Summary Report

Inspection of
Environment, Safety, and Health Management
and Emergency Management
at the

Nevada Test Site

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Office of Independent Oversight and Performance Assurance
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OVERSIGHT

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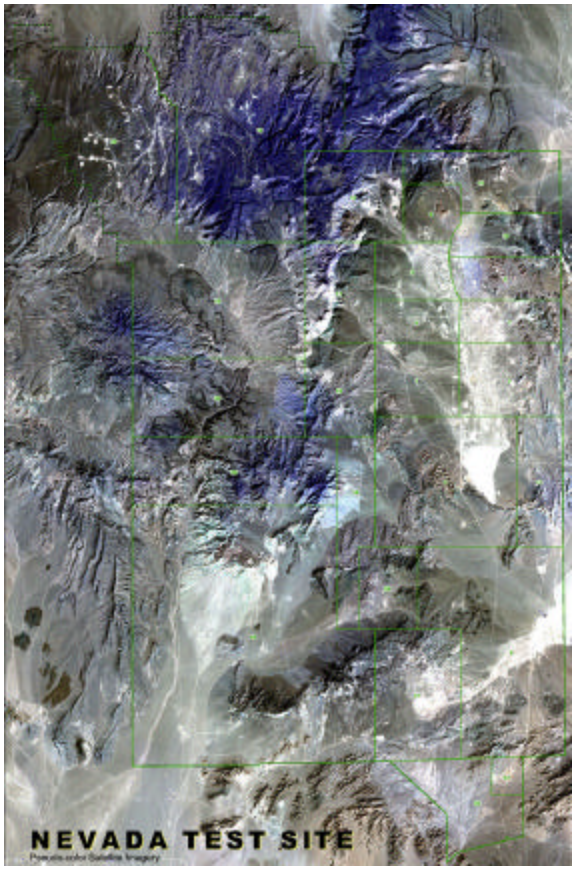
Abbreviations Used in This Report

BN	Bechtel Nevada
CBD	Chronic Beryllium Disease
CY	Calendar Year
DAF	Device Assembly Facility
DOE	U.S. Department of Energy
DTRA	Defense Threat Reduction Agency
EAL	Emergency Action Level
EMC	Emergency Management Center
EMOT	Emergency Management Operations Team
EMHA	Emergency Management Hazards Assessment
EOC	Emergency Operations Center
ERO	Emergency Response Organization
ES&H	Environment, Safety, and Health
HAZMAT	Hazardous Materials
HSC	HAZMAT Spill Center
ISM	Integrated Safety Management
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
M&O	Management and Operating
MSDS	Material Safety Data Sheet
NNSA	National Nuclear Security Administration
NTS	Nevada Test Site
NV	Nevada Operations Office
OA	Office of Independent Oversight and Performance Assurance
REOP	Real Estate/Operations Permit
RMAD	Reactor Maintenance Assembly and Disassembly
RWP	Radiation Work Permit

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.



Aerial View of the Nevada Test Site

Background

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 explosive testing, characterization of hazardous material spills, and emergency response training). NTS activities involve significant quantities of hazardous materials in various forms, including radiological materials, explosive materials, and chemicals. The various potential hazards at NTS that need to be effectively controlled include 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, ES&H, and emergency management 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 and emergency management 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 and emergency management 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 and emergency management performance.

ES&H Review Scope and Overview

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, and 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 Materials 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, Bechtel Nevada 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.

Exterior View of DAF

Emergency Management Scope and Overview

The purpose of the emergency management portion of this inspection was to assess the effectiveness of selected aspects of emergency management program management as implemented at NTS under the direction of NV. In addition to NV's emergency management oversight and operational awareness activities, OA evaluated selected institutional-level emergency management program elements, such as plans and procedures; training, drills, and exercises; emergency public information; and self-assessment programs, the majority of which are managed and administered by the BN Operations Center organization. Furthermore, the OA team examined implementation of requirements at selected NTS organizations and facilities, specifically the U1a Facility, the DAF, and the HSC. Facility-level reviews included an evaluation of hazards surveys and hazards assessments. As part of the overall program evaluation, the inspection team also conducted tabletop performance tests with a sample of the site's key decision-makers to evaluate their ability to employ available tools and skills developed in training to respond to postulated emergency conditions.

As discussed throughout this report, the emergency management program at NTS is generally well defined, emergency responders are trained and capable of handling potential emergency events, and NV and BN feedback and improvement programs are working effectively to self-identify and correct program and performance weaknesses. The current program effectiveness is attributed largely to the strong leadership and active involvement of the NV Manager, and the expertise and persistence of the NV emergency management operations team (EMOT) in monitoring and overseeing this program. However, the effectiveness of program implementation at the facility level varies and is not consistent among or within the contractor and national laboratory organizations at NTS. Serious weaknesses were identified in the area of hazards surveys and hazards assessments. The identification and analysis of hazards in these fundamental documents has not been established and maintained to provide an accurate technical basis for the other elements of the NTS emergency response program. NV has documented and BN understands the current program deficiencies, and in most cases they have established plans to address them.

Organization of the Report

Section 2 of this volume provides an overall discussion of the results of the review of the NTS ES&H and emergency management programs, including positive aspects and weaknesses. Section 3 provides OA's conclusions regarding the overall effectiveness of the NV, BN, LANL, and LLNL implementation of the NTS ES&H and emergency management programs. Section 4 presents the ratings assigned during this review. Appendix A provides supplemental information, including team composition. Appendix B identifies specific findings that require corrective action and follow-up.

More detailed information on the inspection results is contained in two separate volumes of the report, which were provided to NV management and are available to other DOE sites on request. Volume I provides more detailed information on the results of the review of NTS ES&H programs, and Volume II provides more detailed information on the results of the review of the NTS emergency management program.

2.0 Results

2.1 Positive Attributes

ES&H 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.

Hazardous Materials Equipment

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.

Device Assembly Facility Explosives Handling Room

Subcritical experiments are performed in accordance with rigorous safety processes. Most aspects of the REOP process have been notably effective for subcritical experiments at the 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.

Emergency Management Positive Attributes

Many aspects of the NTS emergency management program are effectively implemented, including the training, drill, and exercise program, emergency public

information program, and the BN self-assessment and NV oversight programs. Program requirements are well defined, and the basic infrastructure of plans, procedures, and response tools is in place to support emergency decision-making.

Through the strong leadership, direction, and active involvement of the NV Manager, the NV emergency management operations team (EMOT) has implemented a comprehensive and extremely effective program for monitoring and overseeing the BN emergency management program. The NV oversight program that is being implemented by the EMOT includes a well-documented and comprehensive assessment and corrective action management process, a formal and detailed task plan documenting BN emergency management program deliverables, and financial performance incentives. All of these components have been used effectively to drive needed improvements and to set appropriate priorities and expectations for upgrading the BN program. For example, during fiscal year 2002, EMOT has used these program elements to direct much-needed improvements in BN hazards assessments, and the NV Manager has withheld fees from the contractor for failing to satisfy NV's hazards assessment performance expectations. Senior NV managers, most notably the Operations Office Manager, are actively involved in the NTS emergency management and response programs, and provide strong leadership to the EMOT in implementing their vigorous and effective oversight program.

An Emergency Management Exercise

NV and BN have established comprehensive training and qualification programs that effectively prepare emergency responders to perform their assigned response duties. Both organizations have developed position-specific qualification programs for each emergency response organization (ERO) member. The qualification programs and supporting training materials are well structured and routinely updated, and the training status of each ERO member is meticulously tracked. These qualification programs are supplemented by an aggressive drill and exercise program that has been highly effective in self-identifying performance weaknesses and facilitating continuous program improvement.

The performance of emergency responders at all levels of the NV and BN EROs exhibited many significant positive attributes, as demonstrated during tabletop performance tests. All of the responders clearly understood their assigned roles, responsibilities, and authorities; they demonstrated effective command and control of the postulated emergencies; and in most cases they took prompt and effective actions to protect site workers from the potential health and safety impacts of postulated hazardous material emergencies. Most responders adhered to proper emergency response protocols, and almost all of the responders made effective use of decision-making aids and checklists to ensure that their response duties were fully and correctly performed.

2.2 Program Weaknesses

ES&H 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 HSC. The Divine Invader

DAF Hallway

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 implementing 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 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.

HAZMAT Drill

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 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.

Reactor Maintenance Assembly and Dissassembly Facility

Emergency Management Program Weaknesses

Although the programmatic framework for NTS emergency management has been defined and established, some of the most fundamental elements of the program have not been adequately developed, implemented, and maintained to ensure that responders have the necessary tools and information to respond appropriately to an event, commensurate with the hazards.

BN and LLNL have not been completing required hazards surveys and/or hazards assessments in accordance with DOE and NV Order requirements before initiating facility operations or when there are significant changes in facility operations or hazardous material inventories. Neither of the BN hazards assessments reviewed by the evaluation team complied with the long-standing requirements of DOE Order 151.1A, *Comprehensive Emergency Management System*, or, more importantly, is adequate to support effective response to mitigate the potential consequences of an accidental hazardous material release. Significant weaknesses in these emergency management hazards assessments (EMHAs) have lingered despite clear and detailed feedback from NV. LLNL has not completed hazards surveys for the majority of NTS facilities under their cognizance to determine whether a facility or operation requires an EMHA, based on the hazards present.

The requirements and expectations for the BN consequence assessment teams (CATs) in the emergency management center (EMC) and emergency operations center (EOC) have not been adequately defined and documented to assist the CATs in fulfilling their assigned duties. A wide variety of consequence assessment deficiencies were observed during tabletop performance tests. Both CATs were unable to provide accurate and timely consequence assessment information to their respective EMC or EOC for at least one of the two scenarios presented to them. Weaknesses included failure to recognize that plume projections were not consistent with the prevailing winds, difficulties in operating the computer-based dispersion models, and using incorrect protective action criteria values when generating dispersion plots. Further, NV and BN implementing procedures do not clearly identify how the EOC CAT is expected to perform its role of validating plume projections generated by the EMC CAT.

The BN emergency plan and implementing procedures do not reflect current emergency response practices. Numerous BN emergency response implementing procedures have not been reviewed, updated, and maintained current, as required by DOE Order 151.1A. Many such procedures have not been updated in over two years, even though significant changes affecting those procedures and the BN response system have been implemented during that time. In addition, BN has not established a formal document control system to ensure that program and procedure changes are communicated effectively to facility owners, and that response aids and guidance are updated in a timely manner to reflect changes that can affect emergency management decision-making.

3.0 Conclusions

ES&H Program

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.

U1a Facility Exterior View

The establishment of the REOP process and associated work authorization processes are significant enhancements and are in most cases 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.

U1a Facility Underground

Emergency Management Program

NV has clearly set forth the requirements and expectations for the NTS emergency management program through NV Order 151.1, *Comprehensive Emergency Management System*, and an NV consolidated emergency management plan. The requirements therein apply to all contractors, national laboratories, and other Federal agencies and users of the NTS. The NV Manager is actively involved in the NTS emergency management program and has provided strong and emphatic leadership in ensuring that all NTS entities are fully prepared to respond to an emergency not only at the NTS but also nationwide through the deployment of NNSA assets and expertise. The NV Manager also has devoted significant resources to developing an emergency management operations team that is now comprised of a team leader with strong technical and managerial skills, and a highly competent and dedicated staff, supplemented by additional expertise where necessary, who work continuously to ensure that the manager's expectations are implemented effectively across the NTS.

The NTS emergency preparedness and response elements common to all parties at the site, which are managed and implemented by BN, have clearly improved since previous independent oversight evaluations conducted in 1998 and 1999. NV and BN have established an adequate programmatic framework that is supported by well-trained and practiced emergency responders. In the past year, NV and BN have devoted significant resources to training and conducting drills and exercises for the primary decision-makers in their respective EROs. Training and qualification programs are comprehensive, well documented, and maintained up to date. Further, NTS responders have participated in an aggressive schedule of drills and exercises that have been effective in self-identifying performance weaknesses. The effectiveness of the training, drills, and exercises was clearly reflected in the generally good performance of the emergency responders who were tested during the OA tabletop exercises conducted during this inspection. All of the responders clearly understood their roles, responsibilities, and authorities, and demonstrated excellent command and control at their respective response venues; further, most responders demonstrated the appropriate decision-making skills and set appropriate priorities for protecting workers and the public in the event of a hazardous material emergency at NTS. To support these response activities and guide their decision-making, both NV and BN have established a set of implementing procedures and other response aids, such as responder checklists and packets of pertinent response information. Responders used these tools effectively to facilitate their decision-making and to prioritize response actions.

However, some of the NV procedures are no longer consistent with the recently issued consolidated emergency management plan, and there are some

ambiguities in assigned decision-making authorities. Many of the BN procedures are outdated and do not reflect actual response practices. For both NV and BN, formal control of procedures and response aids is not sufficient to ensure that all responders have the most current information available to support their decision-making. In addition, critical, fundamental decision-making elements, such as emergency action levels, do not have a consistent format and have not been assembled into a format that facilitates prompt decision-making.

The most significant weakness in the NTS-wide emergency management program is that the EMHAs, which form the foundation upon which all other emergency management elements are based, have not been established and maintained in accordance with DOE Order 151.1A. LLNL has not completed hazards surveys for most of the facilities they operate at the NTS and thus has not performed a hazards screening to determine whether an EMHA is required. Both BN hazards assessments that were reviewed during this inspection exhibited major weaknesses and did not comply with DOE Order 151.1A. As a result, emergency action levels and predetermined protective actions have not been established for some known hazards that could clearly impact not only site workers but also personnel on adjacent land. In other cases, information about the type and magnitude of the hazards at some facilities might not be readily available to emergency responders because neither a hazards survey nor hazard screening has been performed. However, NV managers and staff have demonstrated a strong and unwavering commitment to correct these problems. For example, they have denied contractor incentive fees on three occasions this fiscal year because inadequate EMHAs were submitted.

Despite these weaknesses, the remote location of most of the higher hazard facilities and the good anticipatory decision-making skills that were demonstrated during performance testing provide reasonable assurance that workers and the public will be adequately protected in the event of an accidental hazardous material release at NTS. More importantly, the leadership, active involvement, and personal attention devoted to emergency management at NTS by the NV Manager guarantees that any remaining weaknesses will be addressed to the satisfaction of NV. The NV EMOT has identified and documented most weaknesses identified in this report, is ensuring that effective corrective actions are implemented, and has set appropriate priorities for upgrading the BN emergency management program. The efforts of both NV and BN demonstrate a positive trend in identifying and addressing the challenges of implementing a comprehensive and integrated emergency management program on a vast, multi-tenant, multi-user NNSA site. While the BN Operations Center organization is working to address the weaknesses identified by NV and their own self-assessments, the organization's resources are continually being diverted to address unanticipated, time-urgent assignments. If this trend continues, senior BN management intervention may be necessary to ensure that appropriate emergency management program priorities have been established commensurate with hazards, risks, and available resources. Nevertheless, BN understands the current program deficiencies and, in most cases, has established formal plans and schedules to address them.

4.0 Ratings

The ratings reflect the current status of the reviewed elements of the NTS 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

Emergency Planning
Hazards Survey and Hazards Assessments ..... SIGNIFICANT WEAKNESS
Program Plans and Procedures ..... NEEDS IMPROVEMENT

Emergency Preparedness
Training, Drills, and Exercises ..... EFFECTIVE PERFORMANCE
Emergency Public Information ..... EFFECTIVE PERFORMANCE

Emergency Response
Emergency Response Decision-Making ..... EFFECTIVE PERFORMANCE
Consequence Assessment ..... NEEDS IMPROVEMENT

Readiness Assurance
NV Assessments and Performance Monitoring ..... EFFECTIVE PERFORMANCE
Contractor Assessments and Issues Management ..... EFFECTIVE PERFORMANCE

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
Charles B. Lewis, Director, Office of Emergency Management Oversight
Kathy McCarty, Deputy Director, Office of Emergency Management Oversight

A.2.2 Quality Review Board

Michael Kilpatrick
Charles Lewis
Robert Nelson
Patricia Worthington
Dean Hickman

A.2.3 Review Team

Charles Lewis, Team Leader
Brad Davy, ES&H Topic Lead
Kathy McCarty, Emergency Management Topic Lead

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

Emergency Management Team
J. R. Dillenback
Michael Lloyd
Jim O'Brien
Jeff Robertson
Tom Rogers

ES&H Technical Team
Vic Crawford
Marvin Mielke
Mark Good
Jim Lockridge
Edward Stafford
Mario Vigliani

A.2.4 Administrative Support

Mary Anne Sirk
Bonnie Blake
Tom Davis

APPENDIX B
SITE-SPECIFIC FINDINGS

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

ES&H FINDING STATEMENTS
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.
2. NV line managers have not performed sufficient planning and coordination to ensure comprehensive oversight of Nevada Test Site (NTS) ES&H programs and effective implementation of some requirements in the areas of tracking findings and performing self-assessments.
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.
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 analylzed and sufficient to ensure safe storage as required by BN procedures.
5. BN has not applied sufficient rigor and formality in demonstrating that certain radiological control practices meet all U. S. Department of Energy (DOE) requirements and that all potential exposures are fully characterized and will be kept as low as reasonably achievable.
EMERGENCY MANAGEMENT FINDING STATEMENTS
1. BN has not developed and maintained emergency management hazards assessments (EMHAs) in accordance with DOE Order 151.1A and NV Order 151.1, and emergency action levels (EALs) and predetermined protective actions have not been established for many potential accidents that could result in a classifiable emergency at the NTS.
2. Lawrence Livermore National Laboratory has not maintained the Device Assembly Facility EMHA and has not prepared, completed, and/or maintained emergency management hazards surveys to determine whether any other facilities or operations under their cognizance that use or store hazardous materials at the NTS require quantitative analysis, as required by DOE Order 151.1A and NV Order 151.1.
3. BN's emergency plan and implementing procedures have not been maintained up to date, as required by DOE Order 151.1A, and do not accurately reflect current BN emergency response practices.
4. BN and NV have not established a set of EALs that support timely emergency event classification or a process for prompt emergency event classification and notification when both the emergency management center (EMC) and emergency operations center (EOC) are operational, as required by DOE Order 151.1A.
5. The BN consequence assessment teams in the EMC and EOC did not demonstrate the ability to provide accurate and timely assessments of emergency event consequences, as required by DOE Order 151.1A.