Volume I

Independent Oversight Inspection of Environment, Safety, and Health Programs at the

Nevada Test Site

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Abbreviations Used in This Report

CFR	Code of Federal Regulations
DAF	Device Assembly Facility
DOE	U.S. Department of Energy
DOEHRS	Defense Occupational & Environmental Health Readiness System
EMS	Environmental Management System
ES&H	Environment, Safety, and Health
HEPA	High Efficiency Particulate Air
HHE	Health Hazard Evaluation
ISM	Integrated Safety Management
JASPER	Joint Actinide Shock Physics Experimental Research
JNPO	Joint NTS Program Office
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
NFPA	National Fire Protection Association
NNSA	National Nuclear Security Administration
NSO	Nevada Site Office
NSTec	National Security Technologies, LLC
NTS	Nevada Test Site
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
SME	Subject Matter Expert
USQ	Unreviewed Safety Question
WSI	Wackenhut Services, Inc.

OVERSIGHT

1.0 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight, within the Office of Health, Safety and Security (HSS), conducted an inspection of environment, safety, and health (ES&H) programs at the DOE Nevada Test Site (NTS) during March and April 2007. HSS reports directly to the Secretary of Energy. The ES&H inspection was performed by Independent Oversight's Office of Environment, Safety and Health Evaluations (HS-64). This volume discusses the results of the review of the NTS ES&H program. Concurrently, the HSS Office of Emergency Management Oversight (HS-63) inspected the NTS emergency management program; the results of that inspection are discussed in a separate volume.

Aerial View of NTS

Within DOE, the National Nuclear Security Administration (NNSA) has line management responsibility for NTS. NNSA provides programmatic direction for and funding of most activities, including ES&H program implementation at NTS. At the site level, line management responsibility for NTS operations and ES&H falls under the manager of the Nevada Site Office (NSO).

Under contract to DOE, NTS is managed and operated by National Security Technologies, LLC (NSTec), which began to operate NTS in July 2006.[1] In the past year, much of NSO's attention has been focused on the procurement effort and contract transition. Since the contract transition, NSTec has made a number of changes to the previous contractor's ES&H programs. For the most part, however, NSTec is using the previous contractor's procedures with a new coversheet that identifies the new organizations.

In addition to NSTec, a number of other organizations have responsibilities for operations and ES&H at NTS. Wackenhut Services, Inc. (WSI) is the protective force contractor responsible for site physical security. NNSA national laboratories, including Los Alamos National Laboratory (LANL) and Lawrence Livermore National Laboratory (LLNL), perform experiments at NTS and historically have operated certain facilities used for nuclear stockpile stewardship support. In July 2006, the Joint NTS Program Office (JNPO) was formed, comprised of LLNL and LANL employees, to coordinate LANL and LLNL activities at NTS with NSO and NSTec. The purpose for forming JNPO is to ensure that laboratory activities are effectively supported and appropriately integrated with sitewide programs, including ES&H. The JNPO operates in accordance with memoranda of understanding between the two Laboratories and NSO, and performs the institutional-level elements of Laboratory contactor assurance activities at NTS. With the formation of JNPO, NTS practice is to refer to LLNL and LANL at NTS as JNPO.[2] The U1a Complex is operated by JNPO-LANL; the Device Assembly Facility (DAF) and Joint Actinide Shock Physics Experimental Research (JASPER) Facility are operated by JNPO-LLNL. JNPO-LLNL also operates and conducts activities at various other facilities at NTS.

NTS's current mission includes support for the NNSA stockpile stewardship program, which includes performing subcritical experiments in support of nuclear weapons stockpile verification

[1] Consistent with common practice, the term "NTS" is used to generally refer to the geographic area encompassing the remotely located test site and the associated facilities.

[2] The terms "JNPO-LLNL" and "JNPO-LANL" are used to refer to LLNL and LANL responsibilities and activities at NTS under the JNPO umbrella organization.

efforts, storing special nuclear materials, and maintaining NTS facilities and infrastructure. Other activities under way at NTS are in the areas of environmental management (e.g., decontamination and decommissioning, waste management, 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, emergency response training). NTS activities involve significant quantities of hazardous materials in various forms, including radiological materials, explosive materials, and chemicals.

The purpose of this Independent Oversight inspection was to assess the effectiveness of ES&H programs at NTS as implemented by NSTec, JNPO-LLNL, JNPO-LANL, and WSI under the direction of NSO. Independent Oversight evaluated a sample of activities, including:

- Implementation of the core functions of integrated safety management (ISM) for selected facilities and activities, focusing on work planning and control systems at the activity and facility levels and their application to the following organizations and activities:
  - Operations, research, and support activities at the U1a Complex, performed by JNPO-LANL and NSTec
  - Operations, research, and support activities at the DAF, performed by JNPO-LLNL and NSTec
  - Operations, research, and support activities at the JASPER, performed by JNPO-LLNL and NSTec
  - Maintenance and construction activities, performed by NSTec and subcontractors.
- Essential safety system functionality of the safety class fire suppression system and safety significant high efficiency particulate air (HEPA) filtered ventilation systems, including the safety class contaminated waste collection system, at DAF. DAF is a Category 2 nuclear facility and is in the process of enhancing safety systems and documentation to gain approval for additional operations in the facility to accommodate the expanded mission (e.g., criticality program experiments). The evaluation of these safety-related systems included a review of engineering and configuration management, surveillance, testing, maintenance, operations, and feedback and improvement.
- NNSA, NSO, NSTec, JNPO-LLNL, JNPO-LANL, and WSI effectiveness in managing and implementing selected aspects of the ES&H program that Independent Oversight has identified as focus areas, including environmental management system (EMS) implementation, workplace monitoring of non-radiological hazards, safety management for protective force training, and safety system component procurement. Although these topics are not individually rated, the results of focus area reviews are integrated with or considered in the evaluation of ISM core functions.
- NNSA, NSO, NSTec, JNPO-LLNL, JNPO-LANL, and JNPO feedback and continuous improvement systems.

Sections 2 and 3 discuss the key positive attributes and weaknesses, respectively, identified during this inspection. Section 4 provides a summary assessment of the effectiveness of the major ISM elements that were reviewed. Section 5 provides Independent Oversight's conclusions regarding the overall effectiveness of NNSA, NSO, NSTec, JNPO-LLNL, JNPO-LANL, JNPO, and WSI management of ES&H programs. Section 6 presents the ratings assigned during this inspection. Detailed results and opportunities for improvement were provided to NSO for consideration by NNSA, NSO, NSTec, JNPO-LLNL, JNPO-LANL, JNPO, and WSI management. Appendix A provides supplemental information, including team composition, and Appendix B presents the findings identified during this Independent Oversight inspection.

In accordance with DOE Order 470.2B, *Independent Oversight and Performance Assurance Program*, NNSA must develop a corrective action plan that addresses each of the findings identified in Appendix B. In most cases, the findings listed in Appendix B were derived from multiple individual deficiencies that have been described in the detailed results provided to the site. NNSA, NSO, NSTec, JNPO-LLNL, JNPO-LANL, and WSI need to ensure that the corrective action plan for the findings listed in Appendix B addresses these

individual deficiencies and includes appropriate causal analysis, corrective actions, and recurrence controls. The findings are referenced in Sections 3 and 4 of this report. The weaknesses discussed in Section 3 provide a management-level summary of the findings; the weaknesses do not need to be separately addressed in the NNSA corrective action plan because the findings encompass the scope of the weaknesses.

2.0 Positive Attributes

Positive attributes were identified in ES&H programs in such areas as work controls for certain experiments, the new workplace monitoring database, the maintenance implementation plan, and the NSO oversight efforts for nuclear safety at DAF.

Hazard assessment, controls, and work performance for the Thermos experiments (which are a series of subcritical physics experiments) at U1a are comprehensive. The hazard assessment for Thermos provides a comprehensive, project-level hazard assessment, and individual work packages provide adequate analysis and direction for the various activities. Work package work scopes are detailed and broken down into discrete work tasks, and with few exceptions, hazards are well analyzed, with the appropriate controls identified. Checklists used for Thermos activities—including the Test Director Checklist, the checklist addressing delivery and transport of the package to the zero room, and the checklist addressing operation of the Cygnus Pulsed X-Ray Sources—are technically accurate and complete. Steps are concise and easily understood by workers. Operations related to the Thermos shots were performed safely and in accordance with appropriate controls. Workers effectively performed sweeps, isolation, and interlock arming in preparation for the shot in accordance with the checklists. The shot involved the integration of workers from several companies and disciplines, and the integration of workers and safety professionals was effective.

The architecture of the NTS workplace exposure monitoring program is a noteworthy practice that provides for a comprehensive exposure monitoring database for management of current and historical workplace exposures. Management of current workplace exposures is implemented through exposure assessment documents (i.e., exposure assessments and health hazard evaluations), and through the increasing use of an extensive computer-based workplace exposure assessment system, the Defense Occupational & Environmental Health Readiness System (DOEHRS). Eventually the DOEHRS will be the primary workplace exposure assessment system. The DOEHRS is a comprehensive, automated, information system for assembling, comparing, evaluating, using, and storing occupational personal exposure information, workplace environmental monitoring data, personal protective equipment usage, data obtained from observation of work practices, and employee health hazard educational data. For historical exposure data (i.e., prior to calendar year 2004), workplace exposure records are retrievable though an advanced exposure record database (called the Archived Employee Exposure Records Database). The database contains over one million exposure records (i.e., four terabytes of data) and is text, word, and signature searchable.

DAF has a well structured and detailed maintenance implementation plan. The DAF Maintenance Implementation Plan appropriately reflects the results of a gap analysis, identifies methods for implementing the nuclear operations maintenance management program, accurately describes the status of DOE order compliance, and establishes plans and milestones for full compliance. When combined with ongoing assessments, periodic revision, and NSO oversight, the DAF Maintenance Implementation Plan defines an effective process for achieving the goals of DOE Order 433.1, *Maintenance Management Program for DOE Nuclear Facilities*.

NSO oversight of DAF vital safety systems has improved significantly and is promoting improvements in nuclear safety programs. NSO has conducted a number of assessments of DAF vital safety systems and safety management programs. These assessments have provided valuable feedback for the contractor to focus improvement initiatives to further strengthen the contractor's cognizant system engineer program and its effectiveness in monitoring and ensuring vital safety system performance. Assessments were conducted with sufficient rigor and were technically focused, and typically included elements of performance-based activities to evaluate effectiveness of implementation of

processes, where appropriate. A number of the findings were substantive and a number were independently identified by this Independent Oversight inspection. In addition, the NSO Safety Basis Review Team review of the contractor's 2006 annual documented safety analysis update and recent vital safety system reviews were particularly noteworthy and were effective in identifying similar issues and concerns in the engineering design and authorization basis areas that were reviewed during this Independent Oversight inspection. In addition to the NSO efforts, the NNSA Chief, Defense Nuclear Safety, performed a detailed review of NSO efforts in October 2005 in the nuclear safety area and identified significant performance concerns in the NSO safety system oversight program, the cognizant system engineer program, start-up and restart processes, and other relevant areas, which have led to improvements in NSO and DAF nuclear safety programs.

3.0 Weaknesses

Although some aspects of ES&H management are effective, there are weaknesses in ISM programs at NTS, most significantly work planning and control for skill-of-the-craft work and Type 3 work packages, feedback and continuous improvement processes, certain aspects of engineered safety systems at DAF, and implementation of the EMS.

NSO and NSTec have not established and implemented effective work control processes for skill-of-the-craft activities and work performed according to Type 3 work packages. While programmatic work (e.g., experiments and nuclear facility operations) at NTS is often performed in accordance with procedures that adequately address ES&H hazards, much of the activity-level support work (e.g., maintenance and construction) at NTS is performed utilizing a Type 3 work package, which does not normally require a formal hazards analysis or involvement of ES&H professionals. NSO and NSTec processes improperly allow many hazardous work activities to be performed as a skill-of-the-craft activity, under a Type 3 work package, where too much reliance is placed on the individual workers to recognize and understand activity-level hazards and select appropriate controls. While most NSTec personnel are experienced and often select appropriate controls, Independent Oversight observed a number of situations in which health hazards had not been adequately analyzed or controlled (e.g., insufficient noise protection, operation of a diesel engine indoors without adequate analysis of ventilation, introduction of flammable materials to a confined space without sufficient analysis or controls, insufficient exposure monitoring evaluation of chemical use). In addition, there are a number of systemic weaknesses in the current processes, including inadequate definition of low-hazard activities, insufficient rigor in the training and qualification process, poorly defined controls for potentially hazardous activities, unjustified assumptions that skill-of-the-craft work is low-hazard work, conflicts between the NSTec procedure and the governing NSO directive, and non-conservatisms in the NSO institutional directive on work control. NSO and NSTec have performed assessments of the work control process and recognize the need for improvements. However, NSO and NSTec assessments to date have not identified the systemic weaknesses in the work control process for skill-of-the-craft activities, the misapplication of Type 3 work packages, and the deficient analysis and control of some types of work activity hazards, particularly such health hazards as exposure to noise, chemicals, vapors, and fumes. For some work, health hazards for routine and non-routine skill-of-the-craft work have been identified and analyzed by NSTec through the health hazard evaluation process. However, in a number of these situations, the recommended hazard controls have either not been integrated into the work control processes or have not been followed by workers. (See Finding #C-1.)

Line management has not applied sufficient rigor in work planning as needed to ensure effectiveness of controls and compliance with all applicable institutional and facility requirements. At DAF, internal requirements for completion of job hazard analysis and use of lockout/tagout permits were not adequately understood or followed; internal requirements in the DAF safety and health plan associated with use of chemicals, subject matter expert (SME) review, and fire protection were not implemented as required; and certain job hazard analysis controls were not implemented or specified as intended. In addition, certain institutional controls associated with pre-task hazard reviews (PTHRs) and pre-job briefings were not implemented as required. Similar concerns, such as with environmental controls and workplace monitoring, were evident at other NTS facilities, such as the JASPER Facility (e.g., weaknesses in implementing electrical safety arc flash criteria and lockout/tagout), and in the site programs. Additional management attention is needed to ensure that work is performed safely and in accordance with internal requirements and quality and conduct of operations expectations. (See Findings #C-2 through C-4.)

The vital safety systems and supporting nuclear safety programs currently have a number of weaknesses that warrant continued management attention and oversight. Currently, there are weaknesses in many aspects of vital safety system design, configuration management, the unreviewed safety question (USQ) process, surveillance, testing, maintenance, procurement, and the cognizant system engineer program. Some of these weaknesses are attributed to the inadequacies in some aspects of the original designs of the facility's systems for the confinement function and the fact that the facility was not originally designed as a nuclear facility. Recognizing these deficiencies, NSO and JNPO-LLNL developed a Safety Basis Implementation Plan, dated October 2005, that provides the implementation strategy for the DAF transition from a moderate-hazard, high-explosives facility to a Category 2 non-reactor nuclear facility. The plan delineates the ongoing safety basis implementation efforts that are designed to ensure that the DAF fully meets the stringent nuclear safety requirements for a Category 2 nuclear facility and is capable of supporting existing and future mission activities. Although much work remains, DAF management has a good understanding of issues and the efforts needed and is making good progress. NSO is performing effective oversight, including baseline assessments, which has identified many of the current deficiencies and is driving the needed improvements. (See Findings #E-1 through E-4.)

Weaknesses and deficiencies in NSO, NSTec, JNPO-LLNL, JNPO-LANL, and WSI feedback and improvement processes and their implementation have reduced their effectiveness in ensuring that deficiencies in ES&H programs are identified and addressed to prevent recurrence. Improvements have been made in many aspects of NSO and in each of the contractor's feedback and improvement programs since the 2002 Independent Oversight inspection. Contractors have established and implemented the assurance system elements identified in DOE Order 226.1. However, NSO and contractor assessment programs are not sufficiently assessing all safety topical areas and the scope and rigor of many self-assessments are insufficient. Issues are not always adequately evaluated and recurrence controls have not been established for addressing root and contributing causes. NSTec occupational injury and illness investigations are not sufficiently rigorous in identifying ISM-related causes. Corrective actions and implementation mechanisms are not always sufficiently detailed. Reporting of Occupational Safety and Health Administration (OSHA)-recordable injuries and illnesses is not always accurate or timely. JNPO-LLNL and JNPO-LANL processes and practices do not sufficiently address non-OSHA-recordable injuries and exposures. Although lessons learned are disseminated, assurance that lessons are effectively screened for needed actions regarding institutional processes and implementation practices is not demonstrable. While NSO oversight of nuclear safety at DAF is good, many other aspects of NSO oversight processes are deficient, such as in the industrial hygiene area. The weaknesses in NSO and contractor feedback and improvement programs are a contributing factor for the deficiencies in worker safety and health programs and other deficiencies identified during this inspection. (See Findings #D-1 through D-6.)

Several key actions necessary for integration of the environmental management system (EMS) within line organization operations have not been implemented effectively. An analysis process for environmental hazards has not been implemented. As a result, numerous work packages either did not address environmental hazards or the identified environmental hazards were not fully analyzed so that specific controls could be established. Although an EMS has been established within the NSTec ISM program and significant environmental aspects have been established, these aspects have not been adequately implemented within line organizations. In many cases, controls for environmental compliance and for achieving aspect targets and objectives were very broad and were not tailored to the specific activities occurring in the shop or incorporated into work packages. In addition, the previous operating contractor's environmental policy has not been issued or endorsed as an NSTec senior management commitment to environmental goals. (See Finding #F-1.)

4.0 Results

The following paragraphs provide a summary assessment of the NNSA, NSO, NSTec, and JNPO activities that Independent Oversight evaluated during this inspection.

4.1 Work Planning and Control Processes

While NSTec is working toward developing a single sitewide work planning and control process, currently, NSTec, JNPO-LLNL, and JNPO-LANL personnel each operate according to the work control processes of their respective organizations. As a result, close coordination is needed, particularly for facilities and activities where individuals from more than one organization are working. The Independent Oversight team examined implementation of ISM Core Functions 1 through 4 for organizations that perform maintenance, construction, and other activities at DAF, JASPER, and U1a.

Maintenance and Construction

The NSTec Site Operations Division supports maintenance and construction services for the NTS, the North Las Vegas facility, and the Remote Sensing Laboratories. NSTec has established zones and zone managers who are responsible for maintenance and construction work within each zone.

Most work definitions were adequate for the observed activities and potential hazards. However, in some cases, written work definitions were not sufficiently detailed for work planners to effectively assign the hazard level or assign specific safety professionals to analyze and control hazards. Further, the process relies too much on 1) the line supervisors and workers' walkdowns after the work packages are complete, and 2) pre-job briefings to characterize the scope of work to be performed, its associated hazards, and an adequate PTHR. Many times, the pre-job briefing does not have the benefit of ES&H SME input. (See Finding #C-1.)

Most hazards were appropriately identified and analyzed. However, some hazards were not identified in work packages or their accompanying PTHRs and had not been adequately analyzed. Some work packages were incorrectly categorized as low-hazard Type 3, and thus SMEs were not involved in the work planning; work planners, line supervision, and workers might not have sufficient knowledge of some potential hazards (primarily health hazards) and environmental aspects to ensure that all hazards and/or environmental controls are identified. (See Finding #C-1.)

Most hazards were adequately controlled through engineering and administrative controls. However, for some work activities, controls were inadequate or were not based on an adequate assessment of conditions. The over-reliance on skill-of-the-craft Type 3 work packages and PTHRs for the performance of work has resulted in a system where workers are expected to choose the controls they believe are applicable, rather than being provided with a planned, predetermined set of appropriate controls to implement before performing work. (See Finding #C-1.)

Workers generally followed controls when controls were clearly established. However, in some cases, workers were not aware of required controls and thus did not implement them, and some National Fire Protection Association (NFPA) 70E provisions were not implemented effectively during electrical work. (See Findings #C-1 and C-2.)

Overall, the work control process as currently implemented within the NSTec maintenance and construction organizations relies heavily on the individual workers' knowledge at the time of work, rather than a systematic approach for analyzing hazards and establishing controls that is consistent with ISM. The NSTec approach creates a risk that the necessary controls will not be implemented adequately during the course of work. These conditions present potential worker safety and environmental vulnerabilities. Management attention is needed to ensure that all hazards are adequately analyzed and that controls are implemented for Type 3 and skill-of-the-craft work.

Device Assembly Facility

Independent Oversight's evaluation of work control within DAF focused on the observation of ongoing work activities and associated work planning documentation. There was limited programmatic work occurring at the time of the inspection; therefore, work observations primarily consisted of contact work activities (at NTS, "contact work" refers to work activities that entail contact with hazardous material or conditions, and include most activities other than office/administrative and routine janitorial functions) in the areas of facility corrective maintenance and construction. Specific work observations included programmatic activities related to abnormal response procedures, corrective maintenance of various DAF structures and components, and construction activities performed in support of the relocation of the LANL Critical Experiments Facility to DAF.

Aerial View of DAF

The scope of work for contact work activities at DAF is well-defined in operations procedures and work packages. All contact work to be performed is bounded by a specific work request and a work package traveler that lists the scope of the work to be performed. In general, scope-of-work descriptions are sufficient to enable identification and analysis of hazards.

Various mechanisms are used to analyze hazards associated with activity-level work at DAF. The specific method of hazards analysis employed for contact work is dependent on the principal organization responsible for the work, including the various hazards assessment tools (e.g., integration work sheets, job hazards analyses, PTHRs). For most work classified as Type 1 or 2, the hazards analysis mechanisms are sufficiently defined and implemented to ensure that hazards are appropriately identified and analyzed. However, systemic deficiencies exist at the institutional level in classification and processes for Type 3 work and in determinations that work is within the skill of the craft. These weaknesses have not been formally recognized or compensated for at DAF; a significant amount of corrective maintenance and construction activities involving safety hazards is performed as Type 3 work. This has resulted in ineffective work planning and failure to properly identify and analyze all hazards for some work activities. (See Finding #C-1.)

Engineering controls are prevalent at DAF and are used appropriately to control many activity-level hazards. Procedures and work packages for Type 1 and Type 2 work are generally comprehensive and outline the necessary steps, hazards, and controls involved with performing the work safely. However, a lack of rigor in work planning and ineffective flowdown of DAF-specific requirements to contractor organizations have resulted in requirements and controls that are not always sufficiently understood or properly implemented. (See Finding #C-3.)

Work at DAF is appropriately scheduled and authorized through formal plan-of-the-day meetings. Readiness to perform work is achieved through documented pre-job briefings to discuss hazards and controls associated with the work. Most observed work was performed safely. However, there are weaknesses in the implementation and use of the PTHR as a hazards analysis and briefing mechanism for Type 3 work, resulting in some work being performed without adequate assurance of readiness and understanding of the hazards and necessary controls. These concerns primarily result from systemic deficiencies associated with skill-of-the-craft work and did not reflect intentional noncompliance with identified controls. When the hazards and associated controls were clearly and formally specified, workers and management were diligent about performing work within established boundaries and were not hesitant to stop work when questions arose.

Overall, work planning and control mechanisms at DAF are generally effective when work is planned and executed using Type 1 and 2 work packages and/or is driven by technical procedures. However, systemic deficiencies exist at the institutional level in classification and allowance for Type 3 work and in skill-of-the-craft determinations. These weaknesses have not been formally recognized or compensated for at DAF through more rigorous work control requirements and have resulted in a significant amount of Type 3 work for which some hazards and needed

controls have not been identified. In some cases, there was also insufficient rigor in work planning for planned work packages and in proper implementation of institutional and DAF-specific requirements, including a variety of examples where established requirements, controls, and expectations were not sufficiently understood, properly implemented, or followed. When controls are clearly and formally specified, workers and management at DAF are diligent about performing work within established boundaries and are not hesitant to stop work when questions arise. Additional management attention is needed to ensure that work at DAF is adequately planned and performed safely and in accordance with internal requirements and quality and conduct of operations expectations.

Joint Actinide Shock Physics Experimental Research

The JASPER Facility is operated by JNPO-LLNL to conduct shock physics experiments on special nuclear materials and other actinide materials in support of the stockpile stewardship program. JASPER is managed by JNPO-LLNL and staffed with employees of such organizations as LLNL, NSTec, and JNPO-LANL. The facility was in a maintenance mode during this inspection and experiment operations with fissionable materials were suspended.

Adequate processes for defining work are established and implemented at JASPER.

Equipment at JASPER

Most of the broad range of hazards at JASPER have been adequately analyzed. Results of these analyses are well documented in the JASPER hazard analysis report and work control documents, and most hazards are well understood by the well-trained workforce. A few potential hazards were either not fully analyzed or the analyses were not documented. Of most significance was the failure to maintain a documented analysis of electrostatic sensitivity of high explosives. In this case, the rigor of the analysis was not commensurate with the hazard involved. (See Finding #C-4.)

The broad range of significant occupational hazards at JASPER necessitates rigorous work controls to ensure worker safety. This rigor is provided with engineered safety features, detailed written procedures, and effective management oversight. With few exceptions, appropriate controls have been established and implemented effectively for identified hazards.

The work that was observed was performed safely and, with a few exceptions (e.g., weaknesses in implementation of electrical safety arc flash criteria), was performed in accordance with established requirements. The good condition of safety equipment and facilities indicates a focus on safety by the JASPER management and staff.

Overall, work at JASPER is well defined in work packages, integration work sheets, and detailed procedures. Most hazards are adequately identified and analyzed in the JASPER hazard analysis report, facility safety plan, fire hazard analysis report, and work control documents. Most work packages are adequately controlled through the use of engineered controls, a special controls and conditions document, detailed procedures, and other work control documents. With few exceptions, work was performed with a high regard for safety and was properly authorized through plan-of-the-day meetings and other mechanisms. A few isolated exceptions to this generally good performance were noted. For example, analysis of the electrostatic sensitivity of high explosives was not documented, and a few chemical hazards in one workplace were not adequately monitored or controlled.

U1a Complex

The underground Ula Complex is located in Area 1 of the NTS and is managed by JNPO-LANL. Both JNPO-LANL and JNPO-LLNL conduct subcritical high-explosive experiments underground at the Ula Complex. The U1a Complex is an underground laboratory consisting of horizontal tunnels, each about one-half mile in length. The complex is mined at the base of vertical shafts approximately 960 feet below ground surface.


Experimental Equipment at U1a

In most cases, work documents effectively define the scope of work for current U1a Complex operations. In a few cases, the scope of work of individual packages included broad areas of work without limitations on the complexity of the work; however, observed management practices generally provided sufficient control of scope on observed activities.

Facility-level hazards and potential accidents at the U1a Complex and hazards unique to the Thermos experiments at the U1a Complex are adequately identified and analyzed in most cases; however, the lack of appropriate definition and the classification of skill-of-the-craft tasks as low hazard (Type 3 work) indicates a fundamental weakness in the understanding of the definition of hazards and in the application of ISM. Management attention is needed to ensure that industrial hazards (which includes such hazards as high-voltage equipment and toxic chemicals) are appropriately identified and analyzed for all work. (See Finding #C-1.)

In most cases, appropriate and effective controls are established and implemented for hazards in the Thermos series of experiments. However, due to the non-conservative categorization of hazardous activities as Type 3 work (discussed above), some controls might be missed for those hazards not adequately analyzed; some controls were not adequately documented or communicated to the workers.

When appropriate controls were established, supervisors, scientists, and technicians at the U1a Complex appropriately verified readiness to perform work, and authorized and performed work safely and within established controls.

In general, implementation of Core Functions 1 through 4 in the U1a Complex is effective. In most cases, work documents effectively define the scope of work for current U1a Complex operations. Management intervention compensated for cases where the scope was too broad. Project-level hazards associated with the Thermos experiments at the U1a Complex are adequately identified and analyzed, and in most cases appropriate and effective controls are established and implemented for most U1a Complex hazards. Observed work was appropriately verified as ready to perform and was authorized and performed within established controls. However, from the NSO and corporate contractor level, the lack of a definition of low hazard and the inappropriate classification of all skill-of-the-craft tasks as low hazard indicate a fundamental weakness in the understanding of the definition of hazards and in the application of ISM at the activity level. Most of the examples of inadequate hazards analysis and improper controls observed at the U1a Complex were directly attributable to the non-conservative work control processes for Type 3 work. Management attention is needed to ensure that all activity-level hazards are identified and analyzed appropriately.


Work Activities at U1a

4.2 Essential System Functionality

In the review of essential system functionality, Independent Oversight evaluated the effectiveness of the NTS processes for engineering and configuration management to determine whether selected DAF safety systems are capable of performing their safety functions with a high level of confidence, commensurate with their importance to safety. The programs and processes evaluated included configuration management, the USQ process, maintenance, testing, and operations.

Configuration Management and Supporting Processes

The majority of the recently generated permanent modifications complied with procedural requirements, but a number of process weaknesses indicate inadequate implementation of some of the aspects of the modification process. The Independent Oversight team also identified a number of concerns related to temporary modifications. Additionally, the DAF configuration management process needs improvements to reflect the change in the DAF mission from nuclear explosives activities to a Category 2 nuclear facility operation and ongoing changes to accommodate additional nuclear operations and the expanded mission. Significant non-conservatisms with respect to the existing DAF USQ process have been recognized by the contractor and NSO, and the correction process is well under way; a proposed new draft that addresses all of the concerns identified by the Independent Oversight team has been completed. (See Finding #E-1.)

Engineering Design and Authorization Basis

Engineering and safety basis personnel and facility staff are knowledgeable about the facility, its systems, and the supporting design and safety bases; they display a strong sense of ownership, responsibility, and mutual cooperation and coordination. Although the designs of the fire protection and confinement HVAC systems evaluated by the Independent Oversight team were generally adequate, significant concerns were identified in these and related support or interface safety-related structures, systems, and components with regard to their adequacy to perform their designed safety functions. The safety basis documents were generally clear, well-written, comprehensive, appropriately detailed, and compliant with regulatory requirements, orders, codes, and standards—except in one area. The documented safety analysis does not adequately analyze the radiation exposure consequences from evaluation basis events to facility workers outside the immediate building in which the event is postulated to the level indicated by DOE Standard 3009-94. Many of the design and safety basis concerns identified were in two general areas, with significant overlaps and interconnections between them: 1) structures, systems, and components design concerns related to radioactive materials confinement with respect to worker safety, and 2) safety basis concerns related to radiation exposure worker consequences for evaluation basis events. Some of these potential hazards could be attributed to leakage pathways that appeared to have resulted from inadequate original designs of the facility's systems for the confinement function. Some facets of the concerns were recognized by the NTS staff and in the documented safety analysis; however, characterization of these conditions and the associated safety ramifications had not yet been fully addressed. These concerns were documented in a potentially inadequate safety analysis, a USQ determination, and an occurrence reporting and processing system report generated by JNPO-LLNL. (See Findings #E-2, E-3, and E 4.)

Surveillance and Testing

Surveillance activities at DAF are currently performed by NSTec maintenance personnel and DAF cognizant system engineers, following coordination with and authorization by JNPO-LLNL Operations. However, with the planned change and expansion of the DAF mission in the near future, additional JNPO-LLNL Operations personnel will be hired to assume many of the responsibilities of the current performers. Observed surveillance activities and records that were reviewed demonstrated that the safety class fire suppression system and safety significant ventilation system were operable. DAF management and staff were effective in tracking technical safety requirement surveillances and assuring that they are completed. NSO appropriately identified a deficiency in the blast valve surveillance procedure's ability to confirm operability and a corrective action plan is being developed. However, some additional deficiencies in surveillance activity procedures and system labeling indicate a need to re-examine existing procedures and training to ensure that they are understood by operators, including the planned new operators who might be less familiar with the facility and equipment, and to improve the rigor and formality of procedure review, walkdowns, and approvals.

Maintenance and Procurement

The DAF and its equipment were generally in very good physical condition. Operations, maintenance, engineering, and procurement staff demonstrated that they were competent, knowledgeable, and dedicated to maintaining reliable safety-related structures, systems, and components. The DAF maintenance and cognizant system engineer programs are not yet fully compliant with DOE Order 433.1. However, these programs are

compliant with the NSO-approved DAF Maintenance Implementation Plan and significant progress has been made in fully meeting the elements of the order. The DAF Maintenance Implementation Plan, when combined with ongoing assessments, periodic revision, and NSO oversight, defines an effective process for achieving the goals of DOE Order 433.1. Observed maintenance performance and records that were reviewed were generally adequate, with some noted deficiencies. However, of particular concern was that completed surveillance and maintenance work packages did not always ensure that safety-related structures, systems, and components were appropriately returned to service, and that continuing verification of the appropriate status of these structures, systems, and components was not always effective. The NSTec program for maintenance histories was recently upgraded to include work packages completed over the last year in a computer database. The maintenance organization's failure to record corrective maintenance as-found conditions, apparent causes, the details of the repairs beyond that documented in the job plan, and the as-left condition limits the utility of the database in supporting trending and planning. No concerns with quality grade procurement were identified beyond those identified by NSO, which are now being addressed. (See Finding #E-5.)

Safety Systems Feedback and Improvement

Although much work remains, DAF and NSO have made progress in establishing their respective cognizant system engineer and safety system oversight programs. DAF management is actively involved and has established effective mechanisms (such as the Issues Priority Review Team) for the development, reporting, tracking, and monitoring of nuclear safety performance issues. NSO oversight and assessments of DAF vital safety systems and safety management programs are providing valuable feedback to the contractor to focus improvement initiatives to further strengthen the contractor's cognizant system engineer program and its effectiveness in monitoring and ensuring vital safety system performance. A number of the performance issues identified by NSO were independently identified by this Independent Oversight inspection.

Overall, considerable work remains to address deficiencies in essential safety systems at DAF. NSO is providing effective oversight in this area. DAF personnel are making significant progress in most of the areas of deficiencies and generally have a good understanding of the current deficiencies and needed actions. Although some of these concerns are related to nuclear explosive operations within the assembly cells, it is recognized that these issues would require resolution as part of a readiness review before authorization of cell operations. Nevertheless, these deficiencies highlight the need for continued management attention on improvement initiatives and such upcoming important verification activities as operational readiness reviews and readiness assessments before nuclear facility operations commence.

4.3 Focus Areas

Environmental Management System and Pollution Prevention Program

At NTS, Independent Oversight evaluated the requirement of DOE Order 450.1, *Environmental Protection Program*, to implement an EMS by inspecting the NSO program for management and oversight of EMS activities, the NSTec environmental compliance program, and the implementation of EMS for activities involved with operations, maintenance, and construction at the NTS and at North Las Vegas facilities.

Although NSO initially determined that the previous operating contractor had established an EMS program, only one assessment including EMS elements has been performed, and that assessment did not cover NSTec operations. NSO oversight of NSTec actions to implement an ISO 14001-certified EMS consists only of attending monthly meetings with NSTec ES&H staff and managers. (See Finding #D-1.)

The ISM system for NTS operations, including maintenance and construction tasks performed at facilities operated by JNPO-LLNL and JNPO-LANL, has incorporated elements of an EMS, with requirements for including environmental hazards and the mitigating controls in work packages. The NSTec Environmental Services Department, which has the lead for EMS implementation, is staffed by knowledgeable and experienced personnel who provide environmental support to line organizations upon request. However, several deficiencies exist. Environmental hazards are not routinely analyzed as a part of work planning so that specific controls can be established as part of work planning and control. Although significant environmental aspects have been established, these aspects have not been adequately implemented within line organizations. The previous

contractor's environmental policy has not been reissued to demonstrate NSTec senior management commitment to environmental goals. Additionally, while pollution prevention activities were extensive in several shops, they were limited in other shops and construction activities. (See Finding #F-1.)

Workplace Monitoring

DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, and 10 CFR 851 establish the basis and requirements for an effective workplace monitoring and exposure assessment process. NSTec is developing a workplace exposure monitoring architecture through the DOEHRS and Apogen Systems that will fulfill these requirements. In the interim, NSTec has an adequate procedural process that includes use of the Industrial Hygiene Field Operations Manual, health hazard evaluations, and documented exposure assessments. Furthermore, since the 2003 Independent Oversight inspection, significant improvements have been made in the overall industrial hygiene program, especially the workplace exposure assessment program. At present, much remains to be done before the NTS workplace exposure assessment program is fully implemented. In recent months, NSTec has been requested to expand its workplace exposure monitoring responsibilities from only supporting NSTec facilities and operations to performing exposure monitoring for other NTS contractors (e.g., JNPO, WSI). The current health hazard evaluations do not address some of these work activities and hazards and other routine and non-routine work activities conducted by NSTec. Although the DOEHRS has extensive capabilities with respect to exposure assessment, much of the exposure assessment data from health hazard evaluations conducted since 2004 has not been entered into the DOEHRS. Similarly, without an active industrial hygiene oversight program within NSO, workplace exposure monitoring programs are not receiving sufficient attention to ensure the implementation of an effective program that meets the requirements of DOE Order 440.1A. (See Finding #F-2.)

Safety Management for Protective Force Training

Many aspects of the WSI efforts to integrate safety into protective force training activities are effective, including range activities and controls for live ammunition. However, the rapid expansion of the NTS mission and the related expansion of protective force activities have presented significant challenges to WSI capabilities in such areas as training, equipment, and infrastructure. The WSI staff has good expertise in firearms safety but limited expertise in some other ES&H areas, such as industrial hygiene. In the past, WSI had occasionally used NSTec ES&H SMEs. This approach has been effective in some areas, such as range safety, but not sufficient to support rigorous and systematic evaluations of health hazards or a workplace monitoring program. In order to keep pace with the rapid expansion of the protective force, it will be important for NSO and WSI managers to establish a sufficient ES&H capability on its own staff and an adequate support team (which could either be WSI personnel or support from another organization) to augment all aspects of the WSI security program, which will enhance the integration of safety into protective force operations in such areas as training, quality processes, adapting new technologies, procurement, and support services.

In addition, the revised Design Basis Threat has created a need to introduce and test sophisticated technologies that can be effectively deployed at many DOE facilities. The Mercury facility is ideally suited to participate in and test new security technologies. Because of the WSI and NTS efforts in testing safety of prototypes, some important and previously unrecognized safety risks with carbon monoxide, lead, and noise at hardened fighting stations were identified and now are being addressed at NTS and other DOE sites.

NSO has performed some oversight of the safety aspects of protective force activities. However, NSO has performed few operational awareness activities and has had only limited capability and involvement in industrial hygiene issues that impact the protective

NTS Mercury Base Camp

force. In addition, NSO was not proactive in ensuring that timely and thorough analyses were performed for three firearms discharge investigations. (See Finding #D-1.)

4.4 Feedback and Improvement Systems

National Nuclear Security Administration

Based on this review of NTS and another recent review of an NNSA site, NNSA has an adequate process to maintain operational awareness and adequate processes to exchange information with NSO. However, NNSA has not completed some of the actions necessary to fully implement their programs for meeting the requirements of DOE Order 226.1, *Implementation of DOE Oversight Policy*, such as developing a contractor assurance system policy and performance expectations and developing a Headquarters issues management system. Also, NNSA has not completed its delegation process for NSO, but recently (March 30, 2007) completed its annual assessment schedule for fiscal year 2007. In addition, NNSA oversight has not identified significant differences in the implementation of requirements in some areas, such as nuclear facility maintenance, and NNSA expectations for reviews of work control processes have not been adequately implemented.

Nevada Test Site

Some aspects of the NSO line management oversight program, such as the Facility Representative program, are effective, and NSO is performing some assessments that are identifying substantive issues and driving improvements. Most notably, NSO has focused attention on nuclear safety at the DAF and has conducted a number of assessments of DAF vital safety systems and safety management programs. These assessments have been effective in identifying a number of weaknesses in JNPO-LLNL and NSTec programs at DAF in such areas as the cognizant system engineer program, the USQ process, and aspects of the design and configuration management for safety systems. NSO has also been effective in ensuring that NSTec and JNPO-LLNL developed effective corrective action initiatives for the identified nuclear safety programs at DAF; corrective actions are in process for many of the deficiencies with essential safety systems that were identified by the Independent Oversight team on this inspection. In addition, NSO is in the process of implementing an integrated software solution (Pegasus), that when fully implemented, has the potential to address a number of longstanding deficiencies (identified by both external and internal assessments) in correspondence management, issues management, corrective action tracking, and operational awareness documentation. In several areas, NSO is effectively using contract performance measures to drive contractor improvements.

Although NSO has completed a significant number of satisfactory assessments and self-assessments in the last two years, it has not established an adequate baseline assessment program. The planning and schedules for assessments and self-assessments have not been sufficient to demonstrate adequate coverage over a reasonable period of time. A number of DOE directive-required assessments have been missed. Further, while NSO has devoted significant attention to oversight of nuclear safety at DAF, NSO oversight in a number of other areas, including industrial hygiene, environmental protection, and safety of protective force operations, has been insufficient. For example, NSO does not have an industrial hygienist assigned to conduct oversight of contractor or Federal industrial hygiene programs. There have been no documented assessments or self-assessments in this area for the last two years. The ineffective oversight in these areas contributes to the weaknesses noted at NTS facilities in work control processes for controlling worker safety health hazards, workplace monitoring, and implementation of the EMS. In addition, the NSO technical qualification program has a number of weaknesses. Some NSO personnel have not made adequate progress in achieving and sustaining their qualification standard. There are also weaknesses in the NSO lessons-learned program, issues management process, management of operational awareness data, conduct of Federal workspace walkthroughs, and employee concerns program. In some of these areas, NSO has self-identified the weaknesses and has developed corrective actions. Increased management attention is needed to drive further improvements. (See Findings #D-1, D-2, and D-3.)

National Security Technologies, LLC

NSTec became the management and operating contractor for the NTS on July 1, 2006. Because NSTec has continued to use the former contractor's procedures pending development of new procedures and most of the NSTec personnel implementing and

approving feedback and improvement activities were in the same positions with the previous contractor, the Independent Oversight team evaluated feedback and improvement activities performed over the past two years. NSTec has established and implemented the basic management systems that comprise an effective contractor assurance program. Most of these elements are adequately defined in an assurance system program description and in institutional and organization-specific procedures that direct the implementation of these management systems. These processes were usually adequately implemented, providing feedback on the adequacy of ES&H processes and performance and improving safety performance. At present, NSTec conducts a variety of assessment and inspection activities and identifies and documents safety problems. These safety issues are evaluated, corrected, and tracked to closure with a robust tracking tool. Corrective and preventive actions are taken when operational events and occupational injuries and exposures occur, and injuries and operational events are reported to DOE reporting systems. NSTec identifies, develops, communicates, and applies lessons learned. The site coordinator receives and maintains documented feedback from field coordinators on the application of lessons learned. NSTec workers have various methods to report and resolve safety concerns, including access to a sitewide program administered by NSO.

However, not all of these processes have been sufficiently detailed in procedures; implementation in some cases lacked sufficient rigor or was otherwise inadequate. Management assessments often have lacked sufficient depth and rigor, have not sufficiently focused on work observation, records, and work documents, and have not sufficiently evaluated program implementation to provide management with a full and accurate picture of safety process and performance adequacy. Although NSTec has conducted various studies and assessments on work control, these assessments have not identified the systemic weaknesses in the work control process for skill-of-the-craft activities, the overuse of Type 3 work packages, and the deficient analysis and control of some types of work activity hazards identified by Independent Oversight. Weaknesses in identifying causes and lack of requirements for determining extent of condition were identified. Event analyses have not always included non-reportable events as required, and the Independent Oversight team identified examples where critiques and formal root cause analyses were not performed as required by procedures and where events were not reported to DOE as required. Many occupational injury and illness investigations that were reviewed by Independent Oversight were incomplete, unsigned, or insufficiently detailed to describe all aspects of the incidents. In some cases, proper causes were not identified, ISM elements were not addressed, and appropriate corrective actions, recurrence controls, and implementation mechanisms were not provided. In some cases, injuries have not been reported to supervision or have not received medical attention in a timely manner. The Independent Oversight team identified errors in determining OSHA recordability and days-away cases and in timely reporting to the DOE Computerized Accident and Injury Reporting System. The NSTec lessons-learned program did not demonstrate that externally generated lessons were being screened by SMEs and program owners for applicability and needed action at the institutional level or that department level coordinators were consistently screening externally generated lessons learned. No formal contractor procedures or instructions detail the protocol, responsibilities, or processes for managing employee concerns in support of the NSO employee concerns program. There is insufficient communication to workers about the NSO employee concerns program and the ES&H hotline or links on the NSTec intranet. (See Finding #D-4.)

Joint NTS Program Office – Lawrence Livermore National Laboratory

JNPO-LLNL feedback and improvement processes and performance are much improved since the 2002 Independent Oversight inspection. More assessments are being performed, based on strengthened procedures and structured planning and issues management processes, and tracking systems have improved and are used to manage safety issues and drive process and performance improvements. Process weaknesses and performance deficiencies were identified in feedback and improvement processes that reduce their effectiveness. Some independent and facility management assessments were limited in scope and did not always clearly describe the scope or the basis for conclusions of satisfactory results. Most assessments did not involve watching work. The hazard and risk basis for assessment planning is not well-defined, and assessment schedules generally do not identify specific assessment topics and might not adequately address an appropriate population of ES&H functional/topical areas. Issue corrective action due dates and issue closures are not timely in many cases, and corrective

actions often do not address the causes of issues or always adequately provide recurrence controls. Additionally, issues trend analysis is not performed at a defined and consistent frequency. JNPO-LLNL procedures for managing injuries and illnesses are inadequately tailored to the NTS, and investigation and management of first aid cases are not performed as required by procedures. Although lessons learned are communicated to JNPO-LLNL personnel, no internal lessons learned have been generated at the NTS by JNPO-LLNL for sharing at the NTS or with the DOE complex since at least 2003. JNPO-LLNL is not identifying any process changes or other applications of lessons learned other than dissemination to site personnel in reports to the NSTec site lessons-learned coordinator. JNPO-LLNL has neither established any formal NTS policy or procedures that address the NSO formal concerns program nor any policies or procedures for how JNPO-LLNL interfaces or supports NSO in addressing employee concerns. (See Finding #D-5.)

Joint NTS Program Office – Los Alamos National Laboratory

JNPO-LANL feedback and improvement processes and performance are much improved since the 2002 Independent Oversight inspection. More assessments are performed, based on strengthened procedures and structured planning and issues management processes, and tracking systems have improved and are used to manage safety issues and drive process and performance improvements. However, process weaknesses and performance deficiencies were identified in feedback and improvement processes that reduce their effectiveness. The quality, depth, rigor, and focus on work observation of many management assessments were insufficient. Not all safety topical areas are considered and identified for assessment in a structured manner or on a frequency based on risk and past performance. Quarterly ISM management assessments required by JNPO-LANL NTS procedures have not been performed. Safety issue significance-level examples reflect categorization based on the source of issues rather than the significance or risk. There is no difference in management requirements between significance levels. Issue trend analyses are not performed on a defined and consistent frequency. Issue resolutions are not always timely, and the resolution of many issues failed to adequately address the cause and provide appropriate recurrence controls. The JNPO-LANL procedure for managing occupational injuries and illnesses is not specific to NTS activities and does not establish the necessary NTS-specific responsibilities for workers, supervisors, and NTS medical staff to manage occupational injuries and illnesses as required by JNPO-LANL procedures and DOE/OSHA. Further, investigation and management of first aid cases are not performed as required by procedure. JNPO-LANL does not formally log, track, or investigate injuries classified as first aid cases. Although LANL has a home Laboratory institutional policy on employee concerns, JNPO-LANL has neither established any formal NTS policy or procedures that address the NSO formal concerns program nor any policies or procedures for how JNPO-LANL interfaces with or supports NSO in addressing employee concerns. (See Finding #D-6.)

Joint NTS Program Office

The JNPO was formed in mid-2006 to provide more efficient, coordinated, and effective management of LLNL and LANL activities at NTS. JNPO is comprised of staff selected from both JNPO-LLNL and JNPO-LANL and is governed by memoranda of understanding between the two Laboratories and between NNSA/NSO and the Laboratories. The JNPO has issued a mission and vision plan, an execution plan, and an integration schedule, and has drafted a contractor assurance system description document. Contractor assurance and feedback and improvement elements are implemented by a staff organization called Independent Elements, which reports directly to the JNPO program leader. Independent Elements includes security, Price-Anderson Amendments Act tracking activities, issues management, and quality and contractor assurance elements. At the time of this inspection, personnel had been assigned to positions in the JNPO and were implementing the execution plan, including scheduling, planning, and conducting assessments; screening, generating, and distributing operating experience information; collecting and managing issues; and coordinating the management of reportable events. At the time of this inspection, much of the JNPO activities were being performed using the applicable policy and procedural requirements of both LLNL and LANL. The plan identifies that JNPO will evaluate and develop unified procedures and processes, including a contractor assurance program description. However, at the time of this inspection, JNPO had not developed feedback and improvement procedures governing activities that are to be conducted under the new organizational

structure. The Independent Oversight team's review of the limited number of assurance activities performed by JNPO to date identified process and performance weaknesses and deficiencies similar to those identified in the review of recent LLNL and LANL feedback and improvement activities. The deficiencies and weaknesses identified in this report should be addressed by JNPO as consolidated procedures are developed and implemented.

Wackenhut Services, Inc.

WSI has established processes for managing the investigation, classification, and reporting of occupational injuries and illnesses. However, some non-conservative errors were made in classifying occupational injuries and illnesses for OSHA recordability and reporting to DOE through the Computerized Accident and Injury Reporting System. Further, in two cases, injuries in which employees were treated at the NTS medical facility were not included in WSI case management files. In other cases, the documented descriptions of restrictions were insufficient to make proper recordkeeping decisions. Management attention is needed to ensure that accurate and complete records are maintained and that accurate classifications and reporting are performed.

5.0 Conclusions

NSO has some adequate oversight program elements, such as the Facility Representative program, and in several cases NSO is effectively using contract performance measures to drive performance improvements. NSO has also applied significant effort to oversight of nuclear safety at DAF, which has been effective in driving improvements in the contractor nuclear safety programs at DAF and in identifying the needed corrective actions to fully meet the requirements of a Category 2 nuclear facility and to make the upgrades needed for the additional planned nuclear activities. However, many aspects of NSO processes are deficient, and NSO has not performed adequate oversight in certain ES&H areas, such as industrial hygiene, environmental protection, and safety of protective force operations.

With few exceptions, NSTec, JNPO-LLNL, and JNPO-LANL have effectively identified, analyzed, and established controls for the hazards associated with facility operations and experiments. Further, safety controls for experiments at JASPER and U1a were detailed and comprehensive. However, work control processes were not consistently adequate to ensure that workers are well-protected from some hazards because of deficiencies in the application of skill-of-the-craft processes and Type 3 work packages, electrical safety control (e.g., NFPA codes), workplace monitoring, and the rigor of work control process implementation. In addition, the EMS is not sufficiently integrated into operations at the facility level, and certain actions to implement the EMS have not been completed in a timely manner. Many aspects of NSTec, JNPO-LLNL, and JNPO-LANL feedback and improvement programs have improved since the most recent Independent Oversight inspection of NTS. However, weaknesses in feedback and improvement processes and their implementation have reduced their effectiveness in ensuring that deficiencies in ES&H programs are identified and addressed to prevent recurrence.

Considerable work remains to address deficiencies in essential safety systems at DAF in such areas as vital safety system design, configuration management, the USQ process, surveillance, testing, maintenance, procurement, and the cognizant system engineer program. However, many of the deficiencies are attributed to the changes in the facility mission to a Category 2 nuclear facility and the associated stringent nuclear safety requirements. DAF personnel are making significant progress in most of the areas of deficiencies, and NSO and DAF personnel generally have a good understanding of the current deficiencies and needed actions. Further, some of these concerns are related to nuclear explosive operations within the assembly cells and their resolution would be expected as part of a readiness review before authorization of cell operations.

Overall, NNSA, NSO, JNPO-LLNL, and JNPO-LANL have made improvements in a number of areas, but increased management attention is needed to enhance ES&H processes and performance. Areas of particular priority and emphasis should include:

- Improvement initiatives and upcoming important verification activities, such as operational readiness reviews and readiness assessments before nuclear facility operations commence
- Worker protection programs, with particular attention on resolving deficiencies in skill-of-the-craft and Type 3 work package processes and workplace monitoring
- Enhancement of NSO and contractor feedback and improvement, including emphasis on work planning, industrial hygiene, environmental programs, and safety of protective force operations.

6.0 Ratings

The ratings reflect the current status of the reviewed elements of NTS ISM programs. The ratings for work planning and control and essential safety systems reflect the performance of both NSO and the responsible contractors.

Work Planning and Control

ACTIVITY (Responsible Contractor)	CORE FUNCTION RATINGS			
	Core Function #1 – Define the Scope of Work	**Core Function #2 – Analyze the Hazards**	**Core Function #3 – Develop and Implement Controls**	**Core Function #4 – Perform Work Within Controls**
Maintenance and construction activities (NSTec and subcontractors)	Needs Improvement	Needs Improvement	Needs Improvement	Needs Improvement
DAF activities (JNPO-LLNL and NSTec)	Effective Performance	Needs Improvement	Needs Improvement	Effective Performance
JASPER activities (JNPO-LLNL and NSTec)	Effective Performance	Needs Improvement	Effective Performance	Effective Performance
U1a Complex activities (JNPO-LANL and NSTec)	Effective Performance	Needs Improvement	Effective Performance	Effective Performance

Essential System Functionality

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

Feedback and Continuous Improvement - Core Function #5

NNSA and NSO Feedback and Continuous Improvement Processes .....NEEDS IMPROVEMENT
NSTec Feedback and Continuous Improvement Processes .....NEEDS IMPROVEMENT
JNPO-LLNL Feedback and Continuous Improvement Processes.....NEEDS IMPROVEMENT
JNPO-LANL Feedback and Continuous Improvement Processes .....NEEDS IMPROVEMENT

APPENDIX A
SUPPLEMENTAL INFORMATION

A.1 Dates of Review

Planning Visit	March 6 - 8, 2007
Onsite Inspection Visit	March 19 - 30, 2007
Report Validation and Closeout	April 11 - 13, 2007

A.2 Management

Glenn S. Podonsky, Chief Health, Safety and Security Officer
Michael A. Kilpatrick, Deputy Chief for Operations, Office of Health, Safety and Security
Bradley Peterson, Director, Office of Independent Oversight
Thomas Staker, Acting Director, Office of Environment, Safety and Health Evaluations

A.2.1 Quality Review Board

Michael Kilpatrick	Bradley Peterson	Thomas Staker	Steven Simonson
Dean Hickman	Robert Nelson	Bill Sanders	

A.2.2 Review Team

Steven Simonson, Team Leader
Bill Miller, Deputy Team Leader

Phil Aiken	Vic Crawford	Ivon Fergus	Robert Freeman
Janet Macon	Marvin Mielke	Robert Compton	Al Gibson
Ed Greenman	Joe Lischinsky	Jim Lockridge	Tim Martin
Joe Panchison	Don Prevatte	Michael Shlyamberg	Ed Stafford
Mario Vigliani			

A.2.3 Administrative Support

Mary Anne Sirk	Tom Davis

A.3 Ratings

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

- **Significant Weakness (Red):** Indicates senior management needs to immediately focus attention and the resources necessary to resolve management system or programmatic weaknesses identified. A Significant Weakness rating would normally reflect a number of significant findings identified within a management system or program that degrade its overall effectiveness and/or that are longstanding deficiencies that have not been adequately

addressed. A Significant Weakness rating would, in most cases, warrant immediate action and compensatory measures as appropriate.

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

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

APPENDIX B
SITE-SPECIFIC FINDINGS

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

	FINDING STATEMENTS
C-1	NSO and NSTec have not established and implemented effective processes at the activity level to properly define and control skill-of-the-craft activities and ensure sufficient analysis of hazards where Type 3 work packages are used to control hazardous work, in accordance with DOE Policy 450.4, *Safety Management System Policy.*
C-2	NSTec has not ensured that all of the requirements of NFPA 70E for arc flash labeling, arc flash personal protective equipment, and voltage detector operability verification during lockout/tagout have been effectively implemented.
C-3	JNPO-LLNL and NSTec line management responsible for work at DAF have not applied sufficient rigor in ensuring that all applicable institutional and facility-specific requirements, DAF requirements, and administrative controls are understood and effectively implemented in accordance with DOE Policy 450.4, *Safety Management System Policy.*
C-4	The level of rigor applied by JNPO-LLNL to analysis of electrostatic sensitivity of JASPER explosives was not commensurate with the risks involved and was not consistent with DOE Policy 450.4, *Safety Management System Policy,* in that the expert-based analysis was not adequately documented to demonstrate worker safety before the explosives were handled.
D-1	NSO has not established adequate assessment and self-assessment programs, issues management and corrective action tracking processes, operational awareness implementation, and documentation processes in accordance with DOE Order 226.1, *Implementation of Department of Energy Oversight Policy*.
D-2	The NSO technical qualification program does not meet some requirements of DOE Manual 360.1-1B, *Federal Training Manual*, and DOE Manual 426.1-1A, *Federal Technical Capability Manual*, in such areas as assessments, training records, roles and responsibilities, and procedures; some NSO personnel have not adequately achieved or maintained their qualifications.
D-3	The NSO lessons-learned program does not adequately implement lessons-learned roles and responsibilities listed in NSO Manual 111.X-1F, *Functions, Responsibilities, and Authorities Manual*.
D-4	NSTec safety assurance processes and activities have not been fully effective in providing feedback information, rigorously analyzing problems, and establishing appropriate corrective actions and recurrence controls to foster continuous performance improvement in accordance with DOE Order 226.1, *Implementation of Department of Energy Oversight Policy*.
D-5	JNPO-LLNL safety assurance processes and activities have not been fully effective in providing feedback information, rigorously analyzing problems, and establishing appropriate corrective actions and recurrence controls to foster continuous performance improvement in accordance with DOE Order 226.1, *Implementation of Department of Energy Oversight Policy*.
D-6	JNPO-LANL safety assurance processes and activities have not been fully effective in providing feedback information, rigorously analyzing problems, and establishing appropriate corrective actions and recurrence controls to foster continuous performance improvement in accordance with DOE Order 226.1, *Implementation of Department of Energy Oversight Policy*.

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

	FINDING STATEMENTS
E-1	Contrary to the requirements provided in DOE-STD-1073-2003, *Configuration Management*, DAF has not established a modification process that provides a valid independent review, including formal disposition of review comments, control of temporary modifications, and documentation of the design requirements.
E-2	Previously unidentified or unanalyzed confinement leakage pathways and confinement-related equipment failure modes or design weaknesses in the DAF systems that have the potential to allow worker exposures or unsafe facility operating conditions are not addressed or enveloped by the documented safety analyses in accordance with DOE Order 420.1A, *Facility Safety*, and 10 CFR 830, *Nuclear Safety Management*.
E-3	DAF has not fully evaluated the unmitigated offsite (against the evaluation guidelines) and worker consequences for a contaminated waste collection system tank overflow that may occur as a result of a fire or high explosive violent reaction in an assembly cell in accordance with DOE Order 6430.1, *General Design Criteria Manual*, DOE Standard 3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis*, and 10 CFR 830, *Nuclear Safety Management*.
E-4	The DAF safety class fire suppression system boundaries are not clearly identified and properly isolated from non-safety portions of the system in accordance with DOE Order 420.1A, *Facility Safety*, and 10 CFR 830, *Nuclear Safety Management*.
E-5	JNPO-LLNL processes required by DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, to ensure restoration to service of safety structures, systems, and components following completion of surveillances and maintenance and to ensure that the status of operating safety-related structures, systems, and components is monitored and known are not fully effective at DAF.
F-1	NSTec has not sufficiently implemented several key actions to integrate an environmental management system within the integrated safety management program as required by DOE Order 450.1, *Environmental Protection Program*, including revising and issuing an NSTec environmental policy, revising work planning and control documents to incorporate environmental hazards analysis and resulting controls, and developing significant environmental aspects for line organizations.
F-2	Industrial hygiene workplace monitoring and exposure assessment requirements have not been fully implemented for NSO and NTS tenant organizations in all NTS work areas and operations as required by DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*.