proceed. However, the effectiveness of implementing the REOP process has varied across NTS programs and facilities. The REOP process has been effectively implemented for certain programs, but it lacks sufficient definition and guidance in some areas and was not effectively implemented in the Divine Invader test series work-for-others program at the HSC. The Divine Invader test series involves release of various chemicals (including explosive releases) and tracking of the plumes using various technologies. This test series is typical of tests being performed by work-for-others agencies and presents challenges to NV in the oversight and control of

outside agencies and their subcontractors, who are less familiar with DOE's regulations, practices, and safety culture than DOE laboratories. Deficiencies in ES&H roles and responsibilities identified through the review of this test program included ineffective review and approval of the REOP documents, insufficient involvement by the NV subject matter experts in the review of test plans and procedures, unclear definition of responsibilities for personnel who had key safety roles (e.g., the BN project manager), and insufficient definition of organization interfaces. These deficiencies in roles and responsibilities contributed to the deficiencies in the implementation of the REOP process for the Divine Invader tests and might have implications for other work-for-others programs. For example, the secondary REOP documentation was inaccurate for the current test series (e.g., wrong chemicals were listed, and there was incorrect information about chemical storage), and requirements were not clearly defined in some cases (e.g., which explosives safety standard governed operations). Although there are deficiencies in the implementation of the REOP process, many aspects of ISM programs are effectively implemented at HSC, and certain aspects of ES&H for the Divine Invader tests were notably effective.

NV line managers have not performed sufficient planning and coordination to ensure comprehensive oversight of NTS ES&H programs and effective implementation of some requirements in the areas of tracking findings and performing self-assessments. Although most of the framework for an effective program is in place and many oversight activities are being performed, several weaknesses are limiting the effectiveness of the NV oversight of ES&H performance at NTS. NV line management oversight activities are not consistently planned in a comprehensive, coordinated, and rigorous manner that ensures comprehensive coverage of functional and management system areas. Identified safety deficiencies and issues are not being consistently managed to ensure timely resolution and prevention of recurrence. NV organizations are not scheduling or performing self-assessments as required by the Oversight Manual. NV senior management recognizes that some aspects of its line management oversight program need further improvement, and several actions are underway.

BN and LANL issues management processes have not ensured appropriate and timely resolution of safety concerns, the BN management assessment program has not been effectively implemented, and the frequency and scope of LANL assessments have not been sufficient to ensure comprehensive coverage of ES&H programs. Some frequently performed activities, such as construction and maintenance, are not subjected to a level of oversight consistent with the potential for personnel injury and environmental impacts. The inconsistent conduct of self-assessments and inadequate capture and management of identified safety deficiencies by BN hinders continuous safety improvement. Although BN and LANL conduct a variety of assessments, the scope, frequency, and rigor of these examinations vary significantly among organizations. BN and LANL have formal systems for tracking deficiency corrective actions and procedures detailing the implementation requirements. However, the documentation, evaluation, and resolution of ES&H deficiencies and issues at the NTS are not being managed in a structured, consistent, and effective manner that fully supports continuous improvement. Many deficiencies identified by BN and NV assessment activities are not being entered into the BN tracking system. For example, management assessments related to lessons-learned, environmental compliance, industrial hygiene, health physics, maintenance, and industrial safety/hygiene programs were not entered into the tracking system. In addition, performance issues involving the failure to schedule and perform management assessments resulting from the June 2002 independent assessment of corrective actions to the Price Anderson Amendment Act concern in calendar year 2000 were not documented in the BN tracking system. Furthermore, the resolutions of many BN deficiencies do not address all aspects of the reported issues, the extent of the condition (the potential for similar deficiencies in other areas), or recurrence controls to address the causes of the deficiencies. In some cases, BN corrective actions addressed the specific deficiencies without determining that they were isolated cases or why the deficiency occurred. BN has adequate directives in place for identifying and managing issues, but the applicable requirements have not been effectively implemented by BN personnel and/or adequately monitored by NV. LANL has not adequately managed resolution of identified deficiencies.

Over 20 open deficiencies identified in 2001 and included in the LANL tracking system, including some identified as high priority, have not been assigned to responsible parties or had planned actions identified. Weaknesses in issues management at NTS are longstanding and have been identified by previous internal and external assessments, but they have not been adequately addressed.

NV and BN did not ensure that the controls and storage configurations for bulk hazardous chemicals at the HSC were adequately analyzed and sufficient to ensure safe storage as required by BN procedures. While NTS has demonstrated effective performance in many areas of hazard control, some deficiencies were noted in the areas of chemical storage. A number of bulk hazardous chemicals at the HSC are stored in drums or compressed gas cylinders, in locations that are fully or partially open to the environment. Storage of hazardous chemicals in these conditions, without a sufficient and documented review by BN and NV, presents two concerns. First, the OA team identified four bulk chemicals at HSC that are stored under conditions that do not meet the manufacturer's storage recommendations in the material safety data sheets (MSDSs), and an evaluation of this type of storage acceptability has not been documented in work packages or work documents. Improper storage increases the potential for container rupture or inadvertent discharge of the chemical to the environment. For example, the MSDS for carbon tetrachloride, which is stored in drums in the outside storage locations that are only partially protected from the environment, lists a number of handling and use precautions, such as storing the containers in a cool, dark area and away from heat; not storing the chemical outdoors or in direct sunlight; and avoiding bulk storage. Second, some requirements in the applicable BN Company Directive are either not followed or are not sufficiently described to be consistently implemented by HSC staff. For example, at least two of the chemicals stored at HSC are carcinogens or suspected carcinogens (i.e., benzene and carbon tetrachloride). For carcinogens, the company directive requires establishing regulated areas and posting warning signs at the entrance to regulated areas. However, adequate signs are not present at the storage site. While NV was aware of the chemical storage conditions, they did not take action to ensure that the storage practices and controls were adequate for safe storage.

BN has not applied sufficient rigor and formality in demonstrating that certain radiological control practices meet all DOE requirements and that all potential exposures are fully characterized and will be kept as low as reasonably achievable. A number of deficiencies were identified in the application of radiological controls. First, the BN procedure for developing radiation work permits (RWPs)—a principal means of identifying necessary controls and bounds for radiological work—does not adequately specify how to manage changes in RWPs. As a result, multiple versions of the same RWP existed at the NTS RMAD facility, each with somewhat different controls. Second, limiting conditions and suspension limits were not clearly defined in some RWPs. Third, the manner in which respiratory protection requirements were being implemented at RMAD and the DAF may not be fully effective in controlling potential radiological or industrial hazards and was not always specifically tailored to a known radiological hazard. Fourth, BN health physics staff at RMAD did not appropriately post or mark fixed-contamination areas located outside of "radiological areas" consistent with the requirements of the Radcon manual for "Fixed Contamination Areas." Fifth, there was insufficient evidence that BN as-low-as-reasonably-achievable reviews of radiological work were being conducted in accordance with the requirements of the Radcon manual and company directives. Sixth, in one case, an expected radiological control was not evident for work being performed at RMAD. Specifically, beta dose rate measurements were not being taken to evaluate contact dose rates on contaminated surfaces. In conjunction with this, hazard assessment information presented in work plans did not discuss any potential for beta skin hazard from handling contaminated materials; although informal discussions determined extremity dose was not considered to be a concern. However, the site has no documented technical base or evidence that it is properly accounting for extremity exposures or associated monitoring requirements. The limited assessment and oversight activity by NV at RMAD did not identify these or similar deficiencies in the radiological control program. Improvements in the level of rigor and formality in radiological hazard analysis and controls and a sound technical basis for all decision-making is needed to ensure that NTS

complies with its defined radiological requirements and ensures that all potential radiological exposures are kept as low as reasonably achievable.

3.0 CONCLUSIONS

Safety management at NTS has significantly improved under the direction and leadership of the NV Manager. NV and NTS contractors have worked cooperatively to establish an ISM program at NTS that is effective in most areas and is improving. NV, BN, LANL, and LLNL managers were actively involved in and supportive of ISM and continuous improvement. Workers are appropriately empowered to stop work to resolve safety questions and have multiple avenues to express any safety concerns. Management has numerous programs to ensure that workers are involved in safety and to solicit ideas for improvement, including the recent establishment of a performance-based safety program.

The establishment of the REOP process and associated work authorization processes are significant enhancements and in most cases are functioning effectively for nuclear defense program activities. However, implementation of these processes is not yet fully effective in ensuring that work-for-others programs are adequately reviewed and controlled. NV and BN recognize the need to further enhance the implementation of work authorization processes for work-for-others programs as well as to continue to refine and better communicate roles and responsibilities for organizational interfaces.

For the most part, the existing ISM institutional programs and procedures are adequate. However, the effectiveness of implementation varies and is less effective for work activities that historically have received less attention and line management oversight (work-for-others programs and some construction and maintenance activities).

The OA team's observation of numerous work activities conducted at NTS indicates that most work activities were conducted safely and, with few exceptions, hazards were identified, appropriate controls were in place, and work was properly authorized. In most cases, NTS contractors have effectively translated the applicable requirements to clear and concise work instructions. Most aspects of environmental protection programs are effective and have been successfully integrated into ISM. However, improvements are needed in a few areas, such as processes for evaluating and approving chemical storage practices, the rigor and formality of radiation protection controls, and procedural adherence in maintenance activities.

The NV and NTS contractor feedback and continuous improvement programs have identified and corrected numerous deficiencies. NV and NTS contractors conduct frequent assessments, and have improved the rigor of their assessment processes and included more observations of work. NV has maintained good operational awareness through its Facility Representatives and subject matter experts, particularly at the facilities associated with subcritical experiments. BN and laboratory managers also demonstrated detailed knowledge of ES&H programs and issues at NTS. Lessons-learned programs have been improved, and some aspects are notably effective.

However, longstanding weaknesses in issues management and some aspects of NV and NTS contractor assessments have not been fully and effectively addressed. The various NV line management oversight elements are not consistently and effectively planned and integrated to ensure appropriate coverage of activities, ES&H functional areas, and crosscutting management systems. Many deficiencies identified by self-assessments and external reviews have not been recorded in a tracking system, and thus have not been corrected or properly evaluated for the extent of the condition, recurrence controls, trend analysis, and performance monitoring. In addition, BN has not performed sufficient management assessments, and the frequency and scope of LANL assessments have not been sufficient to provide coverage of LANL ES&H elements. Further, LANL has not adequately managed its backlog of identified deficiencies. NV and NTS contractors are working to implement new issues management systems that have the potential to address some of the longstanding weaknesses.

Overall, safety management at NTS has substantially improved in the past three years and is continuing to improve. The ISM institutional programs are effective, with only a few weaknesses, and implementation of those programs is effective for most activities and facilities that were reviewed during this OA inspection. However, implementation of institutional requirements is not fully effective for certain activities, such as work–for-others programs and maintenance and construction activities. These activities are perceived as lower hazard work and historically have received less management attention and line management oversight. Improvements in issues management and planning for assessments is needed to ensure that NV and NTS contractors have the information needed to continue to make improvements in ISM implementation.

4.0 RATINGS

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

Safety Management System Ratings

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

Feedback and Improvement

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

NTS Implementation of Core Functions for Selected Work Activities

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

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APPENDIX A

Supplemental Information

A.1 Dates of Review

Scoping Visit	July 16-18, 2002
Onsite Inspection Visit	September 9-19, 2002
Report Validation and Closeout	October 1-3, 2002

A.2 Review Team Composition

A.2.1 Management

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

A.2.2 Quality Review Board

Michael Kilpatrick
Charles Lewis
Robert Nelson
Patricia Worthington
Dean Hickman

A.2.3 Review Team

Charles Lewis, Director, Office of Emergency Management Oversight (Team Leader)
Brad Davy, ES&H Topic Lead

Safety Management Systems
Ali Ghovanlou
Bill Miller
Bob Compton (Feedback and Improvement)

Technical Team
Vic Crawford
Marvin Mieske
Mark Good
Jim Lockridge
Edward Stafford
Mario Vigliani

A.2.4 Administrative Support

Mary Anne Sirk
Bonnie Blake
Tom Davis

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APPENDIX B

Site-Specific Findings

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

FINDING STATEMENTS	REFER TO PAGES:
1. Nevada Operations Office (NV) and Bechtel Nevada (BN) have not effectively implemented environment, safety, and health (ES&H) roles, responsibilities, and interfaces for the Real Estate/Operations Permit process as applied to work-for-others programs, and have not ensured sufficient identification and documentation of standards and requirements for work-for-others programs.	23
2. NV line managers have not performed sufficient planning and coordination to ensure comprehensive oversight of Nevada Test Site ES&H programs and effective implementation of some requirements in the areas of tracking findings and performing self-assessments.	33
3. BN and Los Alamos National Laboratory (LANL) issues management processes have not ensured appropriate and timely resolution of safety concerns, the BN management assessment program has not been effectively implemented, and the frequency and scope of LANL assessments have not been sufficient to ensure comprehensive coverage of ES&H programs.	36
4. NV and BN did not ensure that the controls and storage configurations for bulk hazardous chemicals at the Hazardous Materials Spill Center were adequately analyzed and sufficient to ensure safe storage as required by BN procedures.	53
5. BN has not applied sufficient rigor and formality in demonstrating that certain radiological control practices meet all U.S. Department of Energy requirements and that all potential exposures are fully characterized and will be kept as low as reasonably achievable.	55

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APPENDIX C

Guiding Principles of Safety Management Implementation

C.1 INTRODUCTION

The Office of Independent Oversight and Performance Assurance (OA) evaluation of safety management systems focused on selected guiding principles of integrated safety management (ISM) as applied at the Nevada Test Site (NTS). OA examined Guiding Principle #2 (Clear Roles and Responsibilities) and Guiding Principle #5 (Identification of Standards and Requirements).

The OA team reviewed various documents and records, including the NTS ISM system description; associated procedures; Functions, Responsibilities, and Authorities Manuals (FRAMs); work smart standards; and various NTS plans and initiatives. In the evaluation of the guiding principles, OA considered the results of the OA review of the core functions. National Nuclear Security Administration (NNSA), Nevada Operations Office (NV), Bechtel Nevada (BN), Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), and Sandia National Laboratories (SNL) personnel were interviewed to determine their understanding of the ISM program and their responsibilities, as well as the status of ongoing initiatives and corrective actions. OA discussed ongoing test activities with selected facility user organizations, such as the Defense Threat Reduction Agency (DTRA). The review of requirements management processes focused primarily on the NV and BN work smart standards (WSSs) and flowdown of requirements to the working level.

C.2 RESULTS

C.2.1 Clear Roles and Responsibilities

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

NNSA Headquarters Roles and Responsibilities

Within NNSA, roles and responsibilities for safety management, program execution, and funding authority for NV and NTS activities are understood. The Deputy Administrator for Defense Programs provides programmatic direction to NV and is responsible for NTS activities. The environment, safety, and health (ES&H) organization, within the NNSA Office of the Associate Administrator for Facility and Operations, provides technical support to line managers on ES&H issues. NNSA has recently released a new draft FRAM, which will update and replace the 1998 version.

NNSA has adequate processes for maintaining operational awareness of the ES&H issues at NTS and maintains responsibility for reviewing subcritical experiment plans and authorizing conduct of experiments. NNSA is in the process of a significant reengineering effort that is designed to enhance and streamline management. As part of that effort, NV plans to split into two organizations: one to perform site office line management functions (e.g., day-to-day direction to contractors and assessments of contractor performance), and the other to function as a service center.

NV Roles and Responsibilities

At the direction of the NV Manager, NV manages the activities of multiple contractors and facility users at NTS, including the management and operating (M&O) contractor (i.e., BN), other contractors (e.g., environmental restoration contractor), the national weapons laboratories (LANL, LLNL, and SNL), and other tenant organizations (e.g., DTRA, the protective force contractor, support contractors, and the Desert Research Institute). Various other organizations use the NTS facilities for experiments from time to time, including other Federal agencies, academic institutions, and private companies. The testing activities at NTS often involve several organizations and facility users that are not subordinate to the M&O contractor; for example, DTRA does not contractually report to BN. As a result, in many instances, NV serves as an integrator of complex organizational interfaces and interrelated sets of activities in addition to the "traditional" operations office line management functions (e.g., providing direction to prime contractors and performing assessments of contractor performance). For example, NV approves primary and secondary Real Estate/Operations Permits (REOPs), which apply to all NTS contractors and tenants and provide the primary mechanism for the review of new work, proposed changes to work, and the assessment of risk for new or changed work activities. NV also reviews and approves various test plans, which may be prepared by BN, national laboratories, or other facility users.

NV has adequately defined most roles and responsibilities in the NV FRAM and other NV documents. The recently published NV FRAM provides a clear definition of various position categories and common responsibilities and authorities for managers and staff. It also identifies key roles and responsibilities and qualification standards for specific positions (e.g., project mangers and Facility Representatives) and provides for integration of safety roles and responsibilities that flow down from DOE directives. NV roles and responsibilities are further defined through a number of policies, procedures, and plans. For example, the NV ES&H Division Management Plan describes the roles and responsibilities of 13 functional managers/subject matter experts (SMEs), including their responsibilities for assessing the contractors' ES&H programs (e.g., industrial hygiene program) and supporting NV project managers in critical NV processes, such as the REOP and work authorization processes.

The roles and responsibilities of individual NV employees are adequately described in their position descriptions. Roles and responsibilities for accomplishing near term goals are included in the annual performance appraisal forms, and managers use them to hold employees accountable through the annual appraisal process.

The NV Manager, who assumed that position in fiscal year (FY) 2000, has been instrumental in providing leadership and direction that have resulted in significant improvements in ISM within the NV organization and at the NTS. Under the leadership of the NV Manager, the definition and implementation of organizational roles, responsibilities, and authorities have improved significantly since the 1999 Department of Energy (DOE) Headquarters independent oversight safety management evaluation, which identified systemic weaknesses in roles, responsibilities, and accountability at NV. Specific enhancements and accomplishments include:

- NV has developed clear strategies for continuous improvement, formulated clear budget and mission guidance, and established priorities and expectations through documents such as the strategic plan. The NV Manager's office has taken a proactive role in establishing and implementing these improvements. Specific objectives and goals have been assigned to individual NV and contractor senior managers and are being tracked.

- Roles and responsibilities for oversight of activities and programs, including the expectations for SMEs (expertise in and assessments of specific ES&H topics such as explosives safety), functional area managers (direction, expertise, and line management oversight in a broad ES&H area, such as

industrial safety), and Facility Representatives (FRs), are clearly delineated through a number of mechanisms.

- NV has clearly defined roles and responsibilities for NV's evaluation of contractor performance and enhanced its evaluation processes through the addition of effective contractual performance requirements and implementation of a performance-based evaluation process. This process is receiving significant NV senior management attention.

- NV has developed and implemented a conceptually sound work authorization process, which includes the REOP process and approval of various experimental program and individual test plans. Although some implementation deficiencies are evident (see discussion later in this section), NV has defined appropriate roles and responsibilities for this process.

NV has been effective in implementing its responsibilities for most of the activities related to the primary NTS nuclear stockpile management mission, such as subcritical nuclear experiments. However, NV has not been as closely involved for certain other NTS activities, such as spill testing performed as part of the work-for-others programs, and some implementation weaknesses were evident in these areas. The weaknesses in NV implementation of its roles and responsibilities, discussed later in this section, typically involve crosscutting functions and complex organizational interfaces. For example, FR roles and responsibilities for overseeing the implementation of REOP requirements and any change controls are not being performed effectively because guidance and priorities for FRs are not sufficiently defined to provide for a balance between competing priorities, such as supporting the NV project managers and performing other FR duties (e.g., surveillances). Similarly, priorities and expectations for SMEs are not sufficiently established to ensure that resources are optimally allocated to perform the ambitious evaluation requirements of the ES&H Management Plan and to support and assess less-visible activities, such as non-nuclear testing and facility maintenance activities.

Bechtel Nevada Roles and Responsibilities

As the M&O contractor, BN is responsible for many projects and support operations that are conducted at NTS, North Las Vegas, and the Remote Sensing Laboratory at Nellis Air Force Base, and operations in California, New Mexico, and Maryland. BN has been the M&O contractor since 1996. At the time of the 1999 DOE Headquarters independent oversight safety management evaluation, BN had made progress in addressing then-prevailing fragmented policies and procedures and had established overall safety management roles and responsibilities for line managers and workers. However, improvements were needed in the specificity and consistency of defining and implementing roles and responsibilities for performing work. Since that 1999 evaluation, BN has implemented a formal ISM program and successfully completed the verification reviews. As an integral part of ISM, BN has significantly enhanced the definition of roles and responsibilities at the institutional, facility, and activity levels.

In February 2002, BN undertook a major reorganization, which was designed to better focus on customer requirements and clearly separate the program management functions from operational activities. Most safety-related functions relevant to the execution of major experiments, tests, and programs fall under purview of the Deputy General Manager for Stockpile Stewardship, who reports directly to the BN General Manager. The Operations organization within the Stockpile Stewardship organization provides support for construction, maintenance, and facility operations for all facilities and activities authorized through the REOP process. The ES&H Division also reports directly to the BN general managers and is responsible for providing matrix support line management and managing certain ES&H programs, such as the radiation protection program and environmental compliance efforts.

With a few exceptions, current roles and responsibilities for BN line managers, the ES&H organization, and other organizations with ES&H responsibilities (e.g., maintenance and construction) are adequately defined in a number of documents. These include the ISM description document, management plans, procedures developed as part of the REOP process, test plans, support execution plans (which encompass ES&H programs, such as industrial safety/hygiene), work-related procedures, and specific work packages. BN has developed appropriate, tailored organizational agreements to further define organizational interfaces where necessary (e.g., an agreement with LANL regarding the division of responsibilities for ES&H at LANL-operated facilities). BN has adequately incorporated ES&H roles and responsibilities in their position descriptions, and safety expectations are defined in performance standards/reviews. Although some implementation deficiencies remain (see discussion later in this section), the establishment and implementation of the NV REOP process and associated work authorization processes have been a major factor in enhancing the definition of roles and responsibilities at BN in the past few years.

Although most aspects of BN roles and responsibilities are adequately defined, some aspects warrant additional management attention and further improvement:

- The recent reorganization has created expanded and/or changed functions and interfaces. In some cases, the modified roles and responsibilities have not been clearly defined and communicated. Also, some procedures and plans have not been revised to reflect organizational changes.

- Non-nuclear experiments (e.g., experiments involving airborne dispersion and plume tracking) and various work–for-others programs are an increasingly important part of the NTS mission, particularly with the increased focus on chemical and biological threats in the aftermath of the September 11, 2001, events and increased concerns about chemical and biological threats. These experiments can involve a number of potential hazards and organizational interfaces with which NTS personnel are less familiar than the historical nuclear programs. BN (as a primary REOP holder) and other site organizations have not fully developed and communicated the new and evolving expectations for roles and responsibilities, particularly as they relate to organizational interfaces in work for others programs.

- Some weaknesses in roles and responsibilities contribute to deficiencies in certain programs that require allocation of resources to lower-priority facilities or that require organizational interfaces and funding from multiple organizations (e.g., NNSA and the DOE Office of Environmental Management for nuclear waste facilities).

- Certain planning efforts (e.g., the Nuclear Operations Implementation Plan) focus on recognized deficiencies that can be mitigated in the near term (within the next six to eight months). The scope of BN planning efforts has not adequately addressed longer-term strategic issues and determination of roles and responsibilities for future needs (e.g., compliance with the recent 10 CFR 830 rule).

Roles and Responsibilities in Authorizing and Performing Work

As discussed above, roles and responsibilities and organizational interfaces at NTS are particularly complex because there are multiple organizations that manage, operate, and use NTS resources and facilities. To deal with this complexity, NV developed and implemented the REOP process as NV's primary tool for authorizing facilities, work, and experiments; defining responsibilities in facility and support execution; and coordinating all contractor, user, and customer activities under a single work authorization system.

Under the REOP, each organization is responsible for the safety of its own employees. For each work location or facility, a single organization—the primary REOP holder—coordinates the interfaces among the various organizations. The primary REOP holder is assigned the role of "safety coordination" and is responsible for ensuring that all hazards have been identified and communicated to all participants. Secondary REOPs are issued by NV or primary REOP holders to authorize and bound operations under the primary REOP holder's control. When other co-located organizations use a facility to perform work, they are identified as a secondary REOP holder. It is the responsibility of the secondary REOP holder to identify and communicate their hazards and hazard controls to the primary REOP holder to ensure that operations can be conducted safely. The REOP process includes clear provisions for the chain of responsibility for safety, which extends from the NV Manager to the head of the organization holding the primary REOP and secondary REOP and subsequently to managers, supervisors, and workers in the primary and secondary REOP-holding organizations, and workers "assigned" by other organizations.

The REOP process, as described in NV procedures, establishes an adequate mechanism for defining work scope, evaluating risk, establishing facility-level controls and a safety envelope, and providing internal and external project reviews before work is authorized to proceed. The REOP process has created a common environment for better integration among a diverse group of participants, and has been instrumental in identifying and improving roles and responsibilities across complex interfaces within the BN organization and between BN and the national laboratories. However, the effectiveness of implementation of the REOP process has varied across NTS programs and facilities. As discussed below, the REOP process has been effectively implemented for certain programs, but it lacks sufficient definition and guidance in some areas and was not effectively implemented in the Divine Invader test series at the Hazardous Materials (HAZMAT) Spill Center (HSC). The Divine Invader test series involves the release of various chemicals (including explosive releases) and tracking of the plumes using various technologies.

Most aspects of the REOP process have been notably effective for subcritical experiments and activities in the Device Assembly Facility (DAF) and the U1a Facility. The definition and implementation of REOP and the associated roles and responsibilities are effective and mature in these programs/facilities. The national laboratories—LLNL and LANL—hold the primary REOP for the U1a Facility and DAF and also hold the secondary REOP for execution of such experiments. Processes and roles and responsibilities for obtaining BN support for maintenance, construction, and operations when required are also well defined in support execution plans and memoranda of understanding (MOUs), and implemented through organizational positions such as the U1a Facility Manager. In addition, the laboratories use dedicated expertise to participate in planning and control of support activities and to perform safety-related work. For example, LANL has established an onsite ES&H organization at NTS, and LLNL has permanently assigned a Deputy ES&H Team Leader to its operations. These individuals have clearly defined roles and responsibilities for safety in preparing the facilities for the intended experiments. The processes involved in these experiments are complex but mature and well documented, and they involve a number of well-documented notification and authorization steps by NV and NNSA and the national laboratories' management chain before the final approval.

Although progress is being made, REOP implementation is currently less effective for programs involving work for others, where an outside agency performs special tests or experiments at NTS. For example, the OA team identified a number of deficiencies in the HSC review of the Divine Invader test series. In accordance with the NV order on work for others, the NV Project Manager has the primary responsibilities for ensuring that all work-for-others projects are properly reviewed, accepted, and executed and that all ES&H requirements are satisfied, including a project review in accordance with the REOP process. Deficiencies in roles and responsibilities identified through the review of the DTRA program tests at HSC and interviews with NV and BN personnel include:

- **Ineffective implementation of roles and responsibilities in the review and approval of REOP applications**. NV SMEs are not sufficiently engaged in the review of test documents and programs identified in the REOP, throughout the planning, preparation, and conduct of tests, to ensure that the hazards of the tests have been adequately identified, analyzed and controlled. Similarly, NV SMEs have not performed rigorous and comprehensive reviews of ES&H programs and facility conditions at HSC.

- **Weak interface between the NV Project Manager and NV SMEs**. Several NV SMEs interviewed indicated that they had not reviewed any Divine Invader documents during the past year, although a number of test documents that exceed the risk management criteria have been issued or revised during this period. SMEs are not always kept aware of new test documents or revisions of existing test documents, particularly if the revision is an administrative change or if the test documents are issued immediately before the test is conducted.

- **Unclear definition of roles and responsibilities and allocation of functions between BN program and operations organization**. For example, the roles and responsibilities of the BN DTRA Project Manager have not been clearly identified and communicated to BN and NV line management, and the functions of this role with respect to the upcoming Divine Invader test series is unclear.

- **Insufficient definition of interfaces among the NV Project Manager, the BN program organization, and the DTRA management team**. The BN DTRA Project Manager for NTS has not been actively involved in the Divine Invader test program (a DTRA test project) and had not coordinated with the NV Project Manager for the Divine Invader test series before the final Safety Evaluation Panel Meeting.

These deficiencies in roles and responsibilities contributed to the deficiencies in the implementation of the REOP process for the Divine Invader test:

- **The REOP documentation for the Divine Invader Test series is not tailored and kept current for the test to be performed**. The secondary REOP lists the incorrect chemical (phosgene), the incorrect test series, and the incorrect facility in which the chemical is being stored or dispersed.

- **Requirements and standards for the Divine Invader test series are not clearly identified in the secondary REOP**. DTRA, which is a Department of Defense (DoD) organization, historically has used DoD health and safety standards in developing test documents for the Divine Invader test series. However, the use of non-DOE standards (i.e., DoD standards) has not been clearly authorized through the secondary REOP process for these tests. Since the requirements basis is unclear, NV SMEs use professional judgment rather than clearly defined and agreed upon standards to evaluate test documents. For example, the NV explosives safety expert has evaluated the Divine Invader test documents using DoD explosive safety requirements rather than DOE requirements, although such an evaluation is not supported by the secondary REOP.

- **Test documents and programs identified in the REOP did not receive adequate review to ensure that the hazards of the tests were adequately identified, analyzed and controlled**. NV SMEs have had limited ongoing involvement in the Divine Invader test series and have not adequately reviewed test documents. For example, the dominant hazards associated with the Divine Invader tests are explosives and chemicals (e.g., phosgene, dimethyl methylphosphonate [DMMP]). Although an NV explosives expert is identified as a reviewer, NV industrial hygienists have not been formally involved in the review of chemical use and dispersion for these tests. In addition, there is no guidance on how SMEs should review test plans, nor is guidance provided concerning how test

reviews performed by SMEs should be documented. For example, there are no critical questions to be answered by SMEs, key documents to be evaluated, or requirements for documenting one's review, although the hazards can be significant (e.g. the detonation of 900 pounds of phosgene gas). During the two years of test preparation for the Divine Invader test series, DTRA and its subcontractors produced numerous test and supporting documents, yet few questions or comments were generated by the ES&H SMEs. Furthermore, there is no formal process for resolving questions and comments raised by SMEs, and there is no record of SME comment resolution. A draft version of the REOP order incorporates a comment resolution process.

Although the OA team focused on a specific work-for-others test at the HSC, similar problems are evident in other work-for-others programs at NTS. As discussed under Guiding Principle #5, some aspects of requirements management have not been effectively implemented in work-for-others programs.

Finding #1. NV and BN have not effectively implemented ES&H roles, responsibilities, and interfaces for the REOP process as applied to work-for-others programs and have not ensured sufficient identification and documentation of standards and requirements for work-for-others programs.

Although there are deficiencies in the implementation of the REOP process, many aspects of ISM programs are effectively implemented at HSC and certain aspects of the Divine Invader test (e.g., the DTRA review committees) were notably effective. In most cases, NV and BN have a good understanding of the weaknesses in the current processes and are working to enhance them.

Summary of Guiding Principle #2. With the leadership of the NV Manager, NV and its contractors have made significant progress in defining and implementing clear ES&H roles and responsibilities since the 1999 DOE Headquarters independent oversight safety management evaluation. With few exceptions, NV and BN have adequately documented the roles and responsibilities of organizational elements, line managers, ES&H support personnel, and workers. Systems for holding organizations and individuals accountable for ES&H performance are appropriate.

The REOP process and associated work authorization processes are a significant enhancement and in most cases are functioning effectively for nuclear defense program activities. However, these processes are not yet fully effective in ensuring that work-for-others programs are adequately reviewed and controlled. NV and BN recognize the need to further enhance the implementation of work authorization processes for work-for-others programs and continue to refine and better communicate roles and responsibilities for organizational interfaces.

C.2.2 Identification of Standards and Requirements

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

WSSs have been established in accordance with the process defined in DOE Manual 450.3-1, *Closure Process for Necessary and Sufficient Sets of Standards.* The processes used to develop the WSSs are well documented, and the agreed-upon WSSs were appropriately incorporated into the BN contract. Appropriate provisions (i.e., the B2 and B3 list of directives) are in place to cover work activities that are

exempted from the NV WSS (e.g., nuclear device assembly/disassembly, energetic experiments with special nuclear material, and nuclear explosive safety).

Responsibilities for implementing requirements management processes are delineated and assigned to appropriate NV managers through the NV FRAM and other manuals and NNSA/NV directives. Similarly, the BN WSS program and responsibilities are defined in a 1999 BN Company Directive.

The NV Directives Management Center has established appropriate processes for handling DOE Headquarters and internal NV directives in accordance with DOE Order 251.1B, *Directives System.* These processes have been adequately defined in the NNSA/NV Directives System Manual. Several recent DOE order/policy changes were correctly processed in accordance with the Directives System Manual.

NV and BN have established adequate processes for maintaining the WSSs. These processes are documented and involve senior management review of WSS changes. A WSS Change Review Group—led by the NV Deputy Manager and including representatives from NV, BN, LANL, SNL, LLNL, (DTRA, and Wackenhut Services—reviews and approves WSS Baseline Change Requests and may charter standards identification teams, SMEs, or independent reviews as needed. The approved Baseline Change Requests are maintained in a log that provides for configuration control of the WSSs. The current WSSs and changes to the WSSs are readily available on the NV home page.

BN's WSS procedures clearly define the process and responsibilities for BN participation in establishing and maintaining the WSSs and DOE directives. The BN management review team coordinates changes to the standards, conducts internal standards reviews, and interfaces with the NV Change Review Group. A BN manager is assigned to each WSS work activity and is responsible for managing the associated standards and performance documents.

Some functional area reviews (e.g., the recent industrial hygiene and occupational safety reviews by NNSA, which are discussed later in this section) have determined that some NV WSSs have not been updated to reflect current laws, regulations, and standards. As defined in the NV and BN processes, NV division directors and BN WSS work activity managers are responsible for ensuring that new or revised laws, regulations, and standards are reviewed for potential inclusion in the WSS. However, the deficiencies identified in recent reviews indicate that these responsibilities are not being effectively implemented in all cases. A contributing factor is that neither the NV nor the BN WSS process includes methods for routinely tracking changes in laws, regulations, and external standards.

NV is working to enhance its WSS and requirements management processes. For example, the WSS Change Review Group has established several initiatives to update and improve the NV WSS:

- The Change Review Group has formally chartered several standards identification teams to review and enhance applicable WSSs. These teams are addressing tri-lab ES&H management issues, sitewide explosive operations and safety, sitewide transportation, and safeguards and security. Although an appropriate initiative, the tri-lab standards identification team (which addresses ES&H management issues and is tasked to determine a common set of standards for BN, LANL, LLNL, and SNL by January 2003) has been working for over two years and will require management attention to ensure that its deadlines are met.

- As required in the NV WSS manual, NV is in the process of defining a revolving three-year plan for reviewing and updating one-third of the WSSs each year. This requirement was recently added to the WSS manual in order to establish a process for NV line management oversight of the WSS.

- The NV Assistant Manager for National Security organization has been assigned to develop a user-friendly WSS database and enhance the capability to search the WSS set.

Several NV and BN WSS owners and users are actively and appropriately pursuing several major changes in the WSSs and BN Company Directives. They have self-identified several deficiencies with the WSSs and are using the Baseline Change Requests process to develop proposed enhancements for WSS Change Review Group review and approval.

- The revised DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, was processed through the NV directives management system in 1998. Following a 1999 DOE Headquarters independent oversight safety management evaluation, it was determined that changes were required in the WSSs for occupational medicine. Chapter 19 of DOE Order 440.1A, which addresses the occupational medical program, was added to the Medical Program Management WSS in 1999. Subsequently, the medical director vacancy was filled in January 2001. These actions have provided stability and focus to the BN medical program. The recent addition of several new staff has allowed the Site Occupational Medical Director to begin developing programs and practices that will better fulfill contract requirements and promote other best-management practices. BN is planning to seek ambulatory health care accreditation, strengthening the medical/ES&H interface, and promoting wellness activities at the NTS. In 2002, the DOE Order 440.1A requirements were included as one of the standards for the Hazard Category 2 and 3 non-reactor nuclear facilities WSS. The effects on other WSSs are still being evaluated, and continued management attention is needed to ensure closure.

- In response to an assessment of industrial hygiene and occupational safety programs by NNSA, significant changes are being made to the industrial hygiene and occupational safety WSSs and associated BN Company Directives. The assessment determined that the WSSs for industrial hygiene and occupational safety were incomplete and the flowdown of WSS requirements to the activity level through BN procedures was inadequate. BN has developed and is implementing a corrective action plan to correct the identified deficiencies.

- Recognizing that the underground operations WSS was significantly out of date, the responsible NV WSS functional manager has submitted a Baseline Change Request to the NV WSS Change Review Group to update the standards to reflect current Mining Safety and Health Administration and Occupational Safety and Health Administration (OSHA) standards. These changes were approved by the Change Review Group on September 18, 2002.

- In response to a readiness review at the Waste Examination Facility, the WSS was changed to add a set of the standards for Hazard Category 2 and 3 non-reactor nuclear facilities. The associated BN Company Directives to implement the new set of standards are being developed for the Waste Examination Facility.

In general, these examples indicate that NV and BN are appropriately working to self-identify deficiencies and make improvements in a timely manner. However, additional management attention is needed to ensure that changes required to achieve full compliance with the DOE Order 440.1A are implemented in a timely manner.

The BN Work Smart Standards Company Directive states that the Performance Assurance Manager will provide corporate line management oversight of the BN WSS program. The current BN oversight activities focus primarily on ISM system reviews at the facility and activity level, of which WSS

implementation is a part. These processes identified some deficiencies in the execution plans and company directives. The Performance Assurance Group also reviews new and revised company directives during the directive approval process. However, the current BN line management oversight processes do not encompass the entire BN WSS program in a systematic manner. For example, there is no defined process for verifying that the WSS work activity managers are performing their responsibilities (e.g., managing the standards and performance documents associated with company-level implementation of their assigned WSS work activity). See Appendix D for additional discussion of the BN feedback and improvement systems.

BN implements the WSSs through its ISM system. BN managers have incorporated WSSs into work performance documents for each of their work activity areas. As an integral part of the ISM system, BN managers are required to develop facility execution plans, project execution plans, and support execution plans. These plans provide the necessary framework for identifying and implementing WSSs applicable to their areas. The OA review of selected plans indicates that the plans have been completed and are being used effectively to define the flowdown of requirements for each activity in most cases.

The BN procurement process has been rigorously defined in a BN Company Directive. The required ES&H reviews are clearly defined when purchasing items or services as listed in the procedure. OA's review of records indicated that these reviews are being performed as required. When subcontractor work is to be performed on government property, the subcontract includes clearly defined ES&H requirements. Subcontractor compliance with the ES&H requirements is ensured by the BN subcontractor technical representative.

The OA team identified instances where the flowdown and implementation of requirements from the WSS to the activity were not fully and clearly defined:

- The BN Company Directive *Selecting, Using and Storing Chemicals* requires that information about handling and storing of chemicals, as obtained from the Material Safety Data Sheet for the specific chemical, be included in the applicable hazard analysis, job hazard analysis, or task hazard review. This requirement has not been implemented for chemicals being stored for the Divine Invader test series. (See Appendix E.)

- At the Reactor Maintenance Assembly and Disassembly (RMAD) facility, the health physics staff did not post and control fixed contamination located outside of "radiological areas" pursuant to the requirements specified in the radiological control (Radcon) manual for fixed contamination areas. Also, the BN as-low-as-reasonably-achievable (ALARA) reviews did not provide sufficient detail to demonstrate they were being conducted in accordance with the requirements of the Radcon manual and company directives. (See Appendix E.)

- The DOE site Radcon manual deviates from DOE requirements and expectations with regard to posting and definition of Radioactive Materials Areas, resulting in unclear requirements for posting and control of some contaminated areas on site. (See Appendix E.)

- The WSS for the Spill Testing Facility identifies the OSHA Process Safety Management (PSM) Requirement Standard (29 CFR 1910.119) and requires a pre-startup safety review for each individual test. BN is aware of this requirement and has developed a PSM plan in accordance with the requirements. Although a pre-startup review is performed for each individual test, this review does not satisfy some of the OSHA requirements. The pre-startup safety review requires that a formal process hazards analysis (PHA) be conducted for new facilities (i.e., new tests) using one of several methods (e.g., what-if checklist or fault tree analysis). A PHA has not been conducted as required by

the WSS for the Divine Invader test for chemicals used in that test, other than an informal validation that potential accidents are bounded by the existing HSC hazards assessment.

- Based on an MOU between NV and DTRA, DTRA will implement NV WSS provisions where applicable. However, in some cases DTRA follows DoD requirements (e.g., the DoD explosives safety manual rather than the DOE explosives safety manual). The use of the DoD explosive safety manual as a short-term standard was not identified via the REOP process.

- The Management Plan for the Disposal of Low-Level Waste With Regulated Asbestos Waste calls out the requirements in DOE Order 5820.2A, *Radioactive Waste Management.* In accordance with the WSS for Radioactive Waste, the referenced order should be NV Manual 435.1-1. Also, the BN process description for Waste Certification Program Plan for Radioactive Waste Storage or Disposal at the Nevada Test Site references the old DOE order for radioactive waste management in the Appendix B Glossary for the description of low-level waste. These deficiencies were addressed during the OA review.

- NV Order 412.X3A, *Work Control*, is applicable to DAF and listed in the DAF WSS. However, the DAF work control system does not fully comply with mandatory requirements in the contract requirement document (CRD) for the order. Although the DAF work control system in some areas is more rigorous than the order requirement, DAF does not use Type 1, 2, and 3 work orders as required by the order and CRD. There are conflicting requirements between the DAF management plans for work control systems and the NV order.

- BN radiation work permit (RWP) development procedures do not adequately specify the methods for managing changes in RWPs. This gap resulted in multiple versions of the same RWP at RMAD, each with somewhat different controls and without an appropriate change revision history.

Summary of Guiding Principle #5. The WSSs provide an adequate requirements baseline for BN activities. Agreed-upon WSSs have been established and implemented at NTS for the major contractors performing work (Wackenhut, BN, LLNL, LANL, and SNL). A formal process for maintaining the WSSs is in place and is being adequately implemented. In a number of instances, NV and BN have self-identified deficiencies and have developed or initiated corrective actions. Continued management attention is needed to address deficiencies in tracking changes in requirements not initiated by DOE (laws, regulations, and standards), isolated deficiencies in implementation of the flowdown of requirements, coordination of requirements of different agencies during work–for-others programs, and NV and BN line management oversight processes. Adding a provision for enhanced NV line management oversight of the WSS process is an important step in achieving continued improvement in requirements management processes.

C.3 CONCLUSIONS

Overall, NNSA, NV, and NTS contractors have adequately defined most aspects of their roles and responsibilities and identified and implemented an appropriate set of requirements, consistent with ISM requirements. Most aspects of the NTS ISM program, with respect to the evaluated guiding principles, are effective, and several elements are particularly effective (e.g., WSS maintenance and enhancements, and definition and implementation of roles and responsibilities for subcritical experiments). Although increased management attention is warranted for the work-for-others programs, the effective implementation of the guiding principles is contributing to improved ISM performance at NTS.

C.4 RATINGS

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

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

C.5 OPPORTUNITIES FOR IMPROVEMENT

This OA review identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible NNSA, NV, and contractor line management and prioritized and modified as appropriate, in accordance with site-specific programmatic objectives.

Nevada Operations Office

1. **Clarify and communicate expectations for implementation of the REOP process in work-for-others programs, such as the HSC, and other applicable NTS facilities.** Specific actions to consider include:

   - Reinforce expectations for NV programs and project managers to fully implement the requirements of the NV work-for-others order and the REOP process for all work-for-others programs.

   - Clarify expectations and provide additional guidance to FRs and SMEs in support of NV work-for-others program managers and project managers.

   - Clarify organizational interfaces for crosscutting activities, such as review and approval of REOPs.

   - Assess the utilization of NV ES&H personnel (SMEs and FRs) and the current allocation of their time and attention across NTS programs and facilities. Determine whether additional SME and FR attention is needed at lower-visibility facilities/activities and work-for-others programs. Establish priorities, provide additional resources (if required), and reallocate existing resources as needed to provide an optimal use of available resources.

   - Evaluate the deficiencies identified in REOP implementation during this OA inspection and determine root causes. Evaluate the extent of these conditions at other NTS programs and facilities and communicate lessons learned.

   - Develop supplemental guidance for implementing the REOP process to address methods for performing, approving and documenting technical reviews of test documents performed by SMEs; REOP definitions and terms (e.g., administrative change, authorization basis, and readiness review); and application of the REOP process to programmatic (i.e., experimental or testing), maintenance, and construction work activities.

   - Clarify expectations and approval processes for experiment/test activities that use standards (e.g., DoD standards) that are not defined in the WSS or primary REOPS. Reinforce the need for determining and documenting an agreed-upon set of standards through existing processes (e.g.,

secondary REOPS or alternative method) to ensure that all organizations have a common understanding about the applicable standards.

2. **Strengthen the NV processes for line management oversight and implementation of WSS processes.** Specific actions to consider include:

   - Ensure that the recently added NV review process that requires one third of the WSSs to be reviewed annually is fully and effectively implemented in a timely manner.

   - Within the NV WSS procedures, delineate processes for tracking changes or additions to requirements not originated by DOE (laws, regulations, and standards). Review the progress and planned activities of the tri-lab standards identification team to ensure that its assigned task (to establish a common set of standards for the different national laboratories working at NTS) is completed on schedule (January 2003).

   - Identify and resolve issues that are prolonging closure of the applicability of DOE Order 440.1A (revised in 1998) within the WSS.

Bechtel Nevada

1. **Strengthen the BN WSS processes and procedures.** Specific actions to consider include:

   - Define a systematic BN line management oversight program that reviews the entire WSS process, with particular emphasis on reviewing the performance of the BN WSS work activity managers in managing their assigned WSS and Company Directives.

   - Within the BN WSS procedures, delineate methods and responsibilities for tracking changes or additions to requirements not originated by DOE (laws, regulations, and standards).

   - Develop and implement a tracking system that identifies each change and includes provisions for review by the assigned WSS owners for application to NV WSS and determining the need for a Baseline Change Request.

   - Systematically analyze the instances of deficiencies in flowdown and implementation of WSS requirements to the working level (lack of strict adherence to pre-test review requirements at the Spill Testing Facility, incorrect or inconsistent references, and inadequate version control for RWPs) to determine root causes and corrective actions. Emphasis should be directed at correcting the flowdown of requirements from the WSS for the Spill Testing Facility for experiments conducted as part of work-for-others programs.

2. **Clarify and communicate roles and responsibilities, with emphasis on ES&H responsibilities in work-for-others programs at the HSC and other applicable NTS facilities**. Specific actions to consider include:

   - Clarify new and evolving expectations for roles and responsibilities, particularly as they relate to organizational interfaces in work-for-others programs.

   - Clarify and communicate modified roles and responsibilities and revise procedures and plans to reflect recent organizational changes.

- Clarify roles and responsibilities and organizational interfaces for nuclear waste facilities and other facilities and programs that rely on overhead funding from multiple organizations.

- Increase the focus on strategic planning (e.g., requirements for new capabilities and functions and associated roles and responsibilities in such areas as conduct of operations) in the next revision of the Nuclear Operations Implementation Plan.

3. **Continue to formalize the mission, function, and role of the medical organization at NTS**. Specific actions to consider include:

   - Ensure that the BN Site Occupational Medical Director continues to coordinate with NV to identify and support the requirements of DOE 440.1A Chapter 19, which requires the medical director to establish a comprehensive medical program based on identified hazards, participation with worker protection teams, and the necessary access to information that will identify potential health effects on workers at the NTS.

   - Consider establishing a formal Company Directive that describes the roles and responsibilities of managers, workers, worker protection team members (e.g., industrial hygiene, health physics, safety), and medical personnel as they relate to the medical program.

   - Strengthen the interface between the industrial hygiene and medical organizations and develop methods for capturing potential health effects from hazards assessments, job task analysis documents, or annual worker/supervisor job demand reviews.

   - In coordination with NV, continue to support efforts to achieve accreditation for the BN medical program in order to formally establish quality improvement activities and provide for a baseline assessment of current medical practices.

APPENDIX D

Core Function #5 – Feedback and Continuous Improvement

D.1 INTRODUCTION

The Office of Independent Oversight and Performance Assurance (OA) evaluation of feedback and improvement at the Nevada Test Site (NTS) included an examination of the programs and performance of the Nevada Operations Office (NV); the management and operating contractor, Bechtel Nevada (BN); and major facility tenants—Lawrence Livermore National Laboratory (LLNL) and Los Alamos National Laboratory (LANL). The OA team examined the NV line management oversight of NTS integrated safety management (ISM) processes and implementation, including the operational awareness program; environment, safety, and health (ES&H) program evaluations; and the award fee/performance evaluation and measurement process. The OA team reviewed BN, LLNL, and LANL institutional processes, such as assessments and inspections, lessons learned, corrective action/issues management, employee concerns, and activity-specific processes such as post-job reviews.

D.2 RESULTS

D.2.1 NV Line Management Oversight

NV has established an appropriate organizational structure and policies for conducting ES&H oversight at the NTS. The NV Oversight Management System Manual describes the processes, requirements, and commitments for NV oversight and self-assessment. The manual appropriately assigns line management oversight responsibilities (i.e., operational awareness activities, validation of contractor self-assessment programs, and NV assessments) to all NV personnel who have applicable work scopes. NV organizations have developed management plans and validation/assessment plans that provide a schedule and expectations for line management oversight assessments of assigned areas. The line management oversight responsibilities of the Facility Representative (FRs) are further detailed in a set of division-level procedures.

With some exceptions, project managers, task managers, FRs, subject matter experts (SMEs), and ES&H functional area managers (FAMs) are conducting periodic formal assessments, as well as operational awareness activities such as walkthroughs, document reviews, and attendance at critiques or other meetings. These oversight activities are identifying ES&H program and facility condition deficiencies and fostering continuous performance improvement at the NTS. With some exceptions, the performance of oversight activities and any findings are documented in the NV Oversight Tracking System (OTS). Deficiencies are risk ranked, communicated to the contractor, and tracked to resolution based on the ranking. Significant deficiencies are communicated to contractors/tenants in writing, and a formal corrective action plan is required. Many other deficiencies are communicated and tracked based on the judgment of the assessors and their management.

Feedback and information sharing for FRs are fostered through weekly reports to their Director, frequent staff meetings, quarterly summary reports, and meetings with the NV Manager. The ES&H technical staff also meets with and presents reports quarterly to the NV Manager. The FAMs/SMEs are in the process of conducting in-depth baseline assessments of the programs and performance of NTS contractors and facility tenants in 13 functional areas. The first two baseline assessments were rigorous and

comprehensive evaluations that involved peer reviewers from other Department of Energy (DOE) operations offices and the National Nuclear Security Administration (NNSA).

NV is demonstrating leadership and commitment to strengthening feedback and improvement processes at the NTS by active participation with NTS contractors and facility tenants in the ISM Council and the Lessons Learned Implementation Team. In addition, NV has established and is implementing a lessons-learned program. In preparation for the OA inspection, NV conducted a self-assessment survey of 11 continuing core expectations from NV Order 450.4, *Safety Management System Maintenance*, using criteria from OA's recent inspection at LLNL. The survey was completed by four Assistant Manager organizations plus ES&H, Environmental Management (EM), and the Management System Steering Panel. Recommended actions are being compiled and presented to the Manager. NTS contractors and facility tenants, under the direction of the ISM Council, are conducting similar self-assessments.

NV is using contract performance based incentives to promote improvement in BN ES&H performance. The fiscal year (FY) 2002 NNSA/BN contract for the operation and management of the NTS includes award fee special emphasis areas for ES&H and ISM performance. NV's interim performance monitoring "scorecard" for the ES&H and ISM award fee items indicates an emphasis on needed improvements in safety at environmental projects and in safety and health programs. The draft performance-based comprehensive incentive scorecard provides detailed performance targets for ISM and Occurrence Reporting and Processing System (ORPS) reporting that are directed at improving BN assessments and the timeliness and reporting thresholds for events.

NV maintains an employee safety concerns program, including a recorded telephone hotline, for use by NNSA employees, contractors, facility tenants, and facility user organizations (e.g., government, academic, or private companies that use the NTS facilities for specific tests) at the NTS. Relatively few safety-related concerns have been received in the last few years, typically one or two per year and none to date in 2002. The program is promoted through posters in all buildings on site and in general employee training. A division-level standard operating procedure details the process for handling concerns received by NV direct from concerned individuals or from the Inspector General. The process involves management reviews at the Division Director, Assistant Manager, and Deputy Manager levels for evaluation and final disposition. The actions and approvals for disposition are maintained.

Although most of the framework for an effective program is in place and many oversight activities are being performed, several weaknesses limit the effectiveness of the NV oversight of ES&H performance at the NTS:

- **NV line management oversight effectiveness is hindered by weaknesses in planning, coordination, and integration of the various oversight activities conducted by project/program managers, FRs, FAMs, and SMEs**. Although NV performs many effective assessments, line management oversight activities are not consistently planned in a comprehensive, coordinated, and rigorous manner that ensures comprehensive coverage of functional and management system areas:

    - No validation/assessment plan was developed for the Reactor Maintenance, Assembly and Disassembly (RMAD) facility demolition work for FY 2002, although this work has significant radiological and work control challenges. EM project and task managers performed at least eight walkthroughs in 2002; however, SMEs and FAMs were not involved in these activities, FRs had only limited involvement, and no findings were documented. EM validation/assessment plans do not identify when FR or SME support is needed.

    - Some responsibilities and expectations for SME oversight of Hazardous Materials (HAZMAT) Spill Center (HSC) projects are not effectively implemented (e.g., application of risk management

criteria and guidance for when SMEs or FRs must review changes to test in firing plans or observe tests).

- NV did not perform sufficient evaluations of chemical storage at the HSC or radiation control practices to ensure that the contractors met applicable requirements in these areas. (See Appendix E.)

- Reviews of contractor self-assessment programs and performance are not effectively incorporated into validation/assessment plans as directed by the Oversight Manual.

- Although FRs conduct many routine operational awareness activities and assessments in support of the project/program manager validation/assessment plans, the FR program is not always implemented as detailed in NV procedures. FRs do not generate annual activity plans and quarterly surveillance schedules as specified in procedures. FR formal assessment activity is primarily limited to supporting the project/program manager validation/assessment plans. Crosscutting management system areas, such as corrective actions, contractor self-assessment processes, lessons learned, and work control, are not routinely evaluated. FR oversight of more routine, but high risk and frequent, activities, such as maintenance and construction/demolition, are limited because the FRs tend to focus on higher-profile weapons test-related activities. No programmatic assessments of maintenance or construction safety have been performed by NV.

- **Identified safety deficiencies and issues are not consistently managed to ensure timely resolution and prevention of recurrence**. As examples:

  - A few findings are not being input to the OTS. For example, findings from the May 2002 NA-53 assessment of nuclear safety and operations oversight capability have not been input to OTS.

  - NV does not ensure that the contractor tracks NV assessment findings (e.g., findings from the April 2002 industrial safety/industrial health baseline assessment have not yet been entered into BN's tracking system.)

  - Trend analysis of ORPS, OTS, and Price-Anderson Amendments Act (PAAA) data to focus oversight planning is not being performed as specified in the Oversight Manual.

- **NV organizations are not scheduling or performing self-assessments as required by the Oversight Manual**. Notwithstanding the recent ISM survey self-assessment, continuing, planned self-assessments of NV programs and processes are not being performed. Although some organizations, such as Stockpile Stewardship, have written implementing procedures, NV managers have not put sufficient emphasis on planning and conducting the required self-examinations.

- **In one case, NV did not fully evaluate the adequacy of BN's review and disposition of a significant employee safety concern**. As discussed in the next subsection, NV forwarded an employee concern to BN for resolution, and BN's review and disposition was inadequate. NV's review was not sufficient to ensure the adequacy of the BN review and disposition.

Finding #2: NV line managers have not performed sufficient planning and coordination to ensure comprehensive oversight of NTS ES&H programs and effective implementation of some requirements in the areas of tracking findings and performing self-assessments.

Although these weaknesses warrant increased management attention, NV's line management oversight program is effective in most respects and is improving. NV's frequent assessments, good operational awareness, and management attention have contributed to significant improvements in NTS ES&H programs over the past few years. Further, NV line management oversight has been extensive and effective in the Device Assembly Facility (DAF) and the U1a Facility and for many other types of hazards (e.g., electrical safety). For certain types of activities (work for others, and some maintenance and construction activities), NV's line management oversight has not been as extensive and rigorous, in part because of weaknesses in the implementation of roles and responsibilities. (See Finding #1 in Appendix C.) NV senior management recognizes that some aspects of its line management oversight program need further improvements. Several key elements of the NV oversight program are in transition as efforts are ongoing to address the known weaknesses. For example, many FR procedures are being revised to align them with actual processes. Also, the OTS is being replaced with a new corrective action tracking system, which will be shared with BN to facilitate trending of data and enhance communication with the contractor. NV management is drafting enhancements to the Oversight Manual to address known weaknesses in roles and responsibilities and interfaces between the various NV oversight elements.

D.2.2 Bechtel Nevada, LLNL and LANL

BN and the two major laboratory tenants, LLNL and LANL, have a number of institutional programs to provide feedback on the adequacy of ES&H processes and performance using, various inspection and assessment processes. Feedback mechanisms, including ORPS, lessons learned, the performance-based safety program, safety committees, and participation in sitewide improvement groups, such as the ISM Council and the Lessons Learned Implementation Team, provide additional institutional feedback vehicles for improving ES&H performance. Each organization employs deficiency tracking systems. As discussed below, assessment programs, corrective action management, lessons-learned programs, the BN performance-based safety program, and the employee concerns program have many positive aspects as well as weaknesses that need to be addressed.

Assessments. BN, LLNL, and LANL conduct numerous independent and management assessments and inspection/surveillance activities to evaluate safety performance and implementation of ISM at the NTS. Requirements for conducting assessment and safety inspection activities are detailed in BN Company Directives. The BN Performance Assurance Division has conducted over 30 independent assessments, focusing on implementation of various ISM elements. These assessments have identified and documented deficiencies in safety processes and performance. Responsible BN managers are required to develop annual assessment schedules and conduct management assessments sufficient to assure a comprehensive review of how well work is being managed. In addition, Company Directives require that management assessment schedules be included in facility, project, and support execution plans. Most of the various execution plans reviewed by the OA team included or referenced management assessment schedules. Some of the BN line and support organization self-assessments, notably program reviews conducted by the ES&H Division, were comprehensive and thorough examinations based on clearly defined criteria. The BN Health Physics Division has established a formal work observation program with scheduled surveillances by radiological control engineers and managers.

Although the framework for an effective BN assessment program is in place and many assessment activities are performed at the NTS, identified weaknesses limit the overall effectiveness in measuring performance and driving continuous improvement. Some scheduled assessment activities have not been performed, and the frequency and scope of assessments in some areas are limited. BN execution plan specifications for some management assessments are minimal (e.g., Construction scheduled one self-assessment for FY 2002, and Facilities Maintenance identifies semi-annually scheduled and "when required" assessments but no specific subject area). No formal self-assessments were performed in FY

2002 by Environmental Restoration and Construction at RMAD. Site Services (Maintenance) has performed few management assessments, and those that were performed lack sufficient rigor to effectively measure program and performance adequacy. A number of scheduled ES&H Division program reviews of industrial safety/hygiene have not been performed in FY 2002. The Environmental Compliance and Health Physics Department assessments have been too limited in scope (one functional element at one facility) to provide sufficient data to evaluate program performance. Although BN has significantly improved its independent assessments and performs numerous management assessments, some of the weaknesses in the management assessment program identified in the 1999 DOE Headquarters independent oversight safety management evaluation have not been adequately addressed (see Finding #3 later in this section).

Few formal safety assessments of LANL activities have been conducted. LANL management and safety personnel conduct regular walkthroughs of the U1a Facility and have identified facility condition safety deficiencies and initiated corrective actions. In addition, the Los Alamos Internal Assessments group performed an independent assessment of the Dynamic Experimentation (DX) Division, including observing work at NTS. Although the DX Division assessment plan requires its managers to perform quarterly management assessments, none have been performed for NTS operations. In June 2002, LANL issued a new procedure for conducting self-assessments and tracking corrective actions (see Finding #3).

For LLNL activities, some aspects of the assessment performed by LLNL personnel are rigorous and effective in identifying deficiencies. However, the scope and number of self-assessments are not sufficient to ensure comprehensive coverage of ES&H programs. The LLNL NTS organization, Nuclear Test Operations (NTO), issues two-year schedules of surveys (structured assessments conducted by the quality assurance [QA] engineer), facility inspections by ES&H Team 1, and independent audits conducted by non-NTO personnel. Requirements for self-assessments are detailed in an NTO administrative procedure. Completed surveys were planned and thorough, and safety deficiencies were identified. Although the ES&H Teams conduct safety-related inspections and the QA engineer conducts some safety-related surveys, the scheduled self-assessments related to ES&H are limited both in number and scope. Only three such surveys were scheduled or performed in FY 2002 (addressing security, transportation, and contractor procurement), and only two independent audits were scheduled or performed in FY 2002. Such topics such as conduct of operations and QA are scheduled for assessment approximately every four years. Many management system and functional areas, such as work control, issues management, environmental protection, construction safety, and industrial hygiene, are not included in the assessment topics. Two of the four planned surveys in FY 2001 were cancelled.

Issues and Corrective Action Management. BN, LLNL, and LANL have formal systems for tracking deficiency corrective actions and procedures detailing the implementation requirements. No deficiencies were identified during the review of selected aspects of LLNL's issues management program.

BN's current deficiency tracking system is called the Computerized Requirement Evaluation, Assessment, and Technical Evidence System (CREATES). A company directive requires that both internally and externally identified deficiencies be processed using CREATES. A new issues assessment and deficiency tracking system, to be shared by NV and BN, is being tested and is scheduled for rollout in October 2002. The new system is designed to be more user friendly, enhance trending and reporting capabilities, and enhance communication and information access between NV and BN.

Although processes are in place, the documentation, evaluation, and resolution of ES&H deficiencies and issues at the NTS are not being managed in a structured, consistent, and effective manner that fully supports continuous improvement. Many deficiencies identified by BN and NV oversight are not being entered into CREATES. The OA team identified numerous deficiencies from BN management and independent assessments, as well as NV-identified issues, that had not been entered into CREATES for

disposition and tracking. Management assessments related to the lessons-learned, environmental compliance, industrial hygiene, health physics, and maintenance programs were not entered into CREATES, nor were findings from the April 2002 NV assessment of industrial safety and industrial hygiene. Performance issues—involving the failure to schedule and perform management assessments—resulting from the June 2002 independent assessment of corrective actions to the PAAA concern in calendar year 2000 were not documented in the tracking system. The failure to enter deficiencies into CREATES adversely impacts the effective implementation of PAAA requirements, because the reviews of reportable items are based primarily on the data in CREATES.

In addition, the resolutions of many deficiencies, as documented in CREATES, do not address all aspects of the reported issues, the extent of the condition (the potential for similar deficiencies in other areas), or recurrence controls to address the causes of deficiencies. For example, lockout/tagout deficiencies and gauges/instruments that had not been calibrated were not sufficiently analyzed; corrective actions addressed the specific deficiencies without determining whether they were isolated cases or why the deficiency occurred. BN has not implemented the requirements of two Company Directives related to identifying and managing issues (i.e., "Gathering of Integrated Safety Management System Problematic Issues" and "Identifying, Prioritizing, and Tracking Critical Safety Management and Security Issues"). In addition, as detailed under Core Function 4 in Appendix E, material condition deficiencies identified by OA in shop areas had previously been identified by DOE and external inspectors but inadequately addressed by BN to prevent recurrence. The 1999 DOE Headquarters independent oversight safety management evaluation also identified deficiencies in issues management. Although some progress has been made, BN has not adequately addressed the longstanding weaknesses in issues management.

LANL has not adequately managed resolution of identified deficiencies. Over 20 open deficiencies identified in 2001 and included in the LANL tracking system, including some identified as high priority, have not been assigned to responsible parties or had planned actions identified.

Finding #3: BN and LANL issues management processes have not ensured appropriate and timely resolution of safety concerns, the BN management assessment program has not been effectively implemented, and the frequency and scope of LANL assessments have not been sufficient to ensure comprehensive coverage of ES&H programs.

NV and NTS contractors recognize the need for improvement in the conduct of management assessments. Some actions are ongoing or planned to improve performance, including LANL's recently issued procedure for assessments and corrective actions and the new issues management system being developed for NV and BN use.

Lessons Learned. Lessons-learned programs are well defined and implemented to communicate safety issues to workers and work planners. External lessons learned are screened and distributed and internal lessons learned are developed and shared, with lessons incorporated into planning activities. The LANL lessons-learned program is notably rigorous, with lessons-learned reviews and actions tracked in a comprehensive database. LANL also conducts formal post-shot reviews at the U1a Facility, and production and ES&H problems are entered into a database, tracked to resolution, and incorporated into future project plans. BN construction crews performing decontamination and decommissioning at RMAD conduct daily debriefings on what went right and wrong. For the past year an improvement team, with representatives from NV and all NTS contractors and tenants, has been formally evaluating and improving the lessons-learned programs and performance at the NTS.

Notwithstanding these examples of excellence in communication of lessons learned, there are weaknesses that limit the effectiveness of the lessons-learned program. Consistent feedback from the line regarding

lessons learned is lacking for BN. SMEs and personnel responsible for corrective actions rarely respond to the lessons-learned coordinator's requests for feedback on applicability and on actions recommended or taken. Thus, although many lessons learned are being communicated to many BN managers, their relevance and application to NTS conditions and processes are not monitored or measured. BN maintenance management does not make effective use of maintenance post-job briefings as a way to obtain lessons-learned feedback from workers.

BN Performance-Based Safety Program. The BN performance-based safety program, in place since the early 1990s, provides a vehicle for increasing worker awareness of safety behavior on a personal basis through training of observers and the immediate feedback provided during the many one-on-one observations conducted in the workplace. The program has had a recent resurgence, with renewed emphasis on increasing the number of observations. Recently, training on the program's purposes and benefits was conducted for BN management and is resulting in improved line management support for the program.

Employee Concerns Program and BN Hotline. NV has established a single employee concerns program that is available to employees of NV and all NTS contractors. As an additional measure, the BN ES&H Division advertises and maintains a safety hotline that provides for anonymity if requested. The hotline receives approximately ten calls a year, and a few of those typically identify ES&H issues. The processes for managing responses to inquiries from the NV employee concerns program and for processing calls to the hotline have not been documented in written procedures. Documentation of responses to NV inquiries and hotline calls indicates that BN is not rigorously managing and resolving employee concerns. An ES&H Division notebook contains records of hotline calls, but the records for some calls are not legible or are very cryptic. Many of the records do not clearly document the routing of the concern for evaluation, and most do not document the final disposition or any feedback to the concerned individual.

In one instance in December 2000, BN's and NV's disposition of an employee concern (an alleged failure of BN ES&H and line employees to employ ISM in an environmental restoration activity) did not reflect a proper consideration of the potential significance of the event or the principles and functions of ISM. The concern, detailed in a letter to NV and BN management and forwarded by NV to BN for evaluation, detailed the unsafe handling and intentional puncturing of an unearthed acetylene cylinder with a bulldozer ripper tine. The investigation minimized failures to apply ISM to worker protection and inappropriately concluded that ISM principles and core functions had been adhered to. The event was not documented in CREATES or deemed reportable in ORPS as a near miss. Although the BN ISM program has matured and improved considerably since the December 2000 investigation, the processes for responding to employee concerns are still not formalized or rigorous, the failure to document performance deficiencies in CREATES remains an issue, and the failure of BN to report near miss events through ORPS has been cited by FRs several times in the past year.

D.3 CONCLUSIONS

NV has established an appropriate organizational and administrative framework for conducting operational awareness and assessment activities related to contractor and facility tenant safety performance at the NTS. FRs and SMEs maintain operational awareness and conduct planned assessments. Project managers are involved in establishing validation/assessment plans and conduct safety related line management oversight. Comprehensive baseline assessments are being conducted in 13 functional areas covering all site contractors and tenants. Safety program and performance deficiencies are being identified and risk ranked, and corrective actions are tracked to resolution. Safety performance incentives are included in the NNSA/BN contract and used to promote improvements in

performance. NV has demonstrated safety leadership through participation in NTS working groups for improving ISM and lessons-learned programs.

Although effective in many respects, NV line management oversight processes need additional attention to ensure that expectations for line management oversight responsibilities are clearly defined. Communication and coordination of oversight planning need to be improved to ensure optimal use of resources, proper prioritization of line management oversight activities, and adequate assessment of crosscutting management systems. In addition, NV management needs to implement the self-assessment requirements of the NV Oversight Manual.

BN and laboratory organizations from LLNL and LANL use many mechanisms to provide feedback and improvement in safety performance at the NTS. Each of these organizations has formal programs for conducting independent and management assessments, tracking corrective actions, and identifying and applying lessons learned. Further improvements in lessons-learned programs are being addressed through a sitewide implementation team.

However, weaknesses in contractor feedback and improvement processes and implementation hinder their effectiveness in driving continuous improvement in ISM. Assessment programs need further strengthening to ensure that all required assessments are scheduled and performed, including institutional evaluations of ES&H program adequacy, and that assessment results are input to deficiency tracking systems. The processes and performance for managing BN and LANL ES&H deficiencies needs management attention to ensure that the extent of condition and recurrence controls are established and that implementation of corrective actions is timely and effective. BN management has not ensured that applicability evaluations are performed, that appropriate actions are taken for applicable lessons learned, and that both are properly documented. The rigor in the disposition of BN employee concerns needs to be improved to ensure that safety concerns are fully addressed and to ensure worker confidence in the process.

Overall, NV and NTS contractors and facility tenants employ many different mechanisms for gathering feedback information, sharing lessons learned, implementing corrective actions, and conducting oversight of ES&H activities. However, process weaknesses and inadequate implementation of these mechanisms have hindered their effectiveness in driving consistent, continuous improvement, especially in managing the evaluation and resolution of safety deficiencies. In several cases, the weaknesses in assessment programs were been self-identified by NV and NTS contractors, and actions are being taken to improve performance.

D.4 RATING

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

D.5 OPPORTUNITIES FOR IMPROVEMENT

The OA review identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible line management and prioritized and modified as appropriate, in accordance with site-specific programmatic objectives.

Nevada Operations Office

1. **Strengthen oversight planning processes and performance for evaluating NV and contractor performance to ensure that oversight activities are appropriately focused**. Specific actions to consider include:

   - Establish clear direction for staff responsibilities in overseeing work–for-others activities at NTS.

   - Establish more rigorous mechanisms to coordinate the development, review, and approval of oversight plans such that project manager, FR, FAM, and SME efforts are coordinated and integrated to provide an appropriate level of oversight and application of resources.

   - Ensure that oversight activities formally and periodically evaluate management systems and activities that cut across programs and projects, including maintenance, construction, training, contractor and facility tenant self-assessments and issues management. Emphasize the observation of work and review of objective evidence of effective ISM implementation.

   - Ensure that evaluations of work and conditions in a sampling of lower-profile, smaller, or isolated facilities are included in oversight plans.

   - Strengthen/formalize mechanisms that provide regular feedback to senior management on the status on the implementation of oversight and self-assessment plans.

   - Establish a mechanism to periodically roll up evaluation data on the adequacy of NTS contractor and facility tenant self-assessment and corrective action processes. Use the data to determine overall progress in the development of a robust, rigorous, and credible contractor self-assessment program as specified in DOE and NV Policy 450.5.

   - Implement the self-assessment process detailed in the NV Oversight Manual.

   - Conduct an implementation assessment of the new corrective action tracking system soon after rollout to verify that BN existing processes and practices have been adopted and that deficiencies are being entered into the system and effectively resolved.

   - Establish routine, formal communication of oversight activities and findings to contractors and facility users.

   - Fully document the NTS employee concerns program by strengthening NV Order 442.1 or issuing another directive to address the objectives, roles, and responsibilities for use of the employee concerns program by contractors and facility users and to address all program elements delineated in DOE Order 442.1.

Bechtel Nevada

1. **Strengthen self-assessment processes to ensure that ISM processes and performance are effectively measured and weaknesses are identified and corrected.** Specific actions to consider include:

   - Increase senior management involvement in ensuring that the frequency and scope of management assessment programs are appropriate to the level of activity and risks involved.

- Ensure that independent assessment reports better describe the basis for conclusions that evaluation criteria have been met.

- Expand independent assessments of the implementation of management assessments to include an evaluation of the appropriateness of the frequency and scope of scheduled assessments and the adequacy of completed assessments and documentation and disposition of findings.

- Broaden the scope of scheduled management assessments to address the overall performance of the organization in the selected focus subjects or functional areas rather than performance at individual facilities or program elements.

2. **Ensure that sufficient controls have been established so that the transition to the new corrective action tracking system results in timely and effective correction of past performance issues.** Specific actions to consider include:

   - Identify and revise all existing procedures that address assessment and inspection processes to address the use of the new system. Identify all existing work-around tracking systems and incorporate into the new system.

   - Clearly communicate senior management expectations to line and support managers and all hands for use of the new system and encourage widespread ownership of the process.

   - In a controlled and comprehensive manner, identify outstanding (unresolved) issues that have not been put into CREATES and transition them into the new tracking system.

   - Conduct comprehensive independent assessments of implementation soon after rollout.

3. **Strengthen the lessons-learned program to ensure that appropriate technical applicability reviews are conducted and documented, recommended actions are communicated, and actions taken are documented.** Specific actions to consider include:

   - Revise the company directive to provide requirements for providing and documenting feedback on lessons-learned applicability and actions.

   - Ensure that support and line organizations perform and document applicability and action feedback.

4. **Establish and implement a formal process for documenting and processing safety hotline concerns to ensure rigorous evaluation, effective resolution, and feedback to concerned individuals.**

5. **Expand the processes for evaluation and trending of performance-based safety program observations of at-risk behavior beyond individual teams to identify potential company-wide program and performance issues and to effect broader performance improvements.**

Lawrence Livermore National Laboratory

1. **Increase the frequency of safety-related surveys and audits that focus on crosscutting safety functional areas and ISM systems.**

Los Alamos National Laboratory

1. **Implement the new management assessment procedure.**

2. **Identify responsible parties and establish corrective action plans and completion dates for longstanding open system issues in the LANL action tracking system.**

3. **Strengthen the NTS self-assessment and corrective action procedure to address the following elements.** Specific actions to consider include:

    - Detail a process for developing, issuing, and revising periodic schedules of self-assessment activities.

    - Include management and safety staff walkthroughs as self-assessment activities.

    - Clarify the relationship of the NTS self-assessment process to LANL DX Division requirements (quarterly "Appendix F" assessments).

    - Address the process for NTS independent assessments.

    - Include expectations and requirements for timeframes for documenting and implementing corrective actions and addressing extent of condition and recurrence controls in deficiency evaluation.

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APPENDIX E

Core Function Implementation (Core Functions 1-4)

E.1 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) evaluation of work planning and control and implementation of the first four core functions of integrated safety management at the Nevada Test Site (NTS) focused on safety performance during conduct of facility maintenance, decontamination and decommissioning, and operations associated with programmatic work and work for others. Observed work activities included maintenance, subcritical experiment setup (the Rocco experiment), programmatic testing preparation, facility operations, waste management, and decontamination. Procedures and policies, such as stop-work policies, were evaluated, and hazard analysis and control systems were examined. This approach enabled OA to evaluate the implementation of work control processes governing a broad spectrum of work in the areas of operations, programmatic and project work, maintenance, and environmental protection.

At NTS, the primary mechanism for implementation of the core functions of integrated safety management at the facility and project level is the Real Estate/Operations Permit (REOP) process. The REOP is a process of the Nevada Operations Office (NV) and provides the primary mechanism for the review of new work, proposed changes to work, and the assessment of risk for new or changed work activities. The REOP process applies to all tenant organizations at NTS. Tenant organizations include Bechtel Nevada (BN), Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), Defense Threat Reduction Agency (DTRA), Wackenhut Services Incorporated (WSI), Desert Research Institute (DRI), International Technology Corporation (IT), and Science Applications International Corporation (SAIC). Primary REOPs authorize defined work scopes performed on defined real estate and are issued to these tenant organizations that have management system controls, which have been validated by NV. Secondary REOPs are used by NV or the primary REOP holder to another organization as a mechanism for authorizing a defined a specific work scope on real estate assigned to a primary REOP holder.

The REOP process includes an assessment of inherent risks to site workers, the public, and the environment from proposed or changed experiments and tests conducted at NTS. NV, NTS contractors, and National Nuclear Security Administration (NNSA) national laboratories designated by NV as facility managers may hold primary REOPs. All other organizations performing work at NTS must acquire a secondary REOP. The REOP, its attachments, any associated project, support, and facility execution plans, and any applicable hazard analyses (such as safety analysis reports or hazards assessments) constitute the authorization basis for facilities and activities performed within those facilities. For work-for-others projects, NV may be the only organization to review a project's hazards and controls and evaluate the risk associated with the performance of that project. NV manuals and procedures on the REOP process define the requirements for the preparation and revision of REOPs and assign roles and responsibilities for the implementation of the process.

Facilities and projects within the scope of this evaluation included a mix of primary and secondary REOPs. At the Device Assembly Facility (DAF) and the U1a Facility, work performed by NNSA government-sponsored national laboratories, such as LANL and LLNL, is conducted under primary REOPs. BN, as the facility operator for the Hazardous Materials (HAZMAT) Spill Center (HSC),, holds the primary REOP for the HSC. Most project work at the HSC is conducted by external agencies and work for others projects, and is controlled using secondary REOPs. This inspection focused on the

Divine Invader test series at HSC being conducted for DTRA. BN is the primary REOP holder for the Reactor Maintenance Assembly and Disassembly (RMAD) building decontamination project.

NNSA and BN have established formal procedures, processes, and requirements for the conduct of specific work (work that falls within a primary or secondary REOP) at NTS. Primary REOP holders, such as BN, LLNL, and LANL, have established work control procedures that govern work activities at the various NTS facilities for which they are responsible. With the exception of DAF and programmatic work done at the HSC, all work control process are based on requirements in an NV work control order and include Type 1 (safety-related work), Type 3 (lower-risk routine and skill-of-the-craft work), and Type 2 (work other than Type 1 or Type 3). The NV order specifies work package requirements that range from a scope of work and hazard identification document for Type 3 work to fully planned and documented work packages for Type 1 work. DAF uses an equivalent work control system where work activities receive more review and control. The BN Site Services and Construction organizations use similar work control processes, with Site Services performing more routine and preventive maintenance activities and Construction performing larger jobs requiring project management and construction services. The HSC, under BN management, provides space and services that allows primarily offsite organizations to perform experiments. Infrastructure work at HSC is performed by BN Site Services, experimental work is controlled by test plans that are authorized by NNSA, and experiment support work (e.g., setup, calibration, and dismantlement) is performed by BN technicians permanently assigned to HSC. At the facility level, facility owners or designees authorize work.

E.2 STATUS AND RESULTS

E.2.1 Core Function #1 – Define the Scope of Work

Missions are translated into work, expectations are set, tasks are identified and prioritized, and resources are allocated.

Programmatic work, which includes experiments performed by onsite NNSA national laboratories and chemical dispersion testing performed at HSC under the work-for-others program, is clearly defined for nearly all work at the site through a systematic approach (REOP, facility execution plans, support execution plans, test plans, and supporting procedures). For example, work at the HSC is defined and bounded by the HSC Facility Execution Plan, the HSC Support Execution Plan, the HSC Hazards Assessment, and the HSC Environmental Assessment. In addition, work activities conducted by the HSC resident staff are defined in specific work packages, test plans, and procedures for work conducted at the HSC by outside agencies. Some specific deficiencies with respect to test plans are discussed later in this section.

The REOP process, as described in NV procedures, establishes an effective mechanism for defining work scope, evaluating risk, establishing facility-level controls and a safety envelope, and providing internal and external project reviews prior to authorizing work. However, the REOP process lacks sufficient guidance in some areas (see Appendix C) and was not effectively implemented at HSC.

For environmental work, BN has effectively defined the framework for implementing the BN environmental management system through issuance of an environmental management system description (EMSD). The EMSD provides the basic premises, environmental policy, requirements, and potential environmental impact evaluation. The structure and responsibilities are also defined, along with document administration and controls, training, and oversight. Support execution plans (SEPs) are also effectively used to define environmental compliance activities. For example, the SEP for the Environmental Compliance Department (ECD) provides the actual execution requirements for the responsibilities defined in the EMSD. This SEP also contains support activity requirements, resources

necessary to perform the work, a hazard analysis for the ECD employees providing field support, and a table of applicable work smart standards and performance documents. The Environmental Technical Support (ETS) group also uses a SEP to define their work and the safety aspects of field monitoring and sample collection. These SEPs provide an effective tool for implementing the responsibilities of the ECD and the ETS in a manner that protects the safety and health of the staff.

Facilities maintenance, utility services, and grounds upkeep is provided by NTS Site Services. Since the 1999 DOE Headquarters independent oversight safety management evaluation, Site Services has extensively revised work control processes and site services functions including the Facilities and Utilities organizations. Revised work management procedures and a common work control system are implemented for all maintenance activities, thereby correcting deficiencies identified during the 1999 DOE Headquarters independent oversight safety management evaluation. The improvements included establishing and formalizing the work management center, the planning and scheduling center, and the customer service center to facilitate identification of work and planning work activities. Observation of work and review of work packages indicated that the scope of work was well defined and clear. Work requests were prioritized based on the importance of the task, and equipment and resources to perform the work were identified.

Site Services recently completed condition assessment surveys (CASs) of BN managed facilities on a three-year cycle to document facility conditions and to identify necessary short- and long-term refurbishment and decontamination and decommissioning (D&D) work activities. A facility management group within Site Services actively manages the operational and inactive facilities to define work and allocate BN resources. Site Services is actively pursuing improvement of all infrastructure facilities and grounds, and an upgrade of Mercury facilities was in progress during the inspection period. The upgrades included road upgrades and a five-year plan for painting buildings. Facility information is documented in the NV Facility Information and Management System (FIMS). The effort to improve facility management and conditions included developing new and revised procedures to address facility condition surveys, and facility activation and deactivation processes.

The BN Construction Department is responsible for facility modifications and new site construction work that exceeds the Davis-Bacon criteria (Federal construction contracts in excess of $2,000). The BN Construction Department also provides the construction labor force for D&D work that is under the responsibility of BN Environmental Management. An example of such D&D work is the RMAD building decontamination activities being conducted in Area 25. The scope of work for the RMAD decontamination project is effectively described at the project level in the Environmental Restoration Project Execution Plan. At the work activity level, initial development of work packages results in an introductory section describing the scope of work in detail. For example, the work package for decontamination of RMAD basement Rooms 6 and 7 provides detailed scope descriptions, such as "remove and dispose of the HEPA [high efficiency particulate air] ventilation systems," "remove and dispose of hydraulic systems," and "decontaminate all accessible radiologically contaminated surfaces to meet release criteria." This level of detail provides the necessary information to facilitate effective hazard analysis and corresponding controls.

For site maintenance, utility services, and construction work, some weaknesses in work definition were identified, primarily related to classification of the work complexity or hazards. Most work performed by Site Services is appropriately defined as Type 3, skill-of-the-craft activities. The work includes carpentry, painting, electrical, custodial, furniture movement, and corrective and preventive maintenance of facilities and equipment. However, the classification of a work package is typically based on the individual craft tasks rather than a composite classification based on all of the craft tasks, the environment, the hazards and risk, and the facility where the work is performed. Additionally, the degree of coordination and the proximity of multiple trades working together is generally not considered when classifying work and

planning work packages. Therefore, some BN Site Services work packages that involve multiple craft, different trades, and coordination issues have been inappropriately classified as Type 3 work packages. The Type 3 classification bypasses the rigor and additional planning afforded by Type 2 work packages where the use of a job planning checklist, a job safety analysis (JSA) or job hazards analysis (JHA), and a work planner is mandatory. Although the Type 3 tasks usually have some planning done by the scheduling and estimating personnel who are qualified job planners, work definition may not always be sufficient to allow identification of hazards and corresponding controls. Procedures for initially classifying the work do not fully consider the increased risks from performing many lower-risk jobs together in the same facility and location. For example, the reactivation of Building 790 involved several concurrent Type 3 tasks. The hazards associated with these Type 3 tasks, when viewed collectively, may not have met the criteria for a Type 3 work package. A similar work package classification concern was identified for fiber optic construction work being performed at the HSC. (See Section E.2.2.)

The primary document defining work scope in chemical release tests performed in work-for-others programs (at HSC) and subcritical experiments (at DAF and U1a) is the test management plan or test plan. Frequently, the test plan is the only document referenced in secondary REOPs as the authorization basis. For work-for-others projects, the test plan is developed by the customer or outside agencies. The test plan, attachments to the plan, and references cited in the test plan are the primary documents reviewed by NV when granting approval to conduct the test or experiment. Despite the importance of these plans, there is no NV procedure for developing, reviewing, revising, and issuing test plans. The NV Emergency Management Division has developed limited, informal guidance (i.e., not an NV procedure or manual) for the development of a test plan. That guidance does not address a number of aspects of test plan development, revision, or authorization. For the Divine Invader test series being conducted at HSC by DTRA, an NV memorandum of understanding (MOU) provides some guidance concerning work plans and roles and responsibilities, but the guidance concerning test plans is not sufficient to ensure effective test plan development. Although NV or BN may provide the customer with an example of a previous test plan, the minimum requirements for an acceptable test plan are subjective and are determined by the customer, not by NV. As a result, the content of test plans varies considerably and is often based on the customer's preference and internal procedures. Furthermore, there is no guidance or thresholds for when and how test plans should be revised, reviewed and approved; identification of the environment, safety, and health (ES&H) content for test plans; or requirements to consider unanticipated events in the test plan.

The REOP process was not effectively implemented at HSC. With respect to work definition, the REOP documentation for some work activities is not always specific to the work being conducted. For example, the description of the work activity in the secondary REOP for the Divine Invader test series is inconsistent with the current tests being conducted at the HSC. The secondary REOP lists the incorrect chemical, the incorrect test series, and the incorrect facility asset in which the chemicals are being stored or dispersed. Furthermore, the test plan addresses both a phosgene test (which was postponed) and the current tests, which will release either dimethyl methylphosphonate (DMMP) or dipropylene glycol methyl ether (DPM). Therefore, it is difficult to identify whether some work activities in the test plan apply to the phosgene test, the current tests, or both. Additional concerns about the implementation of the REOP process are described in Appendix C under Guiding Principle #2.

Summary. Programmatic, maintenance, construction, and environmental work conducted at NTS is generally well enough defined that hazards and controls can be identified and resources allocated. Previous concerns identified by the 1999 DOE Headquarters independent oversight safety management evaluation concerning the lack of a formal and rigorous work control process for maintenance work performed across the site, and facility-level work performed at HSC, have been resolved with few exceptions. BN has completed CASs to better define the work and allocate resources for facility upgrades. Each NTS facility has a suite of documents, including support execution plans, facility

execution plans, environmental assessments, work packages, and other such documents. These document sets have improved the definition and bounding of facility work activities. However, some weaknesses in work definition at both the facility and work activity level remain. For maintenance and construction work, the classification of some work activities as a Type 2 or Type 3 is not always consistent with the magnitude of the hazard or the complexity of the work. For programmatic work, the lack of a formal NV manual or procedure on test plans has resulted in some elements of a test or experiment not being adequately defined or documented. Furthermore, the REOP process, although fundamentally a useful mechanism for defining, controlling, and authorizing work, has not been fully and effectively implemented in some instances.

E.2.2 Core Function #2 – Analyze the Hazards

Hazards associated with the work are identified, analyzed, and categorized.

The REOP procedure provides a logical approach for ensuring that hazards associated with NTS programmatic work are identified and appropriately analyzed by subject matter experts. The REOP process requires that all new work and proposed changes be evaluated for potential hazards and risks, using the Risk Management Criteria Matrix provided as an attachment to the NV REOP Manual. The risk management criteria address a wide range of activities, such as construction, emergency management, and packaging and transportation. The environmental sections of the REOP risk management criteria, for example, address environmental and ecological monitoring, environmental protection, and environmental restoration activities. NV uses the REOP process effectively to review the potential environmental risks and impacts from new work.

The LANL subcritical experiment review process is extensive and includes hazard identification and reviews at various points in the development process by LANL, LLNL, and NV. A comprehensive bounding hazard analysis is developed by LANL for the series of subcritical experiments. The hazard analysis is reviewed by multiple ES&H disciplines. The experiment plan, including the hazard analysis and the project execution plan, also receives an extensive review prior to approval by the multi-disciplined Safety Evaluation Panel, which is chaired by NV.

At HSC, programmatic maintenance work, which is performed by maintenance technicians, is performed using Type 2 work packages with a detailed JHA. Because of the potential hazards involved in supporting tests and experiments at HSC, the Department Manager for Experimental Support has directed the staff that there will be no skill-of-the-craft work at HSC. Standing work packages have been developed for routine work (e.g., forklift operations, chemical transfers, and hot work) to implement this directive. As a result, hazards for most work activities at HSC, including routine work, require a detailed identification of work steps, hazards, and controls, which are documented in JHAs.

To ensure that the environmental aspects of new projects are properly analyzed, NV has instituted a process that requires completion of an environmental checklist. This checklist, completed as a part of project development and reviewed with the project package, identifies potential environmental concerns and determines the need for further review by the environmental compliance group. To ensure early identification and analysis of activities with potentially adverse environmental impacts, environmental compliance personnel serve as observers on the Site Use Development Board (SUDB), where new projects and programs are discussed. The involvement of the environmental compliance personnel facilitates early identification of environmental permit needs and potential mitigation activities.

At the facility level, proposed actions with potential environmental impacts are also subject to activity-level hazards analysis. For example, the HSC proposed activities are presented before a panel that includes the U.S. Environmental Protection Agency (EPA), the National Oceanic and Atmospheric

Administration, the U.S. Air Force, and NV environmental personnel. As a result, environmental impacts can be determined and analyzed. Before a release, the site receives approval from the U.S. EPA representative. In addition, the release plan is submitted to the Nevada Department of Environmental Protection for analysis. BN Ecological Services has analyzed the risk and determined that there is no need to initiate ecological monitoring for each release because of the low volume and minimal toxicity of the chemicals. All test plans at the HSC are also reviewed by the HSC Facility Manager against the HSC Environmental Assessment to verify that proposed tests are adequately bounded by the assumptions and controls in the Environmental Assessment.

NV and BN have made progress in reducing legacy hazards from past projects and experiments. Underground and above-ground testing resulted in substantial amounts (over 200 miles) of surface-laid high-voltage cabling that has degraded over time. NV and BN have made significant progress in gaining configuration control of this 12,470-volt cabling in the forward areas of NTS. The scope of the project includes cabling in the forward areas with energized sections that were not well marked resulting in potential hazards to project, maintenance, and subcontractor personnel performing work activities. To address these hazards, NV has provided funding for BN to identify and plot cabling using the Global Positioning System (GPS) and to reinstall signs for the cabling. Accurate GPS plots of cable location have been overlaid on NTS maps to provide configuration control of the cabling. Site Services has also removed many aging buildings, reducing the risk to workers performing maintenance and inspections on the inactive buildings. BN has also reactivated some buildings, providing funding to conduct necessary repairs and perform deferred maintenance.

As-low-as-reasonably-achievable (ALARA) reviews constitute a primary means for implementing a graded approach to analyzing radiological hazards and identifying necessary controls. For some projects, the determination of whether radiological work requires a formal ALARA review was performed in a systematic and defensible manner. For example, at DAF, a formal ALARA review determination form was completed in conjunction with the radiation work permit (RWP) for working with the Rocco assembly. The form provided a means to outline all the individual subtasks for the work and the corresponding doses that workers might incur during performance of the work. Doses were estimated for each subtask based on measured radiation levels and the anticipated time spent on each task. Subtask doses were summed and compared with the site's formal ALARA review trigger levels to determine whether a formal ALARA review of the RWP was required. Based on the calculated doses, a formal ALARA review was not required for this RWP.

Although most hazards at NTS are identified, analyzed, and documented in work packages, test and experiment plans, REOPs, and facility-level hazards analyses, the OA team observed several weaknesses in the identification and analysis of hazards as described in the following paragraphs.

The level of rigor and formality applied to radiological hazard analyses at RMAD was not sufficient to demonstrate that all relevant radiological hazards were fully analyzed. Work planning documents did not fully describe all potential radiological hazards that could be encountered, and consequently may not have adequately evaluated the need to control or monitor those potential hazards. RMAD D&D work involves hands-on work with contaminated materials, ductwork, and building materials. Based on the presence of strontium-90 and uranium, significantly higher contact beta dose rates may exist in close proximity to workers' hands and arms than is recorded with whole-body thermoluminescent dosimeters (TLDs) worn on the chest. The site’s external dosimetry technical basis document requires the use of extremity monitoring when the dose to any extremity may exceed 5 rem annually or, for a single project, exceed 100 mrem and be 5 times greater than the whole body dose. 10 CFR 835 requires the recording and assignment of extremity doses exceeding 1 rem annually, whether it be by extremity monitoring or other means. At RMAD, the hazards associated with potential beta radiation dose to workers’ extremities have been informally discussed but have not been formally documented. Thus, RMAD does not have a formal

technical base for demonstrating compliance with the site's extremity monitoring and dose reporting requirements. (See Finding #5 in Section E.2.3.)

Although most hazards were identified and analyzed, hazards for some maintenance work performed by Site Services were not fully identified and or analyzed, especially when work was classified as Type 3, skill-of-the-craft. During reactivation of Building 790, which had been inactive for about three years, roof hazards associated with wooden catwalks and lack of railings were not identified during walkdowns or planning for the work. As a result, craft workers sent to the field had to exercise their stop-work authority when they identified the potential hazards. The understanding and empowerment of the craft workers to stop work for the safety question was notable; however, planning for the job was deficient. At the same building, the walkdown prior to allowing craftwork in the building missed some hazards. A 33-gallon radioactive waste garbage can was not identified and could have contained contaminated material. Laborers were sent into the building to clean floors, but pre-job planning did not identify broken asbestos floor tile as a potential hazard for the job. The facility activation procedure requires restoring power and lights to the building before the ES&H inspection of the building is done. However, in this case, initial planning walkdowns were done using flashlights before power was restored and could have resulted in missed hazards. Additionally, there was no documentation that ES&H Division had conducted a facility inspection before turning over the building to the Site Service work management organization, as required by the procedure.

The potential hazards for some BN construction activities are not sufficiently analyzed or documented when the work activities are incorrectly categorized as Type 3. For example, construction of a fiber optic network by BN Construction has been in process across the HSC Dry Lake Bed for the past two months. Work activities involved the use of heavy equipment, trenching for cable line, welding, electrical installations, and construction of small concrete termination pads. Permits for hot work, excavation, and lockout/tagout were generated in support of this Type 3 work activity. Since the work package for this job was categorized as a Type 3 work package, a pre-task hazard review (PTHR) was conducted in lieu of a JHA, and work was considered to be a skill-of-the-craft activity. The use of a Type 3 work package for this activity limited the analysis of the potential hazards and the involvement of BN safety and health personnel. Although "heat/cold stress" was identified as a potential hazard on the PTHR, no formal analysis of the hazard was performed, and no heat stress controls were identified in the work package. Although a number of workers were exposed to desert heat conditions on the HSC Dry Lake for extended periods, there was no evaluation of the heat stress potential by the BN Safety or Industrial Hygiene organizations. As a result, measurements were not conducted to determine work/rest regimens, and opportunities for reducing the risk of heat stress (e.g., cooling vests or portable cooling shelters) were missed. According to the electrical foreman, potential heat stress conditions were identified in one older worker, who was then afforded the opportunity of resting in an air-conditioned truck cab. In addition, during the two months of construction, line management indicated that BN Safety had visited the job site on only two occasions. Defining this work activity as a Type 3 work task, in lieu of a Type 2 work task, limited the opportunity to analyze the job hazards, and hazard controls may have been missed (e.g., active Safety participation and evaluation of the heat stress conditions). Historically, skill-of-the-craft-type work produces the greatest number of reportable events, injuries, and accidents.

Summary. The identification and analysis of hazards for projects, experiments, and program and facilities work are effective for most work activities, driven by formal processes and procedures, and reviewed by appropriate personnel from NV, BN, and the national laboratories. The REOP provides project and facility work control with references to execution plans and authorization basis documents that bound the work and hazards to known and analyzed levels. Laboratory review of subcritical experiment hazards is well defined and documented. Consideration of hazards to the environment and the public are reviewed from the initial stages of projects through the SUDB and review by Federal and state agencies. NV and BN Ecological Services are actively involved in reviewing potential environmental

hazards. NV has provided funding and the site has made good progress on legacy issues, such as the surface-laid high-voltage cabling and remediation and D&D of excess facilities. While these actions are strengths, additional attention is needed to ensure that hazards are appropriately identified and analyzed for radiological work and for Type 3, skill-of-the-craft work. Deficiencies in identifying the hazards and composite risk, for the entire job for multiple Type 3 tasks, increase the potential for injury.

E.2.3 Core Function #3 - Develop and Implement Hazard Controls

Safety standards and requirements are identified and agreed upon, controls to prevent/mitigate hazards are identified, the safety envelope is established, and controls are implemented.

The REOP process is the institutional mechanism for documenting project and facility-level hazards and the necessary controls to establish a safety basis for programmatic work. The REOP requires documentation for work identification, hazards identification and analysis, a hazards control matrix, and other documentation to satisfy applicable risk management criteria, such as security plans and regulatory requirements. The REOP also requires a radiological and hazards data sheet for each Real Property Asset Identification Number. Collectively, these documents and execution plans establish an authorization basis for the facility and a safety envelope for programmatic work being conducted within the facility. The REOP process also identifies mutual support agreements, key facility and project points of contact, and the requirements for readiness reviews. For example, at HSC, since the facility has chemical hazards but no radiological hazards, guidance for establishing an authorization basis is not clearly defined in DOE regulations and orders. The REOP process, however, provides a mechanism for NV to identify those documents and controls that are specific to the HSC facility work activities and chemical hazards and develop a facility authorization basis that is tailored to the facility.

In the environmental area, NV and BN have designed a site environmental monitoring program to monitor, detect, and quantify any effects of site operations on the environment. Environmental monitoring of air and other environmental media is provided around the site border and in areas not occupied by facilities. Facility-level radiation monitoring is also performed around the low-level waste disposal facilities. Results of environmental monitoring activities are reported in the Annual Site Environmental Report.

Sitewide administrative controls, such as hazard specific training (including lead awareness, asbestos, respirator, and personal protective equipment) was thorough and challenging, and the training required an effective knowledge of site-specific hazards and controls to pass the tests. Many of the courses are computer-based training (CBT), which enable workers to proceed at their own pace. The CBT was an interactive multimedia presentation, effectively presenting the materials with pictures, video clips, and sound. The programs provided practice tests before the final evaluation, and provided remedial components during the practice session to further emphasize the learning objectives.

At the activity level, BN has taken several significant actions to resolve concerns identified during the 1999 DOE Headquarters independent oversight safety management evaluation. These include improvements in the management of work, work control systems, and electrical safety. The following improvements define additional controls that will improve work activity safety including:

- BN developed a blind/solid surface penetration permit that establishes improved controls to minimize hazards to personnel, systems, and equipment during penetration of walls, partitions, ceilings, floors, sidewalks, and asphalt. The procedure is used in conjunction with the excavation permit to minimize potential exposure to electrical, physical, and chemical hazards while minimizing the risk of equipment and facility damage. The procedure applies to all BN work activities and those of subcontractors.

- Site services has developed and implemented supervisor training for all craft foreman and superintendents. The training is mandatory for anyone supervising craft personnel. Several supervisors have also attended the ten-hour Occupational Safety and Health Administration (OSHA) safety course. Managers have also attended training on performance-based safety, work planning, and work authorization.

- BN developed and implemented an electrical safety program that includes a detailed company directive on electrical safety. The directive provides requirements to implement the electrical provision of 29 CFR 1926, 29 CFR 1910, and National Fire Protection Association 70E. The implementation of the electrical safety program included the training and selection of an electrical Authority Having Jurisdiction (AHJ) and the establishment of a Senior Electrical Review Board (SERB) to oversee the electrical safety program. The AHJ, with SERB oversight, is the site's authority to interpret electrical code requirements, review and grant variances, and review electrical issues with input from subject matter experts. A Company Directive formally establishes the AHJ and SERB functions and contains requirement for implementation. The SERB has regularly scheduled monthly meetings to review electrical safety performance and issues.

- BN work control processes were implemented at the HSC, and hazard controls are now defined in work packages and test plans.

Health physics survey records reviewed at DAF and RMAD were comprehensive and well documented. Radiological control technicians at DAF and RMAD demonstrated a high level of proficiency in conducting and documenting required radiological surveys. Radiological surveys were conducted in a thorough manner and documented on appropriate survey forms. Survey forms were reviewed and found to be correct, legible, and complete.

Controls specified in individual work plans were well tailored to defined tasks. For example, the RMAD basement Rooms 6 and 7 decontamination work plan was comprehensive and provided very detailed instructions concerning hazards and appropriate controls to safely decontaminate and/or remove contaminated components. A significant amount of effort was expended in developing a comprehensive and detailed work plan for decontamination and removal of contaminated piping, ductwork, and components. The work plan included detailed drawings and photographs of affected components, along with a description of the proper manner of removal or decontamination, including the need for special controls. These work plans identified a number of specific controls that were designed to minimize or reduce the likelihood for generating significant amounts of airborne contamination during work, such as requirements for using plastic coverings, taping open ends, and applying spray and glue contamination fixatives prior to cutting.

In addition to the implementation of the sitewide controls defined in NV and BN processes and procedures, each of the facilities included in this inspection demonstrated some facility-specific practices that enhanced effectiveness.

The RMAD site safety officer has developed several innovative methods to help implement controls at the work site. A computerized matrix was developed to track training and medical surveillance requirements needed by workers to access the RMAD site. Heat stress data (wet bulb readings) are tracked using a computer database to help establish work/rest regimes during extreme heat conditions. The safety team tracks safety related equipment that requires routine inspections, including fire extinguishers, fall protection, and ladders. An RMAD safety representative participates in all pre-job briefings and is scheduled at the site while work is taking place.

At DAF, building checklists effectively implement facility operational safety requirements and were developed with appropriate considerations for ease of use. The facility provides the checklists for project technician use during pre-operational checks prior to allowing work with special nuclear materials or high explosives. These checklists are comprehensive and logically arranged, and they ensure that building-specific systems and equipment, such as cranes, ventilation, utilities, and safety systems, are operational and ready for use.

At HSC, the site safety officer routinely provides pertinent spill test information to the BN fire and medical program managers. Prior to each scheduled spill test, a package of information containing the chemicals to be used, the actual material safety data sheet (MSDS) documents, and other useful information is developed. The fire and medical personnel are also invited to attend safety briefings and safety committee meetings so that appropriate planning and emergency response activities can be formulated.

In the waste management area, BN has implemented rigorous controls to ensure that waste going either to the site's disposal areas or off site for treatment and/or disposal meet applicable waste acceptance criteria. BN Waste Generator Services (WGS) evaluates the waste streams using a compendium of BN forms and organization procedures. This process leads to an approval from NNSA/NV to dispose of the waste generated for that waste stream. Additional quality control is provided by the presence of both WGS and a waste certification official (WCO) during waste packaging. The WCO is independent of the WGS organization and the generator and provides another level of review to verify that the generated waste meets the approved waste stream requirements.

While NTS has demonstrated effective performance in many areas of hazard control, specific deficiencies were noted in the areas of chemical storage and rigor and formality of radiological controls, as discussed below.

A number of bulk hazardous chemicals are stored at the HSC in either drums or compressed gas cylinders. Most bulk chemicals are stored in "motels," which are small concrete block construction buildings that are open to the environment on two sides. A few chemicals are stored for a limited duration on an outdoor chemical staging pad, which is completely open to the elements. Storage of hazardous chemicals in these conditions, without a sufficient and documented review by BN and NV, presents two concerns:

- **Four bulk chemicals at HSC are stored under conditions that do not meet the manufacturer's storage recommendations in the MSDSs, and an evaluation of the acceptability of this type of storage has not been provided in work packages or work documents**. Improper storage increases the potential for container rupture or inadvertent discharge of the chemical to the environment. For some chemicals, adverse storage conditions for extended periods of time can also degrade the chemical. For example, the MSDS for carbon tetrachloride, which is stored in drums in the motels, lists a number of handling and use precautions, such as storing the containers in a cool, dark area and away from heat; not storing the chemical outdoors or in direct sunlight; and avoiding bulk storage. The current storage conditions in the motels do not meet the precautions in the MSDS. Likewise, for DMMP, which is to be used for the Divine Invader test series, the MSDS indicates that the chemical should be stored in a cool dry area, and below 122 degrees F to minimize product degradation. DMMP is stored outside the motels in the open chemical staging area where temperatures have exceeded 100 degrees F (ambient), exclusive of any radiative heating of the chemical due to continuous exposure to direct sunlight. Furthermore, the DMMP MSDS also recommends that containers be in an area where they can be rotated regularly (i.e., first in, first out) and visually inspected on a weekly basis. Some DMMP chemical containers are bound together, which precludes implementing the MSDS control. Furthermore, these controls are not addressed in work packages,

and there are no explanations in work documents for why these controls are not used. The BN Company Directive for "Selecting, Using and Storing Chemicals" requires that information concerning the handling and storage of chemicals, as obtained from the MSDS for the specific chemical, be included in the applicable hazards analysis, JHA, or PTHR. This requirement has not been implemented for chemicals being stored for the Divine Invader test series.

- **Some requirements in the BN Company Directive for "Selecting, Using and Storing Chemicals" are either not followed (as indicated above) or are not sufficiently specific to be implemented consistently**. For example, at least two of the chemicals stored at HSC are carcinogens or suspected carcinogens (i.e., benzene and carbon tetrachloride). For carcinogens, the company directive for "Selecting, Using and Storing Chemicals" requires the establishment of regulated areas and the posting of warning signs at the entrance to regulated areas. The only warning sign at the approach to the HSC motels is "chemicals are now present in the facility," and there is no establishment of a well-defined regulated area for chemical carcinogens. The warning sign and its location do not sufficiently communicate that carcinogens are being controlled in a regulated area. The location of the regulated area is not defined, and specific controls for entering and/or working in a regulated area, if any, are not identified. However, the BN Company Directive does not define a regulated area, nor does it provide sufficient guidance to line management on warning signs for the use and storage of chemical carcinogens.

Although NV was aware that these chemicals were being stored at HSC, they did not identify these conditions as potential safety concerns. NV did not rigorously evaluate these areas, and NV line managers did not effectively coordinate with NV subject matter experts to ensure adequate reviews of tests and conditions at HSC.

Finding #4. NV and BN did not ensure that the controls and storage configurations for bulk hazardous chemicals at the Hazardous Materials Spill Center were adequately analyzed and sufficient to ensure safe storage as required by BN procedures.

RWPs represent a principal means of identifying necessary controls and bounds for radiological work. The BN procedure for developing RWPs does not adequately specify how to manage changes in RWPs. As a result, multiple versions of the same RWP existed at RMAD, each with somewhat different controls and without a revision history outlining the changes made. There is an informal expectation that changes to an RWP are to be handled by issuing a new RWP rather than revising an existing RWP. The new RWP is to have a different RWP number than the one replaced, and the old RWP is to be officially terminated by signature. At RMAD, one RWP has been changed three times in 2002 without closure of the prior RWPs or assignment of new numbers. No information about the reason for the RWP changes is documented or would be evident to a worker reading the RWP.

Limiting conditions and suspension limits were not clearly defined in some RWPs. For example, the RWP for RMAD basement Room 6 and 7 activities was unclear in that condition 6 required decontamination of the work area before work continues if contamination levels exceed 75,000 dpm/100 cm^2. However, this condition does not specify whether the decontamination can be performed under the same RWP or whether it would require a stop-work/suspension and issuance of a different or revised RWP. Other RMAD RWPs also lacked clear definition of suspension limits or hold points in the “limiting conditions” section.

Respiratory protection was required by RWPs at both DAF and RMAD. The manner in which respiratory protection requirements were being implemented at these facilities may not be fully effective in controlling potential radiological and/or industrial hazards and was not always specifically tailored to a

known radiological hazard. Work at DAF included unpacking a device containing special nuclear material from a DT-22 shipping container, which was transported from LANL. The Rocco Assembly Procedure for this work, developed by LANL, included a requirement that all personnel be required to wear full-face respirators before the container is opened. The NTS LANL health physics staff does not believe there is any potential airborne hazard associated with opening these containers. However to comply with the procedure, an RWP was developed for this work which established a roped exclusion and contamination control zone. Respiratory protection (respirators) was required only for workers inside the roped area. There is no documented justification to demonstrate why a potential airborne hazard to a worker inside the roped-off area would not exist for a worker outside the rope several feet away. The roped zone was posted as a contamination area until survey results confirmed the lack of removable contamination. However, despite the respiratory protection requirement, air sampling was not conducted to characterize the air concentration as required by the radiological control (Radcon) manual when respiratory protection devices have been prescribed. While the NTS LANL project staff belief that the lack of any potential for airborne radioactivity may be correct, this belief is not supported by any documented hazard analysis and conflicts with the controls specified and required by the procedure prepared by LANL for this work. The NTS LANL personnel have not reconciled this anomaly (e.g., a change to the procedure prior to performing the work). As another example, respirators are required for work in the RMAD basement and lower disassembly bay. The nature of the work steps also requires workers to leave the airborne radioactivity areas to operate a crane located outside the building away from the airborne hazard. The worker performs the crane operation while still wearing respiratory protection, even though the potential radiological hazard no longer exists during this part of the work. The suitability of this practice, including evaluation of the additional industrial hazards introduced by this control when not needed for radiological protection (e.g., vision impairment and decreased mobility), has not been formally evaluated, documented, or discussed in the work plans.

The DOE site Radcon manual deviates from DOE requirements and expectations with regard to posting and definition of Radioactive Materials Areas, resulting in unclear requirements for posting and control of some contaminated areas on site. Specifically, the DOE site Radcon manual allows some contaminated surfaces and soils to be considered a Radioactive Material Area. However, this approach is less conservative than the surface contamination posting requirements of 10 CFR 835 and the soil contamination area posting guidelines of the DOE Radcon standard, resulting in a potential for improper posting and control of some contaminated areas at NTS. DOE has not requested an exemption from 10 CFR 835 concerning the definition of Radioactive Material Areas.

An example of improper posting and control of fixed contamination areas was noted during this inspection, partially as a result of the misapplication of the Radioactive Material Area posting allowances in the site Radcon manual. BN health physics staff at RMAD did not appropriately post or mark fixed contamination areas located outside of "radiological areas," consistent with the requirements of the Radcon manual for "Fixed Contamination Areas." Some areas within RMAD contain fixed contamination (after decontamination) that exceeds the Radcon manual limits requiring posting as "fixed contamination areas" to alert personnel of the contaminated status and specific controls for management of fixed contamination areas. The Radioactive Material Area posting for the area did not meet requirements for delineation of the specific locations of the fixed contamination.

Formal, documented ALARA reviews are required for some higher hazard radiological work that exceeds pre-defined thresholds. ALARA reviews are conducted through the site ALARA committee and documented in ALARA committee meeting minutes. There was insufficient evidence that BN ALARA reviews of radiological work were being conducted in accordance with the requirements of the Radcon manual and company directives. For example, one RMAD RWP required a formal ALARA review, but the meeting minutes did not provide evidence that the review met the site's requirements for conducting ALARA reviews, including consideration of all required topics and official integration of the ALARA

review results into project plans and work documents. Neither the RWP nor work instructions noted that an ALARA review was performed or how the results were incorporated into the work planning. For example, radiation control hold points are required to be addressed as part of the ALARA review, but the RWP for the work did not include specific hold points or suspension limits.

In one case, an expected radiological control was not evident for work being performed at RMAD. Beta dose rate measurements were not being taken to evaluate contact dose rates on contaminated surfaces. As discussed in Section E.2.2, a potential hazard from beta skin exposures can occur when dealing with strontium-90 and uranium. However, the hazard associated with the potential for higher contact dose rates on contaminated surfaces was not being evaluated or required through the use of beta-sensitive dose rate instruments. External exposure rates resulting from x and gamma radiation were routinely evaluated, but the instrument used for this purpose shields out the beta component of the radiation field. This phenomenon is not a concern for determining whole body dose rates from uniform radiation fields but is necessary for evaluating and controlling non-uniform radiation fields that may contribute a higher dose to the extremities, such as those emitted from beta sources.

Limited assessment and oversight activity by NV at RMAD did not identify these deficiencies (see Appendix D).

Finding #5. BN has not applied sufficient rigor and formality in demonstrating that certain radiological control practices meet all DOE requirements and that all potential exposures are fully characterized and will be kept as low as reasonably achievable.

Implementation of the waste characterization and certification process has not always been timely. For example, the RMAD remediation plan, which discussed the need for lead removal in general terms and recognized that some of the lead may be contaminated, was issued in January 2001. However, WGS was not officially informed until July 30, 2002, through a material evaluation form for the mixed waste, of the need for WGS to begin characterization and certification of the waste. Because WGS was not notified during the early stages of planning, it could not provide input into waste management actions, such as ways to minimize the waste generated, or observe waste packaging.

Another observed weakness in waste management at NTS is the lack of controls or signage on sanitary waste trashcans and dumpsters. Numerous operations across the site involve small amounts of hazardous material, such as solvents and paint cans. Examples of these areas include the Hazardous Material Spill Release Facility and the Mercury paint, electrical, and plumbing shops. Trash containers at these locations are not marked to prohibit hazardous materials. Empty containers can go into the sanitary trash, but partially full containers need special handling. There is also a potential for finding radioactively contaminated metal around the site. Although the facility personnel who generate sanitary waste sign a request for non-hazardous waste disposal, certifying that the contents are sanitary waste only, there are no controls (e.g., waste inspections, signs on containers) to verify the accuracy of this signoff. As a result, there is a risk of inadvertently sending hazardous waste or radioactive material to the sanitary landfill.

In recent years, the pollution prevention and waste minimization programs for NV and BN have not been fully effective. For FY 2001, NV reduced the award fee for BN because NV's expectations with respect to the development and implementation of this program were not met. There has been recent, renewed management attention to the pollution prevention and waste minimization programs. For example, BN has recently developed a Pollution Prevention/Waste Minimization Program Manual to ensure that requirements are communicated. This program, for BN, is available on the intranet. However, many Web page links have not been updated or are unavailable.

Summary. The REOP process is the key institutional mechanism to be used for documenting project and facility-level hazards and the necessary controls to establish a safety basis for programmatic work. When implemented correctly, the REOP provides an effective means of documenting and implementing the necessary controls for conducting programmatic work. Subordinate mechanisms for identifying and implementing controls for work at NTS were found to be effective in most cases, and BN has taken several significant actions to resolve concerns identified during the 1999 DOE Headquarters independent oversight safety management evaluation including improvements in work management, work control systems, and electrical safety.

While NTS has demonstrated effective performance in many areas of hazard control, specific deficiencies were noted in the controls for chemical storage and in the rigor and formality of radiological controls. The deficiencies in chemical storage and handling practices and the weaknesses in rigor and formality of radiological controls indicate a need for additional management attention to and improvement in the implementation of controls at NTS.

E.2.4 Core Function #4 – Perform Work Within Controls

Readiness is confirmed and work is performed safely.

Performing work safely is the culmination of performing core functions #1, #2, and #3 to properly plan the work and then to ensure that the work is appropriately authorized and that the facility, workers, and conditions are ready to perform work. Weaknesses in performing work are generally traceable to deficiencies in work planning and control in the first three core functions. Recurring deficiencies in work performance may be due to weaknesses in post-job reviews and the feedback and improvement process.

The OA team observed a variety of work activities, including construction, D&D, experiments, chemical test preparations, and operations. Construction activities were observed in Mercury facilities, the HSC Lake Bed, and the RMAD. Programmatic work and maintenance were observed at DAF and the HSC. Site Services maintenance activities were observed in shops, Mercury facilities, and DAF. The OA team also observed work in maintenance, carpentry, and metal working shops at Mercury and HSC. With few exceptions, the work observed was performed safely. Processes were in place and implemented to ensure that work was authorized and that facilities and personnel were ready to perform work.

Work authorization, pre-job briefing, and readiness check activities are generally thorough and performed in accordance with site requirements. Pre-test review activities for tests conducted at HSC are rigorous and include facility workers, independent reviewers, and the staff of the test agency. Pre-test reviews include a Safety Evaluation Panel, numerous pre-start checklists, test briefings, and hazard training. For example, during the week before the commencement of the Divine Invader tests, a variety of pre-test reviews were conducted by NV, BN, and the customer (DTRA). A pre-job briefing was conducted by the BN staff at HSC on the preparatory activities for staging the test. A formal Safety Evaluation Panel meeting was held before the test, providing an opportunity for DTRA to present the details of the upcoming tests to a board of independent testing and ES&H subject matter experts, NV line managers, and other test participants and observers. Before the test began, the HSC safety engineer briefed all test participants on hazards and controls associated with the tests. In addition, daily briefings were conducted during each day of testing to inform test participants of testing activities, changes in the test plans, potential hazards, and hazard controls.

At RMAD, the construction supervisor covers each job and its hazards in the daily pre-job briefing. For Type 2 work packages, the BN procedure requires a review of the JHA as necessary to ensure that the hazards and appropriate controls are discussed. To accomplish this review, the construction supervisor

uses a pre-task hazard review form as a JHA summary checklist for the briefing. This practice ensures that all hazards in the JHA are addressed in a practical manner.

At DAF, pre-job briefings were comprehensive, and LANL technicians performed readiness checks in preparation for assembly work in a systematic and formal manner in accordance with approved procedures and checklists. Although facility access restrictions limited direct OA team observation of actual assembly operations at DAF, the strong attitude toward safety was evident in pre-evolution briefs and performance of the readiness checks.

Following proper work authorization and pre-job briefings, NTS workers generally performed work safely and within established controls. The following paragraphs describe the team's observations of work and evaluation of jobs across the site.

Construction work to install a new fire protection alarm system in the Mercury cafeteria was performed safely and effectively. The work involved numerous wall and ceiling penetrations to run conduit and cabling and to install pull boxes and alarms. Penetration permits were used properly, and the PTHRs identified all hazards associated with the work activity. Housekeeping was good, and no safety deficiencies were evident. Construction work to remodel Building 113 for the weapons of mass destruction organization was also performed safely. This work involved multiple crafts personnel performing electrical work, painting, installing ceiling tile and carpeting, and performing TV cabling work. Although about 20 craft workers from several trades were working in the building, the work and the worksite were organized and orderly. Fall protection provisions for work on the roof were good, with a substantial railing on both sides of the access ladder leading up to the flat part of the roof and clear warning barriers for the unprotected edge of the roof.

The Facilities and Utilities maintenance work that OA observed was performed safely, with few deficiencies. This work included painting buildings from elevated work platforms, furniture movement and custodial work by laborers, carpentry work, refrigeration and air conditioning, and metal and electrical work. The BN craft workers are well qualified and experienced, and they appropriately used the PTHR process to identify hazards before starting work. The refrigeration craft workers appropriately stopped work when they identified questions about roof safety at Building 790. The maintenance craft workers at DAF were experienced and knowledgeable of their trades and DAF work control and safety procedures. Lockout/tagout was performed properly, and electrical disconnects and termination of wires were performed effectively and safely with no observed deficiencies.

The stop-work philosophy is well established and mature, fully supported by management, and well documented in sound stop-work policies and a detailed stop-work procedure. The stop-work procedure provides requirements for stop-work initiators, supervisors, and managers and includes requirements for notification, documentation, Occurrence Reporting and Processing System and Price Anderson Amendment Act reportability, critiques, and root cause evaluations. Workers indicated they would not hesitate to stop work for unsafe conditions and did not indicate any fear of reprisal for doing so. As indicated above, work was appropriately stopped at Building 790 due to a concern about roof work.

At all the facilities inspected, waste management operations were also adequate, and the facilities were in compliance with environmental requirements. The Satellite Accumulation Areas and less-than-90-day storage areas were properly operated, with labeled containers that were locked to ensure tight control on contents. Logbooks and weekly inspection reports were maintained as required by site procedures and environmental regulations. Low-level waste storage areas were also managed in accordance with site requirements.

At RMAD, workers performed decontamination work safely and, with few exceptions, in accordance with established controls. For example, radiological control technicians were positioned at the stepoff pad location. The availability of dedicated radiological control technicians greatly aided the workers in safely managing the donning and doffing of respirators and performing more effective contamination control. Workers and supervisors clearly demonstrated an appropriate regard for safety in performing their duties.

Although work at NTS is generally performed safely and within the prescribed hazard controls, some weaknesses were observed in ensuring readiness to perform work and in longstanding safety deficiencies identified in some NTS facilities, as detailed in the following paragraphs.

According to the NV REOP Manual, the REOP process applies to all NV organizational elements and all new work or proposed changes in work, whether the work is programmatic or facility work (i.e., construction and maintenance). Because facility work is often emerging work, the REOP process may not always be effectively or timely when high-priority work must be completed in a short timeframe.

Although hazards are covered in RMAD pre-job briefing process, the sitewide or generic hazards (such as biological hazards) and controls (such as hard hat, safety shoe, and safety glasses requirements) are repeated for each job. In many cases, these are repeated as many as five times during the briefing. It was apparent that many workers' attention waned during these repetitions. Better tailoring of the briefing to the hazards unique to the job may provide a more effective briefing. In addition, the pre-job briefing for Type 3 work did not discuss radiological hazards and associated RWP requirements during the discussion of the PTHR as required by Company Directives. The radiological briefing was conducted informally by the radiological control technician covering the job but was not documented in accordance with the procedure. Following this observation, RMAD began conducting RWP reviews in conjunction with the PTHR briefing.

There were also deficiencies in ensuring readiness to perform work for some Site Services facilities maintenance work. Morning standup meetings did not routinely address safety topics and lessons learned, nor was specific safety information presented for the jobs scheduled for the day. Pre-job briefings for Type 3 skill-of-the-craft work were not always complete enough to ensure that all the hazards at the workplace are identified (asbestos tile, roof hazards, and hazards resulting from the need for coordination among the trades). Because most of the Site Services work is skill-of-the-craft, pre-job briefings are treated somewhat informally, with little input from maintenance management, superintendents, and job foremen.

Several procedural deficiencies were identified during a safety-significant preventive maintenance activity on a large building equipment door at DAF. The workers did not follow the procedure verbatim, and they did not stop work when they could not perform the procedure as written. The procedure did not address the safety-significant task of removing or replacing the back of the door (which weighed several hundred pounds and was held in place with dozens of bolts, requiring a forklift and special lifting feature to remove the back with limited overhead clearance). WSI communication personnel and a technician required by the procedure to be in place were not present. The procedure also had unapproved pen and ink changes in the margin of the procedure. The NV DAF Facility Representative had written a work procedure/practice conflict issue on this procedure in February 2002. The NV Independent Oversight Division improperly closed the issue before the final corrective actions to revise and approve the procedure were completed.

The OA team identified numerous longstanding industrial safety and hygiene deficiencies in Mercury and Area 6 maintenance shops that indicated failure to follow established procedures and inadequate implementation of OSHA and site requirements. These deficiencies could cause injury and may cause unnecessary exposure to spray paints and dust from carpentry operations. For example, some flammable

lockers contained damaged containers, standing oil/lubricants in the bottom, and other improper combustibles (rags and cardboard). Locker inventories had numerous deficiencies and did not fully reflect the actual contents. Several pieces of portable electrical equipment (e.g., drills, skill saws, and routers) had frayed cords, and other pieces had not been inspected and marked in accordance with tool inspection procedures. Machine grinders had tool rests that were not adjusted properly, and craft workers had been grinding on aluminum and not dressing the wheels to prevent loading. Out-of-service equipment was not marked and segregated as required by the "Maintenance of Tools and Equipment Control" procedure. Access to some power panels, machine disconnects, and eyewash stations was encumbered by storage of materials. Welding booth ventilation and carpentry shop ventilation inspections were overdue and not completed because of industrial hygiene resource constraints. As deficiencies were identified, Site Services took prompt action to correct the deficiencies and performed walkdowns in maintenance shops and other areas to determine whether other problems existed.

Other deficiencies in Site Services activities included potential unmonitored or unacceptable exposures to paint, dust, and other chemical fumes. Painting booth operations have not been conducted in accordance with industrial hygiene recommendations, and ventilation surveys on the painting booth are overdue. Painters perform small painting jobs in the paint booth without respirators, contrary to the recommendation documented in a January 2001 industrial hygiene survey. Painting is also performed on a long table in the paint booth, contrary to a 1989 industrial hygiene report documenting that using the table causes spray paint to migrate outside the booth. Carpentry shop exposure assessments have not been done with the most limiting type of materials sawed, machined, and sanded in the shop. Such materials as Hardy board (cement board) produce silica dust, and laminates are made from adhesives containing varying amount of formaldehyde that may present more hazards than nuisance dust from sawing wood. Although walkthroughs by the ES&H organization identified the overdue ventilation surveys, resources were not made available to update the surveys.

These deficiencies in the maintenance shops should have been identified and corrected by effective implementation of the BN facility workplace inspection program and management assessments. A number of these deficiencies had been previously identified and documented by NV and an external ES&H review, but they had not been properly characterized, entered into the required deficiency tracking systems, and properly followed to closure. DOE Facility Representatives had documented machine grinder deficiencies in March 2002, and an external assessment had identified many of the shop deficiencies and a lack of management and ES&H assessments in June 2002 (see Appendix D).

Summary. With a few exceptions, NTS facility operations, tests, subcritical experiments, and maintenance activities are performed with a high regard for safety. Readiness to perform work is established through the proper reviews, authorizations, and pre-job briefings. Skilled and experienced workers take pride in their work and perform most activities safely. Stop-work authority and responsibility are well understood by supervisors and workers, and a strong attitude toward safety was evident. Although deficiencies were identified, NTS management and workers immediately corrected deficiencies where feasible, and adequate management attention to the remainder of the deficiencies was evident. Continued management attention in the Site Services maintenance shops is needed to ensure a safe working environment for the employees.

E.3 CONCLUSIONS

Overall, most work at NTS is performed consistent with the core functions of ISM. NTS has established and implemented effective processes for defining the scope of work activities, analyzing hazards, and performing work within established controls. With some exceptions (chemical storage and radiological controls), NTS has also established and implemented effective controls to ensure that work is performed

safely. NV and NTS have a good understanding of the residual weaknesses and have self-identified deficiencies and corrective actions.

E.4 RATINGS

The ratings of the first four core functions reflect the status of the reviewed elements of ISM programs elements at NTS.

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

E.5 OPPORTUNITIES FOR IMPROVEMENT

This OA review identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible NNSA, NV, and contractor line management and prioritized and modified as appropriate, in accordance with site-specific programmatic objectives.

Nevada Operations Office

1. **Develop an NV manual and/or procedure to provide guidance to NTS customers and NTS line management in developing test management plans (TMPs).** Topics to consider include: objective and purpose of the TMP; format and content of the TMP; roles, responsibilities, and interfaces of primary TMP personnel (customer, BN, and NV); hazards analyses and mitigating controls for test activities and unanticipated conditions; safety and health plans; defining and communicating TMP requirements; defining the safety envelope and authorization basis for the TMP; TMP document submittals, and the requirements and process for approving, revising, and issuing TMP documents; test and experiment preparations; and sample templates for TMP formats, safety and health plans, REOPs, and hazards analyses.

2. **Review the site Radcon manual to ensure consistency with all DOE radiological requirements and expectations.** Specific actions to consider include:

    - Ensure that soil, Radioactive Material Area, and contamination posting requirements in the Radcon manual match those delineated in 10 CFR 835 and the DOE Radcon standard.

    - Evaluate all contamination areas at the NTS against DOE posting requirements and determine whether any exemption requests are needed.

    - Ensure that contractors post and control all radiological areas in accordance with DOE-approved requirements.

Bechtel Nevada/Los Alamos/Lawrence Livermore

1. **Increase the emphasis on rigor and formality associated with radiological work planning and control to ensure that a documented and justifiable technical basis for radiological decision-making is maintained.** Specific actions to consider include:

- Ensure that all possible hazards associated with planned work are discussed in detail in work plans, health and safety plans, RWPs, JHAs, and/or ALARA reviews and that the basis for establishment or elimination of potentially applicable controls is documented.

- Establish a formal checklist for use in conducting ALARA reviews and ensure that a documented description of how each required element of the ALARA review has been incorporated into the proposed work is produced.

- At the project level, ensure that work control documents, such as RWPs, clearly describe how ALARA review results have been incorporated into the project planning. Consider attaching additional sheets with narrative to the RWP to discuss why there was a need for an ALARA review and the unique hazards and/or important controls to be applied to the work.

- Ensure that limiting conditions and suspension limits for voiding RWPs are clearly noted in the appropriate locations of the RWP form.

- Provide additional detail in Company Directives, operating instructions, and/or job aids to ensure that the requirements of the BN Radcon manual are followed (e.g., RWP preparation, identification of required controls, documentation of ALARA reviews, respiratory protection, posting).

- Ensure that a documented hazards analysis tailored to the work being performed is available to support the prescription of respiratory protection devices.

- When respiratory protection is prescribed, ensure that all personnel in a contiguous room or area have the same level of protection and treat the area as a potential airborne radioactivity area until air sampling results demonstrate otherwise.

2. **Improve the rigor and analysis for bulk chemical storage and handling at the HSC.** Specific actions to consider include:

   - Review and evaluate the manufacturer's and customer's handling and storage requirements for all bulk chemicals, and incorporate such requirements into BN work packages. If the proposed storage and handling requirements for bulk chemicals deviate from the manufacturer's recommendations, provide an explanation in the work package.

   - Based on current and projected test activities at the HSC, evaluate the adequacy of the existing HSC chemical storage facilities for short- and long-term bulk storage, handling and transfer of chemical and biological material.

   - Review the adequacy of the bulk chemical storage facility and area postings.

   - Revise the BN Company Directive for "Selecting, Using and Storing Chemicals" to provide additional guidance on the storage and posting requirements for various types of chemicals and biological agents.

3. **Develop a DAF Maintenance temporary procedure change process, or revise the present change control process so that changes in deficient procedures are implemented in a timely manner.** Specific actions to consider include:

- Improve the procedure change process to preclude maintenance personnel from violating procedures and bypassing procedural steps in order to complete safety significant preventive maintenance.

- Perform a review of other safety-significant (Category 2) and mission-critical (Category 3) maintenance procedures to ensure that there are no additional cases where workers must bypass or alter steps in order to complete the procedure as written.

- Verify that materials and lubricants specifically called out in the procedures are correct and that substitutions are suitable and documented through the procedural change process.

4. **Revise and implement changes to the Site Services Maintenance work control system and work planning procedures to require upgrading work packages from Type 3 to Type 2 based on the composite risk of all job tasks, considering the environment where they are performed.** Specific actions to consider include:

   - Implement additional work planning (e.g., job planning checklist, JSA) for work packages requiring multiple trades in the same location or building, increased coordination due to sequencing of work, or facility/environmental factors that increase job risk, rather than basing the work package on each individual task

   - Perform additional training for work planners and scheduling/estimators on recognition of additional hazards based on where the work is performed (e.g., roof hazards for heating, ventilation, and air conditioning work; asbestos tile in old buildings; coordination of multiple trades).

5. **Communicate clear maintenance management expectations for conformance to OSHA and BN safety requirements in the maintenance shops.** Specific actions to consider include:

   - Perform training for craft workers, foremen, and superintendents addressing OSHA requirement applicable to the Mercury and Area 6 maintenance shops.

   - Assign facility workplace inspections to small multidisciplinary teams that include ES&H, superintendents, foremen, and crafts workers.

6. **Enhance the performance of the pollution prevention/waste minimization program both within NV and for the contractors performing work across the site.** Specific actions to consider include:

   - Issue the recently developed Pollution Prevention/Waste Minimization Program Manual.

   - Ensure that NV and contractors implement the requirements in the manual.

   - Update the BN pollution prevention/waste minimization program intranet site and ensure all linked pages are functioning.

7. **Provide guidance on the use of WGS support during the planning for waste disposal.** Specific actions to consider include:

   - In accordance with ISM, include WGS as part of the waste management planning process for remediation of facilities or areas that contain low-level or mixed waste.

- Ensure that WGS and the WCO are involved in waste packaging.
- Provide notification to WGS as soon as possible if unanticipated low-level or mixed waste is encountered during operations in order to allow timely completion of waste certification and disposal documentation.
- Ensure that waste management subject matter expertise is incorporated into site operation to allow identification of pollution prevention/waste minimization opportunities.

8. **Develop guidance for proper waste management in shop areas to ensure that hazardous and radioactive materials and waste are not inadvertently sent to sanitary landfills and that hazardous material is not stored beyond usability.** Specific actions to consider include:

- Provide signs on sanitary trash cans in work areas stating “sanitary waste only” and clearly specify that no hazardous or radioactive waste is allowed.
- Label dumpsters as "sanitary waste only" and clearly specify that no hazardous or radioactive waste is allowed.
- Lock dumpsters in areas used by transient contractors and other non-resident personnel to ensure that they do not place inappropriate items in the sanitary waste without the knowledge of the facility owner who certifies that the contents are acceptable for the landfill.
- Ensure that material inventories are managed effectively to prevent storage beyond a reasonable use period and to identify materials that could be considered hazardous waste because they have not been used within a reasonable period.

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