

Summary Report

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

Los Alamos National Laboratory



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Office of Independent Oversight and Performance Assurance
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Abbreviations Used in This Report

AAAHC	Accreditation Association for Ambulatory Health Care
AL	Albuquerque Operations Office
ALARA	As Low As Reasonably Achievable
CMR	Chemistry and Metallurgy Research
DOE	U.S. Department of Energy
EM&R	Emergency Management and Response
ESH	LANL Environment, Safety and Health Division
ES&H	Environment, Safety, and Health
HCP	Hazard Control Plan
ISM	Integrated Safety Management
LANL	Los Alamos National Laboratory
LIR	Laboratory Implementing Requirement
NNSA	National Nuclear Security Administration
OA	Office of Independent Oversight and Performance Assurance
OLASO	Office of Los Alamos Site Operations
RLWTF	Radioactive Liquid Waste Treatment Facility
TA	Technical Area

OVERSIGHT

The Secretary of Energy's Office of Independent Oversight and Performance Assurance (OA) conducted an inspection of environment, safety, and health (ES&H) programs and emergency management programs at the U.S. Department of Energy (DOE) Los Alamos National Laboratory (LANL) in March-April 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.

The DOE National Nuclear Security Administration (NNSA) has DOE Headquarters responsibility for programmatic direction and funding of activities at LANL. Within the NNSA, the Albuquerque Operations Office (AL) and its subordinate Los Alamos Area Office historically had line management responsibility for operational direction and DOE line management oversight at LANL. In accordance with the changes in line management directed by the NNSA Administrator in March 2002, the Los Alamos Area Office has been renamed as the Office of Los Alamos Site Operations (OLASO), was made a direct report to the NNSA Administrator, and will be given increased responsibility and accountability for managing and directing the LANL contractor. Concurrently, AL will transition to a support office for OLASO and other NNSA site operations offices. Under contract to AL, the University of California is the prime contractor for operations at LANL. Transition of contractual administration to OLASO is planned.

Throughout its evaluations, OA reviews the role of DOE organizations in providing direction to contractors and conducting line management oversight of contractor activities. OA is placing more emphasis on the review of contractor self-assessments and DOE line management oversight in ensuring effective ES&H and emergency management programs. In reviewing DOE line management oversight, OA focused on the effectiveness of NNSA, AL, and OLASO in managing the LANL contractor, 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 contractor self-assessment programs, which DOE expects to provide comprehensive reviews of performance in all aspects of ES&H and emergency management.

LANL's primary mission is to provide scientific and engineering support to U.S. national security programs. LANL performs research, development, design, maintenance, and testing in support of the nuclear weapons stockpile. LANL also performs a wide variety of other theoretical and applied research and development activities in such areas as materials science, physics, environmental science, energy, and health.



Aerial View of Chemistry and Metallurgy Research Facility

To support these activities, LANL operates numerous laboratories, test facilities, and support facilities and performs such activities as facility maintenance and waste management. LANL activities involve various potential hazards that need to be effectively controlled, including exposure to radiation, radiological contamination, nuclear criticality, hazardous chemicals, and various physical hazards associated with facility operations

(e.g., machine operations, high-voltage electrical equipment, pressurized systems, noise, and construction/maintenance activities). Large quantities of fissile and radioactive materials are present in various forms at LANL.

The purpose of this inspection was to assess the effectiveness of selected aspects of the ES&H management and emergency management programs as implemented by LANL under the direction of NNSA, AL, and OLASO. The ES&H portion of the inspection evaluated implementation of the integrated safety management (ISM) program, including evaluations of the guiding principles of safety management, the application of the core functions of safety management to work activities at selected LANL facilities, and the effectiveness of OLASO and LANL feedback and continuous improvement programs. The ES&H portion of the review also examined the functionality of selected essential systems and implementation of environmental protection programs at LANL. The emergency management portion of the inspection focused on emergency planning, preparedness, and response, as well as DOE performance monitoring and LANL performance assurance activities.

The OA inspection team used a selective sampling approach to determine the effectiveness of NNSA, AL, OLASO, and LANL in implementing DOE requirements and expectations. This approach allowed effective, efficient evaluation of DOE and LANL management effectiveness while reducing the impact on site operations and minimizing the inherent overlap between OA's independent oversight role and the line management oversight role of NNSA, AL, and OLASO. The selective sampling approach involves examining selected institutional programs that support the ISM and emergency management programs, such as OLASO and LANL assessment programs and programs for identifying and implementing applicable requirements.

To determine the effectiveness of the institutional programs, the OA team examined the implementation of requirements by LANL and its subcontractors at two selected LANL facilities. The two selected facilities were the Chemistry and Metallurgy Research (CMR) facility and the Technical Area (TA)-50 Radioactive Liquid Waste Treatment Facility (RLWTF). CMR supports programmatic and research and development and laboratory operations related to chemistry and metallurgy of materials, including plutonium, uranium, and other radioactive materials.

The RLWTF supports the processing of radioactive liquid wastes and management of the associated waste materials.



Aerial View of Radioactive Liquid Waste Treatment Facility

As discussed in this report, OLASO and LANL have made significant improvements in ISM and some progress in emergency management. Many aspects of these programs are effective and some innovative measures have been developed. However, some important ISM and emergency management elements are not yet sufficiently effective and mature and weaknesses in supporting ISM systems, such as OLASO assessments, LANL assessments, and issues management, contribute to the observed implementation deficiencies and recurring weaknesses.

Section 2 of this report provides an overall discussion of the results of the review of the LANL ISM and emergency management programs, including positive aspects, weaknesses, and other items requiring management attention. Section 3 provides OA's assessment of the overall effectiveness of the ISM and emergency management programs and the overall conclusions of the review. Section 4 presents the ratings assigned as a result of this review. Appendix A provides supplemental information, including team member composition. Appendix B identifies the specific findings that require corrective actions and follow-up.

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

The results of this review indicate that ISM at the LANL site has several significant positive attributes (see Section 2.1). OLASO and LANL have established an effective ISM framework, and many elements of the ISM and emergency management programs are effectively implemented. However, several weaknesses and areas requiring attention were identified (see Section 2.2).

2.1 Positive Program Attributes

ES&H Positive Attributes

The leadership and direction of NNSA, DP, AL, and OLASO have resulted in improvements in ISM at LANL. The DOE line organizations have been instrumental in driving improvements in LANL ISM. With a few exceptions in the environmental protection area, DOE line management – NNSA, the Office of Defense Programs (DP), AL, and OLASO – has worked effectively with LANL to establish clear ES&H policies and performance expectations for LANL in the contract between DOE and the University of California. The contract includes work smart standards that identify an appropriate set of requirements and performance expectations, including performance goals (such as zero injuries, illnesses, and environmental incidents). DOE line management used the latest contract negotiation process (signed in December 2000) to introduce a new set of performance initiatives designed to ensure that LANL improves safety performance in key areas, such as nuclear facility operations, authorization basis, and project management. For example, the contract mandates a rigorous assessment of LANL operations; the assessment was performed by an external organization and resulted in significant findings that are producing numerous corrective actions and improvements in ISM at LANL. AL and OLASO have continued to use contract modifications as a vehicle to drive improvements at LANL. The need for increased

formality of operations was recognized and is being addressed by including the DOE conduct of operations order in the contract in March 2001. The NNSA reengineering initiative, and the transfer of the contract administration and evaluation function to OLASO, is another important step in the ongoing effort to empower the NNSA field elements to perform effective line management and line oversight of their contractors.

LANL senior management has provided sustained leadership that has resulted in implementation of ISM at LANL. Although deficiencies remain and much work remains to be accomplished (e.g., improved formality of operations), LANL has successfully completed the ISM verification process. The transition to ISM from the historical “expert based” approach to safety, which relied heavily on the experience and initiative of individuals to recognize and control hazards, has been challenging and has required sustained commitment by the senior management team to achieve acceptance at the lower tiers of management. Currently, support for ISM has filtered down to lower tiers of management—division managers, facility managers and group leaders—and ISM is widely accepted by the LANL and Johnson Controls Northern New Mexico workforce, including maintenance personnel, facility operators, laboratory personnel, scientists, and engineers. Interviews with LANL management and workers indicated that ISM goals and objectives for integrating safety in all aspects of work are well understood and accepted. ISM implementation has resulted in dramatic improvements in the approach to safety management at all levels of the LANL organization. In the past five years, LANL has established an effective requirements management system, formal systems for integrating ES&H needs into project planning and resource allocation, mechanisms for holding organizations and individuals accountable for ES&H performance, and integrated work planning processes that effectively identify hazards and establish controls before work is authorized. In addition, ES&H performance, as indicated by the performance metrics, has been steadily

improving as the benefits of ISM and the focus on performance measure are realized. A key to success has been sustained management commitment to a top-down approach in which they first focused on establishing the top-tier policies and then on the institutional programs and requirements, division-level implementing procedures, facility-level procedures, and finally work instructions. Continued management attention and commitment will be needed to ensure that the remaining efforts to establish work instructions for all potentially hazardous operations (e.g., operating procedures for safety-related equipment) are effective and timely.

Several aspects of LANL's ISM program are particularly effective or innovative in the area of worker protection. In general, the performance measure trends indicate improvements in ES&H in recent years, and LANL injury and illness rates are low compared to similar industries and other DOE laboratories. LANL and Johnson Controls personnel were, for the most part, very qualified and motivated, and they demonstrated good understanding of the hazards and facility operations. Various processes for involving and empowering the workforce are established and effective. Workers are empowered to stop work if an unsafe condition is identified, and they are not hesitant to invoke their stop-work authority. LANL has initiated a number of innovative concepts for empowering workers and promoting safe work behaviors, such as the nested safety committees and a program that entails workers observing other workers during the performance of work to identify potential "at risk" behaviors and promote awareness of safety. The LANL program for disseminating lessons learned includes innovative techniques, such as linking lessons learned to procedures and permits. Various efforts to reduce and control hazards are ongoing, such as the CMR efforts to control and reduce chemical inventories and the extensive RLWTF effort to address legacy problems by updating and certifying electrical drawings. Engineering controls are used extensively and are effectively implemented to reduce risks to workers. RLWTF has developed a strategy for operations procedure development that integrates controls resulting from the hazard control plan (HCP) directly into the procedures. The controls are placed in cautions, warnings, or action steps directly associated with the activity steps where the hazards are encountered. This application of the requirements for safe work practices to operational activities and the approach to operational hazard control are noteworthy in that safety is fully

integrated into the instructions used by the operators to perform work.



Sediment Traps in Mortandad Canyon

Radiological environmental monitoring and surveillance activities at LANL have been effectively implemented, and some aspects are noteworthy. The air, water, and ecology groups within LANL's Environment, Safety and Health division (ESH) conduct routine annual environmental surveillance of all potentially affected environmental media. The air program monitors stack effluents and ambient air using a network of stationary air samplers situated around the site. Routine sampling of surface water and sediment in representative areas that may be impacted by current operations or legacy sources and surveillance of remaining media that may be impacted, such as soil, foodstuffs, and biota, are being performed consistent with applicable requirements. Results of monitoring and surveillance are compiled by the respective groups and published annually in the environmental surveillance reports. The radiological sections of these reports, including public dose assessments, were well organized, thorough, and comprehensive. Certain aspects of the radiological environmental monitoring and surveillance program are noteworthy. Specifically, the bases for the design and implementation of the air monitoring systems (i.e., data quality objectives, analytical methods, sensitivities, and quality assurance) are of high quality. Also, the ability of the radiological environmental monitoring systems to distinguish site-derived radionuclides from natural background and determine the impacts from all media is superior to those seen at most other DOE sites, particularly for the ambient air monitoring network. These systems provide assurance that even small

releases of radionuclides would be detected, thereby enhancing protection of the public and the environment.

LANL has established a comprehensive program for the identification and analysis of beryllium contamination. The beryllium program addresses both current and legacy uses and is being rigorously implemented at CMR. The extensive characterization of the beryllium hazard at CMR included development of a beryllium sampling strategy, collection of more than 300 surface and air samples, extensive interviews with current and former LANL workers who may have been exposed to beryllium, and a risk-based plan for future sampling and decontamination of beryllium-contaminated areas.

The LANL occupational medical program has achieved reaccreditation. The LANL occupational medical program successfully completed a second three-year term of accreditation from the Accreditation Association for Ambulatory Health Care (AAAHC). The AAAHC accreditation process is a voluntary activity that benchmarks the clinical application of occupational health services with nationally recognized standards maintained by the AAAHC organization. The LANL occupational medical program was found to comply with all AAAHC standards reviewed in the February 2002 AAAHC survey. In addition, the LANL occupational medical group has maintained and expanded several institutional initiatives, such as the tri-laboratory peer review process, the medical/industrial hygiene interface agreement, and most recently participation in the medical section of the Energy Facilities Contractor Group. Occupational medical program requirements are clearly identified in institutional requirements. In addition, the medical director is planning to initiate a specific occupational medical program Laboratory Implementing Requirement (LIR) that will further clarify line management responsibilities to inform the appropriate LANL occupational medical group of health hazards and provide a more efficient vehicle for managers and employees to participate in occupational medical surveillance programs.

Emergency Management Positive Attributes

CMR has implemented an outstanding emergency preparedness program. The CMR building emergency plan establishes an excellent foundation for the facility's emergency preparedness and response program. The plan is supplemented by well-developed implementing

procedures and response instructions that specifically address responder roles and responsibilities and prioritized response actions. To implement these plans and procedures, CMR has established a rigorous training and drill program for its facility incident commanders, operations center supervisors, and emergency response team. CMR also maintains and conducts periodic inventories of a wide array of strategically positioned emergency response equipment both inside and outside the facility and has installed visual and audible warning systems to quickly alert employees to abnormal conditions or events. Facility incident commanders are knowledgeable of their duties and responsibilities, facility response mechanisms, and the important elements for interfacing with responders from outside the facility. Finally, CMR is proactively working to correct self-identified program weaknesses, such as those associated with the capability to shelter in place.

EM&R has established conservative chemical screening thresholds based on the potential for health and safety impacts rather than on the significantly larger threshold quantities outlined in DOE Order 151.1A, *Comprehensive Emergency Management System*. The Emergency Management and Response (EM&R) group derived chemical-specific screening thresholds based on the quantity of material that, if released, could exceed protective action criteria beyond the immediate event area. The thresholds were calculated using conservative assumptions and are significantly lower than the thresholds mandated by DOE Order 151.1A. The use of the lower screening thresholds recognizes that small quantities of some materials may produce significant consequences outside a facility and provides assurance that all such hazards are reviewed to determine whether further assessment or additional emergency planning is necessary.

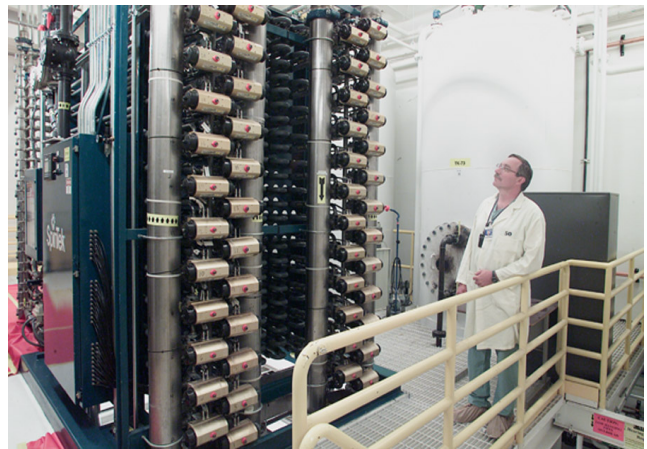
EM&R maintains strong and productive interfaces with offsite responders and local emergency planning committees. EM&R staff are active participants on the Los Alamos County local emergency planning committee and the Interagency Wildfire Management Team, among others. EM&R has been proactive in working with the local emergency planning committee to develop and disseminate emergency public education information and materials. The LANL hazardous devices and crisis negotiations teams are composed of laboratory personnel and local, offsite personnel, thus facilitating effective interagency coordination in responding to emergencies.

AL's site-level assistance and assessment activities have significantly increased and improved over the past year. Over the past year, AL emergency management and public affairs staff have significantly increased both the frequency and quality of their interactions with OLASO and LANL emergency management and response personnel. Operational awareness activities have included monthly visits to discuss program status, staff assistance visits that have included limited scope performance tests, and exercise planning and evaluation assistance. In addition, the August 2001 LANL portion of the AL baseline emergency response capabilities study, while not yet formally transmitted to the site, is a major improvement over previous AL evaluation reports and identified many of the same weaknesses that are conveyed in this report.

2.2 Program Weaknesses

ES&H Program Weaknesses

LANL facilities do not have adequate procedures for some equipment and operations, and LANL management has not yet emphasized use of and adherence to procedures as an important element of ISM. CMR currently does not have adequate procedures for operation of some safety systems and safety-related equipment and thus cannot adequately assure that systems and equipment are always configured correctly and operated in accordance with ISM and conduct of operations requirements. RLWTF management has not yet established and sufficiently enforced clear expectations for the use of procedures for facility operations. Some operating procedures have not yet been developed; many existing operating procedures are of poor quality or are not current; and operating procedures are often not used or followed in the RLWTF. CMR and RLWTF are both in the process of developing operating procedures; however, progress has been slow at RLWTF, and CMR is in the early stages. At the institutional level, LANL is in the planning stage of implementing the DOE conduct of operations order at its facilities. Full and effective implementation of this order is an appropriate method for addressing LANL-wide weaknesses related to adequacy of procedures and adherence to procedures. However, sustained management attention is needed to implement the formality of operations required by the conduct of operations order.



Radioactive Liquid Waste Treatment Facility Operations

The implementation of hazard identification, analysis, and control processes for programmatic work is deficient in several areas. Programmatic work (e.g., research or facility operations) at LANL is performed under the “safe work practices” process, which has many effective aspects. However, some hazards and associated controls were not identified or analyzed in the implementation of safe work practices, because sufficient tools and guidance have not been provided to line management. For example, the risk ranking of hazards has not ensured that safety and health subject matter experts are appropriately involved in the planning of programmatic work. Safety and health requirements in LIRs have not been adequately incorporated into HCPs and work instructions. Although the LANL ES&H hazard identification process has the potential to assist line managers in identifying safety requirements and hazard controls, the process has not been effectively used for programmatic work. In addition, hazard controls were not always sufficient to address the hazard because of weaknesses in HCPs, work instructions, specification of personal protective equipment, guidance for posting hazards and controls on laboratory doors, radiation work permits, and some radiation contamination workplace indicators. While work observed by the OA team at LANL was performed safely, timely attention is needed to address a number of process and implementation deficiencies in the performance of programmatic work.

Important elements of an effective configuration management program are missing or inadequate at CMR and RLWTF. The CMR configuration management program has improved but still is missing some of the fundamental program elements needed to ensure that safety systems and safety-related equipment are properly configured and

will function as intended in routine and emergency conditions. Deficiencies were identified in important elements of the CMR configuration management systems and practices, including the design change process, equipment identification and tagging, review and comment resolution processes, and root cause and corrective action programs. When viewed collectively, the deficiencies above indicate a weakness in the overall configuration management program at CMR. At RLWTF, the work control process does not provide sufficient detailed requirements to ensure that appropriate documents, drawings, and procedures are updated for facility modification performed under a maintenance work package. In addition, responsibility for configuration control is not clearly defined. Both facilities have ongoing initiatives to improve configuration management.

There are deficiencies in a few aspects of the authorization basis and technical bases for a safety class fire protection system at CMR. Most aspects of CMR authorization basis documents are adequate, accurate, and complete. However, the accident analysis in the basis for interim operation does not address the threat of wildland fire or its potential effect on the TA-3 water supply. The standpipes do not have sufficient flow capacity to meet the expectations of the Los Alamos Fire Department. In addition, the risks associated with water hammer events, which are the probable cause of a safety class component failure in 1997, have not been adequately analyzed and addressed.

A few important gaps exist in an otherwise effective environmental protection system. Most aspects of LANL's environmental protection system are effective, and some aspects are significant strengths. However, there are three aspects that do not fully meet DOE expectations. First, vulnerabilities associated with potential contaminant release pathways from operational facilities to the environment have not been fully analyzed. LANL recognizes that several tanks and piping systems located at CMR and RLWTF are vulnerable to potential leaks because of aging and design weaknesses. For example, CMR has four long-unused storage tanks containing 12,000 to 15,000 gallons of water contaminated by radiation. LANL has not performed comprehensive vulnerability assessments for facilities and tank systems that would identify potential contaminant release pathways and does not have the capability to detect leaks in a timely manner as required by DOE. Second, environmental as-low-as-reasonably-achievable (ALARA) requirements of a DOE order have not been formally incorporated into

site environmental processes at LANL that generate and discharge radioactive liquids to the environment. At RLWTF, LANL is releasing radioactive liquids at or below derived concentration guideline screening levels without sufficient analysis of ALARA requirements as specified in the DOE order. Third, LANL soil posting criteria and implementation guidance for environmental contamination have not been sufficient to ensure that existing soil contamination areas around the site are appropriately identified and controlled in accordance with LANL site radiation protection requirements and expectations. LANL management is in the process of addressing many of these concerns and is strengthening its institutional environmental protection functions through development of an environmental protection program plan and a reorganization that consolidates various environmental protection functions within the laboratory.

OLASO and LANL feedback and improvement programs are not fully effective in ensuring that ISM process and performance deficiencies are identified, resolved, and corrected in a timely manner. Although the framework for an effective program is in place, several weaknesses are limiting the effectiveness of the OLASO oversight of LANL ISM performance. Specifically, many planned OLASO assessments are not conducted, deficiencies in LANL ISM processes and performance identified by OLASO line oversight programs are not consistently documented and transmitted to LANL for resolution, and OLASO issue management processes do not ensure that identified deficiencies are tracked to resolution and analyzed to identify systemic problems and/or trends. LANL has numerous feedback mechanisms and performs many assessment activities, but their overall effectiveness is limited by several process and implementation weaknesses. For example, many LANL assessments are not rigorous enough to identify ISM process and performance weaknesses. In addition, the LANL issues management system is not being managed in a structured, consistent, risk-based, and effective manner that supports continuous improvement.

Emergency Management Program Weaknesses

EM&R has not effectively implemented the necessary program elements to ensure timely and accurate emergency response decisions and actions, most notably in the areas of protective



Emergency Operations Center at LANL

actions, emergency notifications, and emergency classification. Due to the collective impact of significant weaknesses in emergency response plans, implementing procedures, decision-making aids, timeliness expectations, notification systems, and responder training and drills, the LANL emergency management program does not ensure that the promptness and accuracy of decision-making will be commensurate with the severity of an emergency and its potential consequences. While LANL has successfully managed responses to recent wildfires and facility-level chemical incidents, the existing EM&R program has not established and tested the necessary infrastructure and definitive response expectations to ensure that time-urgent decisions are formulated and implemented in the event of an airborne hazardous material release outside a facility. As a result, EM&R emergency managers and other responders were unable to respond appropriately and effectively to simulated emergency conditions during both this evaluation and a recent no-notice exercise conducted by the DOE Headquarters Office of Emergency Operations.

LANL and EM&R feedback and improvement processes have not ensured that program assessment activities have been conducted as required and that some previously identified weaknesses have been effectively addressed and corrected to prevent recurrence. Internal

assessments of the laboratory's emergency management program have not been conducted as required by DOE Order 151.1A and the LANL emergency management plan. Although some program development activities and corrective actions have addressed weaknesses identified in the 1998 OA evaluation of the LANL emergency management program, several significant weaknesses have not yet been fully corrected or warrant further action to achieve satisfactory results. Weaknesses remain in the areas of emergency response organization procedures and training to support prompt and accurate emergency decision-making; back shift duty arrangements for ensuring adequate after-hours response capability; and management of emergency response organization training, drill, and exercise requirements and participation related to responder proficiency. In addition, as in 1998, the laboratory's public information program still contains numerous inconsistencies in the approval process for releasing such information in an emergency.

OLASO has not formally assigned responsibilities and dedicated resources to monitor the effectiveness of the LANL emergency management program and to fulfill site office emergency planning and response requirements. OLASO expectations for conducting operational awareness of the LANL program and implementing site office emergency management requirements are generally well defined. However, OLASO has not formally assigned responsibility for these activities to one or more staff members to ensure that they are implemented effectively and as required by internal procedures. As a result, day-to-day monitoring of the contractor program has been limited; OLASO duty officers are unaware and unable to fulfill their assigned emergency response functions; OLASO interfaces with offsite response authorities is minimal; and, as identified during the 1998 OA evaluation, memoranda of understanding for emergency support services from offsite response authorities have not been maintained current.

LANL ES&H Program. OLASO and LANL have worked cooperatively to establish a comprehensive ISM program. NNSA, AL, and OLASO have provided clear direction and set ES&H performance expectations for LANL. Over the past two years, AL and OLASO have been effective in using the DOE/University of California contract to set expectations and drive improvements. OLASO and LANL have also worked cooperatively to establish a work smart standards set that appropriately addresses the hazards and conditions at LANL. NNSA, AL, and OLASO have provided programmatic direction, performance expectations, and resource allocations that reflect an appropriate balance between ES&H needs and mission needs. Appropriate ISM institutional policies and requirements have been established and communicated. Workers and stakeholders have multiple avenues to express ES&H concerns. OLASO and LANL roles and responsibilities are adequately defined at all levels of the organization. OLASO and LANL personnel exhibited a good understanding of facility hazards.

With the support of NNSA and AL, OLASO has been working the past several years to address staffing and qualification shortages and attrition. OLASO's need for additional technically qualified personnel has increased significantly in the past few years as OLASO has assumed additional line management responsibilities, such as approval of the authorization basis and starting projects. OLASO has made significant progress to obtain sufficient staff to perform its expanded role. Over the last three years, authorized technical staffing has been substantially increased (from 43 to 67) and onboard technical staff has more than doubled (from 24 to 57). During this time, the number of Facility Representatives has also increased from 6 to 18. The Facility Representative training and qualification program is effective, and the individual Facility Representatives have made good progress in completing qualification requirements. Senior NNSA and AL management commitment and support were instrumental to this progress. For example, in an effort to reduce turnover, OLASO

was authorized to award a retention and relocation bonuses and promote Facility Representatives to the GS-14 level once fully qualified. While OLASO has significantly increased its technical staffing, continued management attention is needed to fill 10 remaining technical staff vacancies and to ensure that OLASO has the proper skill mix to perform the expanded role envisioned by the NNSA reengineering effort. In addition, OLASO needs to ensure that its technical personnel achieve the appropriate level of technical qualifications in a timely manner. NNSA involvement and support may be necessary to address obstacles, such as the current hiring freeze, that could hinder OLASO's ability to obtain the necessary number of qualified technical specialists to perform its line oversight mission.

Some aspects of OLASO and LANL implementation of ISM are notable. LANL has established innovative methods to disseminate lessons learned, including linking them to procedures. LANL is also developing operating procedures that include the hazard controls within the operating steps. The technical basis for radiological monitoring and surveillance is noteworthy. Several efforts to control and reduce hazards, such as beryllium, have been effectively implemented. The LANL occupational medicine program has achieved accreditation.

Many aspects of the ISM program are effectively implemented at LANL. Most aspects of environmental protection programs are effective and have been successfully integrated into ISM. The LANL work control processes—which are the key processes for identifying hazards and establishing controls—are well defined and were effectively implemented. Although these processes had some weaknesses that warrant attention, they have significant strengths and are a major improvement over historical LANL practices. Work is generally well defined, pre-job briefings and job walkdowns are thorough and effective, and briefings and walkdowns appropriately involve line management, subject matter experts, and workers. Workers are involved in the work planning process and have been

empowered to identify and stop unsafe work. Work observed by the OA team was performed with a high regard for safety and environmental protection.

The most important safety systems and components at CMR were adequately maintained and were operated within the technical specifications. Most aspects of the CMR authorization basis documents are adequate, accurate, and complete. However, there are deficiencies in a few aspects of the authorization basis and technical bases for a safety class fire protection system at CMR. In addition, important elements of an effective configuration management program are missing or inadequate at CMR.

Further, although CMR and RLWTF have many well-documented safety processes and procedures that govern work and provide assurance that hazards are controlled, both CMR and RLWTF lack sufficient procedures for certain operational activities, such as operation of safety equipment. Lack of adequate procedures for many specific work activities is a LANL-wide problem. LANL management recognizes that procedures and procedural compliance requires attention and has a number of appropriate ongoing initiatives, such as implementation of the conduct of operations program and various ongoing procedure development efforts. However, at the facility level, LANL management has not yet emphasized use of and adherence to procedures as an important element of ISM, and procedure development has not been a high priority or timely in some instances. Full and effective implementation of conduct of operations requirements will be a major undertaking that will require sustained management attention, particularly at the facility manager and group leader level.

Although the ISM framework is in place and improving, several process and implementation deficiencies were identified by the OA reviews. Programmatic work performed under safe work practices has many effective aspects, but some hazards were not identified or analyzed in the implementation of safe work practices because sufficient tools and guidance have not been provided to line management. As a result, some hazard controls were not identified in HCPs or work instructions, or adequately implemented (e.g., hazard postings on laboratory doors). Further, some aspects of environmental protection do not meet all DOE expectations for analysis of leak pathways, environmental ALARA, waste minimization, and soil posting.

The continuous feedback and improvement programs at OLASO and LANL have improved significantly and include numerous assessment



TA-50 Outfall

activities, some of which have been of high quality. However, there are weaknesses in both OLASO and LANL feedback and improvement, including lack of rigor in self-assessments and a lack of rigor and comprehensiveness in issues management systems. Nevertheless, OLASO and LANL feedback and improvement systems have self-identified numerous areas for improvement and have resulted in significant improvements at LANL.

LANL Emergency Management Program.

The LANL Emergency Management and Response group has established a sound emergency management program basis through its hazards assessment process and through the depth and breadth of experience and expertise of its staff. LANL has successfully managed the response to several facility-level events involving hazardous materials and the devastating Cerro Grande fire of May 2000, which burned over much of the LANL's property and caused evacuations of LANL and the surrounding population. While these successes must not be diminished or overlooked, OLASO and LANL have not implemented an emergency preparedness and response program that is fully capable of responding to a significant release of hazardous material, a condition that warrants a more immediate response in order to protect workers and the public.

The hazards assessment provides a good technical foundation for the LANL emergency management program and the emergency action levels and predetermined protective actions derived from those assessments. Notably, EM&R has established very conservative chemical screening thresholds that are based on potential health and safety impacts rather than on the much larger thresholds identified in DOE Order 151.1A. Annual updates of the hazards assessment are rigorously performed and have resulted in a

continuously improving planning basis, but the process for conducting hazards surveys and assessments has not been adequately defined and documented to ensure that it is consistently and effectively implemented.

The LANL program continues to be supported by adequate and well-maintained emergency response facilities and equipment and strong interfaces with offsite response authorities and organizations, both of which have been significantly strengthened in the wake of the Cerro Grande fire. LANL personnel from several organizations routinely interface with offsite responders and play an active and beneficial role in local emergency planning committees. LANL maintains the necessary apparatus, equipment, and emergency operations centers to respond effectively to virtually any type of emergency, not only on the laboratory site but throughout the local communities as well. Recent and ongoing upgrades to these facilities and equipment are being made using funds provided to the laboratory following the Cerro Grande fire. The building emergency planning program is well defined and has been implemented at the local level commensurate with facility hazards. CMR is well prepared for facility-level emergencies because of the experience and qualifications of its emergency response staff, availability of response equipment, and well-conceived response procedures and checklists. The RLWTF has established an emergency action plan, but much of the response equipment and supplies identified in the plan was found to be missing or significantly out of date.

The LANL hazard identification and building run sheet process also appropriately mandates line management responsibility for and routine involvement in identifying hazards to EM&R. However, several important weaknesses in implementing this process were identified such that the process does not ensure that the most accurate information is considered when classifying an emergency. Weaknesses include significant discrepancies in hazardous material quantities among the sitewide chemical database, building run sheets, and the amount of material typically used or stored in a facility; inadequate evidence to determine whether some hazardous materials were evaluated against the EM&R screening thresholds and that materials exceeding the thresholds had been further evaluated; and the absence of a mechanism to modify the hazards assessment or emergency action levels following a significant reduction in hazards. While this last condition does not have the same impact as an unidentified increase in hazards, the issuance or recommendation of unwarranted protective actions still

presents an unnecessary risk to those who take such actions.

The EM&R emergency management and response program is largely expert-based. Response capabilities have not been sufficiently tested and are not adequately supported by procedures, job aids, and expectations to ensure timely and accurate decision-making for a hazardous material emergency. The training and drill program for emergency response organization members does not include any performance-based elements to determine whether responders can readily implement procedures and decision-making aids or that responders are proficient in applying those tools under varying emergency conditions. Success of the LANL response system is highly dependent on numerous individuals being available in the emergency operations center at the time of an emergency to assist in decision-making and to perform such critical response functions as emergency notifications, protective action formulation and communication, and emergency response organization activation. However, EM&R has not established formal provisions to ensure that individuals with the necessary expertise, and in sufficient numbers, are available at all times to assist in completing these tasks. Furthermore, the ability to perform these critical functions promptly would be further complicated if an emergency occurred after normal working hours, when the emergency operations center is not staffed. As a result, during performance tests, initial decision-makers were generally unable to use their response tools to readily determine the correct emergency classification and appropriate protective actions for postulated emergency conditions.

The LANL emergency management program has recently received significantly increased oversight and assistance from AL and the DOE Office of Emergency Operations. In August 2001, AL conducted a baseline needs capability study of the LANL program as mandated by the AL Manager. The depth and quality of that study is a marked improvement over previous AL evaluation activities and identifies many of the weaknesses reflected in this OA report. The increased assistance from AL is particularly important since OLASO has not dedicated sufficient resources to maintain operational awareness of the LANL program and to ensure that DOE personnel are proficient in their assigned emergency response duties.

LANL internal assessment activities have not been effective in identifying emergency management program or performance weaknesses, most notably with regard to the procedures and training necessary to execute time-urgent response functions. The

periodic assessments performed by the LANL Audits and Assessment Group do not evaluate decision-making skills and have not identified many of the weaknesses contained in this report. Semiannual safety function manager assessments conducted by EM&R have not identified any program or performance weaknesses in the past two years. Furthermore, the laboratory's internal assessment program has not ensured that programmatic weaknesses identified by OA in 1998 were adequately addressed and corrected. Some aspects of almost all of the LANL weaknesses identified in 1998 were evident during this current inspection.



Los Alamos Townsite with TA-3 in Background

The LANL emergency management program continues to be strong in the areas of emergency facilities and equipment and offsite response interfaces, and the program is now supported by a thorough and technically sound hazards assessment and set of facility-specific emergency action levels. Recent responses to locally confined chemical events have been generally well managed, and the massive response effort demanded by the Cerro Grande fire was managed effectively without any serious personnel injuries. However, repeated responses to these types of events have cultivated a belief among LANL managers that an expert-based system is sufficient to handle all laboratory emergencies and a diminished recognition

of the need for prompt decision-making in the case of an airborne hazardous material release. Most importantly, the need for timeliness and accuracy is not reflected in response plans and procedures or addressed through training and drills. Both OLASO and LANL management attention, and continued program monitoring by AL, are necessary to ensure that the laboratory's emergency management system is fully capable of responding to all types of potential emergencies.

Overall Conclusions. Overall, OLASO and LANL have made significant improvements in ISM and some progress in emergency management. NNSA, OLASO, and LANL have provided leadership and devoted resources to ES&H programs and ISM. However, some important ISM elements, such as adequacy of procedures, procedure compliance, configuration management, and isolated aspects of hazard identification and control, are not yet sufficiently effective and mature. Many aspects of LANL emergency management programs are effective, and some are notable. However, the LANL emergency planning, preparedness, and response programs do not reflect the necessary structure to support timely and accurate identification and implementation of emergency response actions. The most significant weaknesses involve the plans, procedures, systems, and tools that are intended to facilitate implementation of time-urgent response functions, and the emergency response organization training and drill program. Because of these weaknesses, emergency responder decision-making is not sufficiently timely or accurate to be effective in protecting workers and the public from exposure in the event of a significant hazardous material release. Weaknesses in supporting ISM systems, such as OLASO assessments, LANL assessments, and issues management, contribute to the observed implementation deficiencies and recurring weaknesses.

OLASO and LANL have a good understanding of most of the ISM and emergency management weaknesses and have ongoing actions to address some of them. Continued attention is needed to ensure that ongoing and planned ISM initiatives are effectively completed in a timely manner. Increased attention is needed in the emergency management area to ensure that LANL can respond effectively in time-sensitive emergencies.

The ratings reflect the current status of the reviewed elements of the LANL ISM and emergency management programs:

Safety Management System Ratings

Guiding Principle #1 – Line Management Responsibility for Safety	EFFECTIVE PERFORMANCE
Guiding Principle #2 – Clear Roles and Responsibilities	EFFECTIVE PERFORMANCE
Guiding Principle #3 – Competence Commensurate with Responsibility	EFFECTIVE PERFORMANCE
Guiding Principle #4 – Balanced Priorities	EFFECTIVE PERFORMANCE
Guiding Principle #5 – Identification of Standards and Requirements	EFFECTIVE PERFORMANCE

Feedback and Improvement

Core Function #5 – Feedback and Continuous Improvement	NEEDS IMPROVEMENT
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LANL Programmatic Work Activities and Facility Operations and Maintenance Work Activities

Core Function #1 – Define the Scope of Work	EFFECTIVE PERFORMANCE
Core Function #2 – Analyze the Hazards	NEEDS IMPROVEMENT
Core Function #3 – Establish Controls	NEEDS IMPROVEMENT
Core Function #4 – Perform Work Within Controls	EFFECTIVE PERFORMANCE

Environmental Protection

Environmental Protection (Core Functions #1-4)	EFFECTIVE PERFORMANCE
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Essential Systems Functionality

Engineering and Configuration Management	NEEDS IMPROVEMENT
Maintenance	EFFECTIVE PERFORMANCE
Surveillance and Testing	EFFECTIVE PERFORMANCE
Operations	NEEDS IMPROVEMENT

Emergency Management Systems

Hazards Survey and Hazards Assessments	EFFECTIVE PERFORMANCE
Program Plans and Procedures	NEEDS IMPROVEMENT
Offsite Response Interfaces	EFFECTIVE PERFORMANCE
Emergency Facilities and Equipment	EFFECTIVE PERFORMANCE
Training, Drills, and Exercises	NEEDS IMPROVEMENT
Emergency Public Information	NEEDS IMPROVEMENT
Response Decision-Making	NEEDS IMPROVEMENT
Consequence Assessment	EFFECTIVE PERFORMANCE
DOE Performance Monitoring	NEEDS IMPROVEMENT
Contractor Assessments and Issues Management	NEEDS IMPROVEMENT

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APPENDIX A

SUPPLEMENTAL INFORMATION

A.1 Dates of Review

	Beginning	Ending
Planning Meeting (Germantown)	March 11, 2002	March 15, 2002
Onsite Evaluation	March 18, 2002	March 28, 2002
Report Validation and Closeout	April 9, 2002	April 11, 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 (Team Leader)
Charles Lewis, Director, Office of Emergency Management Evaluations

A.2.2 Quality Review Board

Michael Kilpatrick	Patricia Worthington
Charles Lewis	Dean Hickman
Robert Nelson	

A.2.3 Review Team

Patricia Worthington, Team Leader

Safety Management Systems/Feedback and Improvement

Ali Ghovanlou, Topic Leader
Tim Martin
Bernie Kokenge
Al Gibson
Robert Compton

Emergency Management

Kathy McCarty, Topic Leader
Steve Simonson
Jim O'Brien
Al Cerrone
Dave Schultz
Tom Rogers

Technical Team

Bob Freeman, Topic Leader
Edward Stafford
Jack Riley
Mike Gilroy
Jim Lockridge
Marvin Mielke
Joe Lischinsky
Bill Miller
Don Prevatte
Joe Panchison

Environmental Protection Team

Bill Eckroade, Topic Leader
Vic Crawford
Mario Vigliani
Tom Naymik

A.2.4 Administrative Support

MaryAnne Sirk
Tom Davis

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APPENDIX B

SITE-SPECIFIC FINDINGS

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

<p>Because of staff shortages and personnel who have not completed their technical qualification standards, the Office of Los Alamos Site Operations (OLASO) does not have sufficient technically qualified personnel to appropriately perform all assigned safety management responsibilities.</p>
<p>The Albuquerque Operations Office (AL) and OLASO have not established and implemented a fully effective and efficient oversight and self-assessment program that ensures that Los Alamos National Laboratory (LANL) and OLASO are implementing integrated safety management (ISM) as specified in DOE Policy 450.5, <i>Line Environment, Safety and Health Oversight</i>.</p>
<p>LANL feedback and improvement mechanisms, particularly assessments and issues management, have not been fully developed and rigorously implemented to identify and effectively resolve ISM program and performance deficiencies and drive continuous improvement as specified in DOE Policy 450.4, <i>Safety Management System Policy</i>, and DOE Policy 450.5, <i>Line Environment, Safety and Health Oversight</i>.</p>
<p>Baseline hazard surveys are not being maintained, and exposure assessments for chemical and physical hazards are not being performed as required by DOE Order 440.1A, <i>Worker Protection Management for DOE Federal and Contractor Employees</i>, to ensure that potential worker health risks are identified and evaluated.</p>
<p>The safe work practices process does not provide sufficient guidance to programmatic line managers to ensure that hazard identification tools are appropriately and consistently used. Examples of such tools include risk ranking of programmatic work activities, incorporation of safety and health Laboratory Implementing Requirements (LIRs) into hazard control plans (HCPs) and work instructions, involvement of safety and health subject matter experts, and use of the LANL environment, safety, and health hazard identification process.</p>
<p>The Chemistry and Metallurgy Research (CMR) facility does not have adequate procedures for operation of many safety systems and safety-related equipment and thus cannot adequately assure that systems and equipment are always configured correctly and operated in accordance with ISM and conduct of operations requirements. Furthermore, Radioactive Liquid Waste Treatment Facility (RLWTF) management has not yet established and sufficiently enforced clear expectations for the development and use of procedures for facility operations. Many procedures have not yet been developed, most existing procedures are of poor quality or are not current, and procedures are often not used or followed in the RLWTF.</p>
<p>The work control process at RLWTF does not ensure that appropriate documents, drawings, and procedures are updated for facility modifications performed under a maintenance work package.</p>
<p>For programmatic work, hazard controls are not sufficiently defined or adequately implemented in several areas: controls in HCPs and work instructions lack the level of detail to ensure effective implementation and are often inconsistent with similar controls specified in LIRs; personal protective equipment is not clearly specified for some hazards; aggregate hazards in laboratories are not communicated to workers (e.g., door postings); some radiation work permits are not adequately tailored for the work activity; and some radiation contamination workplace indicators are not adequately considered.</p>

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

<p>The CMR accident analysis in the basis for interim operation does not address the threat of wildland fire or its potential effect on the Technical Area (TA)-3 water supply.</p>
<p>LANL has not identified as a concern or formally mitigated the effects of water hammer events in the TA-3 water system that repeatedly challenge and reduce the reliability of the CMR safety-class fire suppression system.</p>
<p>LANL has not adequately and promptly addressed significant previously recognized discrepancies with fire protection, including those documented in the emergency management and fire protection assessment (August 2001) and in the 1998 CMR fire hazards analysis report.</p>
<p>The standpipes at CMR, as installed, are undersized and will not pass the National Fire Protection Association code flow requirements and Los Alamos Fire Department expectations; the Los Alamos Fire Department was unaware of the standpipe limitation.</p>
<p>Current configuration management systems and practices do not contain some essential elements, including a fully effective design change process, completion of equipment identification and tagging on several important systems, a formal review and comment process, and a fully mature root cause and corrective action program.</p>
<p>Vulnerabilities associated with potential contaminant release pathways from operational facilities to the environment have not been fully analyzed.</p>
<p>Environmental as-low-as-reasonably-achievable requirements of DOE Order 5400.5, <i>Radiation Protection of the Public and the Environment</i>, have not been formally incorporated into site environmental processes at RLWTF and CMR that generate and discharge radioactivity to the environment.</p>
<p>LANL soil posting criteria and implementation guidance for environmental contamination have not been sufficiently developed or implemented to ensure that existing soil contamination areas around the site are appropriately identified and controlled in accordance with LANL site radiation protection requirements and expectations.</p>

Table B-2. Site-Specific Emergency Management Findings Requiring Corrective Action Plans

<p>LANL has not ensured that the emergency preparedness hazards assessment is reviewed and updated prior to significant changes in hazardous material inventories or operations involving hazardous materials as required by DOE Order 151.1A, <i>Comprehensive Emergency Management System</i>, Chapter IV, Section 3.a(2).</p>
<p>The Emergency Management and Response (EM&R) group plans, procedures, notification systems, decision-making aids, and response expectations do not ensure that critical, time-urgent decisions and actions are implemented in a timely and accurate manner to minimize exposures to employees and the public in the event of a hazardous material release as required by DOE Order 151.1A, Chapter IV, Sections 3.b and 5, Chapter V, Chapter VIII, Sections 1 and 2, and Attachment 1, paragraph 9.</p>
<p>EM&R has not ensured that emergency response organization members are capable and proficient in fulfilling their assigned response functions and duties through a systematic training and drill program as required by DOE Order 151.1A, Chapter IV, Section 4, and the LANL emergency management Laboratory Performance Requirement.</p>
<p>OLASO and LANL have not implemented current, approved plans and procedures to ensure that timely and accurate emergency public information is provided to site workers and the public in a rapidly unfolding emergency as required by DOE Order 151.1A, Section 4.c(1)(b)3, Chapter I, Sections 8.f and 9.b, Chapter IX, Sections 2 and 4, and Attachment 1, paragraph 12.</p>
<p>OLASO is not adequately monitoring the effectiveness of the LANL emergency management program, ensuring appropriate and capable DOE involvement in emergency response, and maintaining agreements with offsite agencies and organizations to support response to a LANL emergency as required by DOE Order 151.1A, Sections 4.b(1)(b) and 4.c(1)(b), Chapter I, Section 8, and Chapter XI, Section 1.</p>
<p>Annual emergency management program assessments are not being conducted in accordance with DOE Order 151.1A (Chapter I, Section 9.g, Chapter X, Section 4.a, and Attachment 1, paragraph 5), the LANL emergency management plan, and the LANL emergency readiness assurance plan. Furthermore, actions taken in response to a 1998 Independent Oversight evaluation were not sufficient to address identified weaknesses or prevent recurrence.</p>

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