Independent Oversight
Inspection of
Emergency Management
at the

Livermore Site Office and Lawrence Livermore National Laboratory

February 2009

Office of Emergency Management Oversight
Office of Independent Oversight
Office of Health, Safety and Security
Office of the Secretary of Energy

HSS
Office of Health, Safety and Security

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Abbreviations Used in This Report

CATS	*Corrective Action Tracking System*
CQT	*Consequence Assessment Team*
DOE	*U.S. Department of Energy*
EAL	*Emergency Action Level*
EMDO	*Emergency Management Duty Officer*
EMG	*Emergency Management Guide*
EMT	*Emergency Management Team*
EOC	*Emergency Operations Center*
EPHA	*Emergency Planning Hazards Assessment*
EPI	*Emergency Public Information*
EPO	*Emergency Programs Organization*
EPZ	*Emergency Planning Zone*
ERAP	*Emergency Readiness Assurance Plan*
ERO	*Emergency Response Organization*
ES&H	*Environment, Safety, and Health*
FSEP	*Facility-Specific Emergency Plan*
IC	*Incident Commander*
ITS	*Issues Tracking System*
JIC	*Joint Information Center*
LEDO	*Laboratory Emergency Duty Officer*
LLNL	*Lawrence Livermore National Laboratory*
LLNS	*Lawrence Livermore National Security, LLC*
LSO	*Livermore Site Office*
LSPT	*Limited-Scope Performance Test*
LTRAIN	*Livermore Training Records and Information Network*
NA-43	*NNSA Office of Emergency Management Implementation*
NNSA	*National Nuclear Security Administration*
PAO	*Public Affairs Office*
PAR	*Protective Action Recommendation*
PA-DOC	*Public Affairs Department Operations Center*
SDO	*Security Duty Officer*
SEMS	*Standardized Emergency Management System*
TCN	*Temporary Change Notice*
TOC	*Tactical Operations Center*

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1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight inspected the emergency management program at DOE's Lawrence Livermore National Laboratory (LLNL) in October/November 2008. The inspection was performed by Independent Oversight's Office of Emergency Management Oversight. Independent Oversight reports to the Chief, Office of Health, Safety and Security, who reports directly to the Secretary of Energy.

Within DOE, the National Nuclear Security Administration (NNSA) has line management responsibility for LLNL. NNSA provides programmatic direction for and funding of most activities, including emergency management program implementation. As a multi-program laboratory, LLNL receives funding for non-NNSA work from the Office of Environmental Management and the Office of Science. Non-DOE sponsors include Federal agencies, state of California agencies, and industry. At the site, the Manager of the Livermore Site Office (LSO) is responsible for line management of LLNL operations and safety. LLNL is managed and operated by Lawrence Livermore National Security, LLC (LLNS), under contract to DOE.[1] The LLNS Emergency Management Department and its Emergency Programs Organization are the entities tasked with administering the LLNL emergency management program.

LLNL provides scientific and technical expertise in support of NNSA missions involving national security programs such as stewardship of the nuclear weapons stockpile and countering the threats posed by weapons of mass destruction. The Laboratory also pursues research and development in areas of fundamental national importance that include energy, the environment, and life sciences. To support these activities, LLNL operates numerous laboratories, test facilities, and support facilities at two major sites: the LLNL main site and Site 300. The LLNL main site, located in Livermore, California, encompasses approximately 800 acres. Site 300 occupies approximately 11 square miles and is about 15 miles east of the LLNL main site. Activities at LLNL involve a variety of radiological and chemical materials that pose potential hazards to site workers and the public.

The purpose of this Independent Oversight inspection was to assess the effectiveness of the emergency management program at LLNL as implemented by LLNS under the direction of LSO. Independent Oversight used a selective sampling approach to evaluate a representative sample of facilities and emergency responders at LLNL. Specifically, the sampling approach was used to evaluate:

- The effectiveness of the hazards surveys and emergency planning hazards assessments (EPHAs) in serving as an appropriate foundation for the LLNL emergency management program.

[1] The term "LLNL" will be used to refer to the overall site and its operations; the term LLNS refers specifically to site contractor management.

- The effectiveness of the LSO and LLNS emergency responders in applying their skills, procedures, and training to make appropriate decisions and to properly execute actions to protect emergency responders, workers, and the public.

To evaluate response performance, Independent Oversight conducted limited-scope performance tests for initial responders and decision-makers. The performance tests were designed to evaluate the ability of responders to effectively execute their assigned duties during postulated site-specific emergencies. Independent Oversight used trusted agents from the site to assist in developing and conducting the performance test scenarios and validating the results. This inspection also involved examination of selected elements of the emergency management program at LLNL, including plans and procedures; training, drills, and exercises; and emergency public information (EPI). These activities, as well as reviews of assessments and corrective actions, provided insights into the effectiveness of LSO and LLNS feedback and continuous improvement systems, and NNSA's emergency management oversight and operational awareness activities at LLNL.

Emergency management at LLNL was last evaluated in June 2005. Overall, the 2005 inspection found that LLNL had completed program development work or had established an appropriate framework for nearly all the key elements critical to establishing and maintaining an effective site emergency management program. However, the 2005 inspection identified that implementation of requirements and expectations was weak or still evolving in several important areas including hazardous material screening, emergency response organization training, and usage of drills and exercises and issues management systems for program improvement.

Section 2 of this report provides an overall discussion of the results of this 2008 review of the LLNL emergency management program elements that were evaluated. Section 3 provides Independent Oversight's conclusions regarding the overall effectiveness of LSO and LLNS management of the emergency management program. Section 4 presents the ratings assigned as a result of this inspection. Appendix A provides supplemental information, including team composition. Appendix B identifies the findings that require corrective action and follow-up. Appendices C through F detail the results of the reviews of individual emergency management program elements.

2 Results

2.1 Positive Program Attributes

LSO and LLNS have established an appropriate foundation for the LLNL emergency management program, and implementation of the essential program elements is ongoing. Positive attributes of the emergency management program are discussed below.

LSO and LLNS have established the programmatic framework necessary to support effective emergency response. LLNS has developed detailed emergency planning guidance for identifying and further evaluating onsite hazardous materials, and the hazard analyses provide a mostly accurate basis for the site's program. The Environment, Safety, and Health Manual and the LLNL Emergency Plan appropriately establish an institutional basis for a comprehensive emergency management program, and a well-integrated set of response procedures and checklists have been developed to implement the concept of emergency operations. The content and intended operation of the training, drill, and exercise and EPI programs are well defined through the emergency plan and other supporting program documents. Finally, LSO and LLNS have developed well-defined processes for conducting emergency management program assessments and managing relevant issues. These processes include requirements and guidance regarding the use of objective evaluation criteria, documentation of objective evidence used to determine whether criteria were met, root cause analysis, and tracking of corrective actions to completion.

LSO, with the support of the NNSA Office of Emergency Management Implementation (NA-43), continues to be actively engaged in providing line management oversight. Originally identified as a strength during the July 2002 Independent Oversight inspection, LSO has sustained its long-term involvement in the development of the LLNL emergency management program. LSO has delineated clear responsibilities for the review and approval of emergency management documents, the LSO emergency management program manager holds frequent meetings with the LLNS Emergency Programs Organization to provide routine feedback on program performance, and LSO is using contract performance incentives to improve the quality of the LLNL emergency management program. LSO conducts thorough emergency management self-assessments and mostly comprehensive, well-documented reviews of the LLNL emergency management program at the required periodicities. The annual self-assessments and contractor assessments have identified several weaknesses requiring corrective actions, and LSO evaluated all of the corrective action closures conducted by LLNS, although a few LSO closure evaluations were incomplete. Furthermore, NA-43 frequently interacts with LSO regarding current issues, provided assistance reviewing a proposed sitewide chemical EPHA and evaluating exercises, and assisted LSO with the effectiveness review for three of the seven findings from the 2005 Independent Oversight inspection report corrective action plan.

LLNS emergency management program assessments and implementation of issues management mechanisms are improving the site's emergency management program. LLNS has conducted comprehensive annual self-assessments of the LLNL emergency management program. The fiscal year 2008 self-assessment was effective in identifying program and performance weaknesses, and LLNS also uses the annual self-assessments to verify the effectiveness of previously implemented corrective actions. Emergency management issues are systematically captured, addressed, tracked to closure, and, in addition to the triggering of automatic reminders to action owners, overdue corrective actions are discussed at monthly meetings between the Emergency Management Department and the Facilities and Infrastructure Associate Director. When actions taken to address weaknesses identified during the 2005 Independent Oversight inspection were discovered by LLNS to be ineffective, additional corrective actions were developed, and follow-on effectiveness reviews were performed after those actions were completed; however, as noted below, important weaknesses remain because these actions have not always been effective in fully addressing the identified issue.

2.2 Program Weaknesses and Items Requiring Attention

Although the necessary framework has been established and program implementation continues to improve, the Independent Oversight team identified weaknesses in implementation in several important areas. Concerns in some aspects of the proficiency of emergency responders were noted as well. Specific weaknesses are discussed below.

The hazardous material screening process is not consistently effective in identifying materials requiring further consideration in EPHAs. Nearly all EPHAs were reviewed for compliance with the revised screening thresholds contained in DOE Order 151.1C through the development of temporary change notices (TCNs) that, together with the existing EPHA, were intended to serve as the "approved" EPHA until each is revised under the new triennial schedule. However, the TCN process did not always include a careful examination of the types and quantities of hazardous materials present in the facilities and the screening exclusions that are permitted under the current version of the order. Consequently, the TCNs for two EPHAs that were reviewed during this inspection incorrectly concluded that no additional hazardous materials needed to be evaluated in the EPHAs. The inspection team identified several examples in which the TCN did not properly identify a hazardous material that had a health hazard rating and quantity that warranted further evaluation. Additionally, some inconsistencies were identified in the application of the screening process for the same hazardous material in different facilities.

Planning and preparedness activities have not sufficiently considered facility-level response actions. Although the programmatic framework includes an appropriate facility-level response component, facility-specific emergency plans and self-help plans do not provide complete guidance for shelter-in-place tasks, evacuation processes, and accountability processes under all conditions. LLNS does not specify the training requirements or track the training status of all facility personnel who may be required to participate in an emergency event, and, for those self-help program positions, such as zone point supervisors or assembly point leaders, that require training, some assigned personnel have not completed the training. Further, LLNS has not established a process to ensure that personnel assigned to self-help or facility response positions participate in annual drills, and annual evaluated drills at the hazardous material facilities have not included facility participation for performing facility evacuation, accountability, or sheltering in place. As noted below, the absence of clearly defined processes for protecting workers during all types of site emergency events likely contributed to some of the protective action weaknesses observed during performance tests conducted as part of this inspection.

During performance tests, weaknesses in the areas of protective action formulation, notifications, and communications diminished the overall response effectiveness. The emergency operations center (EOC) cadre was not consistently effective in formulating, confirming, and communicating protection measures for site workers and the public. For example, for the security event, neither EOC team based the declaration of the General Emergency on specific, available protective action distances. Consequently, the offsite notification forms did not contain protective action recommendations, as required by the emergency plan and implementing procedures, even though other offsite communications generally discussed an offsite hazard or recommended some type of protective measure. Additionally, the status of personnel evacuation, accountability, and shelter-in-place actions that had been directed was not tracked or verified during any performance test, a contributing factor of which may have been the absence of clear procedural direction for implementing these measures given that the self-help plan was not applicable to the performance test scenarios. During three of the four scenarios, employee notifications issued by the EOC cadre significantly lagged the occurrence of onsite evacuations and gate closures, in one case by well over one hour. During one scenario, the initial news release was disseminated verbally, as permitted by the EPI process, but the contents of the verbal briefing were not captured in hard copy form as required by the EPI plan, potentially complicating efforts to maintain a clear understanding of what information had been released to the public. In some cases, communication weaknesses hampered an effective response. For example, periodic briefings conducted (separately) in the emergency management team room and the operations team area were inconsistent regarding content, formality, and participation, which in some cases contributed to incomplete understanding of the event specifics and slowed the overall response. Finally, communications between the EOC and the incident commander did not always ensure an appropriate understanding of site response actions that might impact the field response and vice versa.

Implementation weaknesses of varying importance and impact in several program areas hamper the overall effectiveness of the LLNL emergency management program. Practical demonstrations of proficiency for a number of critical response positions such as the emergency director were not conducted during fiscal year 2008, and LSO does not have any backup capability for performing its public affairs emergency response functions. Various EPI planning documents include either inconsistent or incomplete mechanisms for developing and disseminating employee notifications. Minimum training requirements (including practical demonstrations of proficiency) have not been established for the public affairs department operations center and joint information center cadre, and formal training activities are not being used currently for new public affairs department operations center and joint information center cadre members; collectively, these training shortfalls are of concern given the turnover of public affairs staff. Weaknesses were noted in LSO's validation of corrective action completion and verification of corrective action effectiveness, and in LLNS's implementation of corrective action processes for emergency management issues. For example, LSO did not ensure that the Department's corrective action tracking system accurately reflected the existence of "partially-effective" corrective action determinations or that LLNS had initiated additional actions to fully resolve some of the findings. Additionally, effectiveness reviews conducted by LLNS for several of the findings from the 2005 Independent Oversight inspection report, including a longstanding weakness regarding the absence of a workable, documented process for implementing a shelter-in-place protective action, either did not determine whether the underlying issues had been resolved or resulted in closure of the findings in the Department's corrective action tracking system even though the corrective actions had not been wholly effective.

3 Conclusions

The June 2005 Independent Oversight inspection at LLNL determined that LLNL had established an appropriate framework for nearly all of the critical emergency management program elements and that responder performance during the exercise provided confidence that site workers and the public would be adequately protected in an incident. However, the 2005 inspection concluded that implementation of requirements in several important areas was weak or still evolving, including hazardous material screening, maintenance of EPHAs and emergency action levels, emergency responder training, and the use of drills and exercises and issues management systems for program improvement. The 2005 report also noted that a longstanding weakness regarding the utilization and effectiveness of shelter-in-place protective actions remained unresolved. This 2008 inspection found that overall, the LLNL emergency management program is, with a few exceptions, well defined and better implemented in most areas than observed during previous inspections, but some implementation weaknesses remain that diminish the ability of the program to ensure effective response under all circumstances.

The LLNL emergency management program is characterized by several notable strengths, including a formal program framework that has been strengthened since the last Independent Oversight inspection. Together, LSO and LLNS have established a well-integrated hierarchy of institutional- and program-specific requirements and expectations. Additionally, LSO and NA-43 are active and knowledgeable participants in monitoring the status and improving the effectiveness of the LLNL emergency management program, and LLNS feedback and improvement mechanisms have been effective in identifying and addressing most program weaknesses.

Despite these noteworthy positive attributes, the effectiveness of the LLNL emergency management program is limited largely by weaknesses in the implementation of many program elements evaluated during this inspection. The staff responsible for developing and maintaining the EPHAs are very knowledgeable and have access to a variety of excellent procedural and computational tools, but the TCNs developed to update the EPHAs to current Departmental requirements lacked the attention to detail needed to identify all of the hazardous materials requiring evaluation. In the areas of protective measures, training and proficiency, dissemination of employee notifications, and verification of corrective action effectiveness, numerous examples demonstrated either a missing or poorly developed mechanism necessary to implement a specific program requirement or that the existing mechanism was not rigorously followed.

Finally, although no fundamental response weaknesses were identified, implementation of the current concept of emergency operations by the EOC cadre is, in several ways, incomplete, as indicated by the various protective action decision-making, notification, and communication weaknesses observed during the performance tests. To a large extent, the response weaknesses are likely a reflection of several newly implemented aspects of the site's emergency response concept, most especially the National Incident

Management System and Standardized Emergency Management System facets of EOC operations and the new emergency management duty officer position; consequently, emergency responders will require additional practice to become entirely comfortable in their positions.

Overall, the LLNL emergency management program continues to evolve and improve, which is a reflection of sustained LSO attention and increased commitment by Laboratory managers over the past eight years. However, LSO and LLNS line management attention is necessary to ensure that the program foundation, as established by the EPHAs, is based on a rigorous accounting and screening of hazardous materials. LSO and LLNS line management attention is also warranted to sustain efforts over the long term to complete program implementation, including those actions necessary to completely address longstanding weaknesses in the ability of the site to effectively implement protective actions for site workers.

4 Ratings

This inspection focused on a detailed assessment of six emergency management programmatic elements, as well as emergency responder performance during limited-scope performance tests. No overall program rating has been assigned. The individual element ratings reflect the status of each LLNL emergency management program element at the time of the inspection. The ratings assigned below to the readiness assurance category are specific to those assessment, corrective action, and performance monitoring mechanisms applicable to the emergency management area.

The ratings for the emergency management elements evaluated during this inspection are:

Emergency Planning	
Hazards Survey and EPHAs	NEEDS IMPROVEMENT
Program Plans and Procedures	EFFECTIVE PERFORMANCE

Emergency Preparedness	
Training, Drills, and Exercises	NEEDS IMPROVEMENT
Emergency Public Information	EFFECTIVE PERFORMANCE

Emergency Response	NEEDS IMPROVEMENT

Readiness Assurance	
NNSA Line Program Management	EFFECTIVE PERFORMANCE
Contractor Feedback and Improvement	NEEDS IMPROVEMENT

Ratings – Purpose

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 emergency management. 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 are:

- **Effective Performance (Green):** An emergency management element is rated Effective Performance if the emergency management function is effectively implemented, all applicable standards are met, and there is reasonable assurance that the program needs are met. An element is also normally rated Effective Performance if, for any applicable standards that are not met, other compensatory factors exist that provide equivalent protection to the site workers and the public, or the impact is minimal and does not significantly degrade the effectiveness of the emergency responders. Line managers are expected to effectively address any specific weaknesses that are identified.

- **Needs Improvement (Yellow):** An emergency management element is rated Needs Improvement when the system being inspected only partially meets identified program needs or is not sufficiently mature to provide assurance that the program needs are fully met. The element is normally rated Needs Improvement if one or more of the applicable standards are not met and are only partially compensated for by other measures, and the resulting deficiencies in the emergency management function degrade the ability of the emergency responders to protect site workers and the public. Line managers are expected to provide sufficient attention to ensure that identified areas of weakness are effectively addressed through corrective actions and/or ongoing initiatives.

- **Significant Weakness (Red):** An emergency management element is rated Significant Weakness when the element does not provide adequate assurance that the identified programs needs are met. The element is normally rated Significant Weakness if one or more applicable standards are not met, there are no compensating factors to reduce the impact on effectiveness, and the resulting deficiencies in the emergency management function seriously degrade the ability of the emergency responders to protect site workers and the public. Line managers are expected to apply immediate attention, focus, and resources to the deficient program areas.

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APPENDIX A
Supplemental Information

A.1 Dates of Review

Scoping Visit	September 24 – 25, 2008
Planning Visit	October 7 – 9, 2008
Onsite Inspection Visit	October 27 – November 5, 2008
Report Validation and Closeout	December 3 – 4, 2008

A.2 Review Team Composition

A.2.1 Management

Glenn S. Podonsky, Chief, Office of Health, Safety and Security
Michael A. Kilpatrick, Deputy Chief for Operations, Office of Health, Safety and Security
William A. Eckroade, Director, Office of Independent Oversight
Steven C. Simonson, Director, Office of Emergency Management Oversight

A.2.2 Quality Review Board

Michael A. Kilpatrick
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Steven Simonson (Team Leader)
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Teri Lachman
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APPENDIX B
Site-Specific Findings

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

Finding Statements	Page:
1. The LLNS emergency planning hazards assessments and their associated temporary change notices do not adequately screen and then assess hazardous chemicals for potential impact on site workers and the public, as required by DOE Order 151.1C, *Comprehensive Emergency Management System*.	17
2. LLNS has not developed detailed, facility-specific procedures for implementing shelter-in-place protective actions or for performing personnel accountability during block evacuation protective actions, as required by DOE Order 151.1C.	20
3. LLNS has not ensured that facility-level personnel with emergency response duties are included in the training and drill program and proficient in their response functions, as required by DOE Order 151.1C.	25
4. LLNS has not ensured that evacuation, accountability, and shelter-in-place processes at all hazardous material facilities are evaluated and critiqued annually or that the facility's ability to integrate with the site response organization is evaluated periodically, as required by DOE Order 151.1C.	26
5. LSO does not possess the trained staff necessary to fill its core emergency public information response positions, as required by DOE Order 151.1C.	28
6. During limited-scope performance tests, emergency operations center personnel did not always provide prompt, accurate employee notifications, as required by DOE Order 151.1C and the LLNL Emergency Plan.	36
7. During limited-scope performance tests, emergency response organization responders did not maintain effective communications among emergency operations center, tactical operations center, and incident command components to ensure accurate, consistent understanding of the event status, as required by DOE Order 151.1C and the LLNL Emergency Plan.	37
8. During limited-scope performance tests, emergency response organization responders did not always formulate and implement protective actions and protective action recommendations in a timely, efficient, and unambiguous manner, as required by DOE Order 151.1C and the LLNL Emergency Plan.	38
9. LSO has not ensured that LLNS corrective actions are consistently effective in resolving identified weaknesses, as required by LSO Work Instruction 226.1.1, *Writing and Managing Contractor Assessments, Issues, and Corrective Action Plans in Pegasus*; DOE Order 151.1C; and DOE Order 414.1C, *Quality Assurance*.	45
10. LLNS has not ensured that corrective actions are identified and tracked in a timely manner and that corrective actions are effective in resolving identified weaknesses, as required by the LLNL Environment, Safety, and Health Manual and DOE Order 151.1C.	48

APPENDIX C
Emergency Planning

C.1 Introduction

Two key elements of emergency planning are the hazards survey and emergency planning hazards assessments (EPHAs), which identify and assess the impact of site- and facility-specific hazards and threats, and establish an emergency planning zone (EPZ). The hazards survey and EPHAs serve as the foundation of the emergency management program; consequently, their rigor and accuracy are keys to developing effective emergency response procedures and other elements of the program. The degree to which the EPHAs effectively serve this function is primarily dependent upon the completeness of the institutional processes for developing the hazards surveys and EPHAs; the effectiveness of the screening process by which hazardous materials are initially considered; and the rigor and accuracy of the analyses contained within the EPHAs.

U.S. Department of Energy (DOE) and National Nuclear Security Administration sites and facilities use the results of these assessments to establish emergency management programs that are commensurate with the identified hazards. The site emergency plan defines and conveys the management philosophy, organizational structure, administrative controls, decision-making authorities, and resources necessary to maintain the site's comprehensive emergency management program. Specific implementing procedures are then developed that conform to the plan and provide the necessary detail, including decision-making thresholds, for effectively executing the response to an emergency, irrespective of its magnitude. These plans and procedures must be closely coordinated and integrated with offsite authorities that support the response effort and receive DOE emergency response recommendations.

This evaluation included a review of the Lawrence Livermore National Laboratory (LLNL) hazards survey and EPHAs and their treatment of hazards associated with the LLNL site. Also reviewed were sitewide and facility-specific emergency plans (FSEPs) and associated implementing procedures.

C.2 Status and Results

C.2.1 Hazards Survey and Emergency Planning Hazards Assessments

The 2005 Independent Oversight inspection found that the quality of the LLNL EPHAs had improved from that observed during the previous Independent Oversight inspection in 2002, and LLNL had initiated a program to further improve those documents. However, the inspection identified several areas of weakness in the site's emergency planning basis including inconsistencies in the hazardous material screening process and a number of errors and omissions in the EPHA analyses. The inspection team also determined that EPHAs and emergency action levels (EALs) were not consistently reviewed, updated, and implemented in a timely manner. This 2008 inspection found that the EPHA analyses are accurate and that the review and approval of the EPHAs and EALs are being conducted in a timely manner. However, inconsistencies and omissions in the hazardous material screening process detract from the overall effectiveness of the EPHAs as the basis for the site's emergency management program.

LLNL has developed an emergency plan implementing procedure (*Emergency Preparedness Hazards Survey and Hazards Assessment Including Emergency Action Levels and the Emergency Planning Zone*) that

effectively incorporates the provisions of DOE Order 151.1C and the *Emergency Management Guide, Volume II* (EMG) for developing and maintaining the hazards survey, EPHAs, EALs, and EPZs. In response to issues identified in the 2005 Independent Oversight inspection, LLNL revised the procedure to ensure consistent application of the source term descriptions, damage ratio, airborne release fraction, and deposition velocities in the development of the EPHAs. The procedure also provides detailed instructions on the methodology, content, and format for developing the relevant documents.

In response to the 2005 Independent Oversight finding pertaining to hazardous material identification, the LLNS Emergency Programs Organization (EPO) has recently developed a sitewide mechanism to ensure that hazardous materials are identified and the developers of the hazards survey and EPHAs are notified prior to significant changes in hazardous material inventories. Although this mechanism has not been fully implemented, as discussed later in this section, it consists of the following positive attributes:

- A chemical tracking database system (ChemTrack) is used for tracking quantities of onsite chemicals, and EPO personnel receive email notifications for procured chemicals at all LLNL facilities.
- Agglomerated quantities of small co-located containers of the same chemical are verified to ensure that the total quantity does not exceed the 5 to 10 times laboratory scale quantities suggested for use in the EMG.
- Facility managers have designated a facility representative who is responsible for procuring hazardous materials within their facility. Facility representatives contact EPO personnel prior to any changes in facility operations or changes in hazardous material quantities.
- EPHA developers are notified by the Authorization Basis Department if changes to the authorization basis documents are anticipated, if a positive unreviewed safety question is identified that requires a safety evaluation report, and if a hazard control evaluation requires a change to the process safety analysis.

EPO has developed a hazards survey that implements the provisions of the development procedure and provides the information stipulated in DOE Order 151.1C and the EMG. The hazards survey is well organized and appropriately identifies a screening process that includes applicable planning and preparedness requirements and offsite response interfaces. Other positive aspects include detailed descriptions of emergency events and conditions of concern and identification of the associated population, hazard type, and description of predominant use for each LLNL facility. The hazardous material inventory processes and databases used to identify and record hazardous materials at LLNL facilities are effectively implemented and used to develop the hazards survey. The locations of hazardous materials are reported and monitored through the use of radiological, chemical, and biological databases that are monitored by facility representatives to ensure that inventories are maintained below allowable facility limits. These databases are also monitored by the EPO hazards survey developer. Independent Oversight found that hazardous material inventories are adequately reflected in the inventory databases and facility managers are knowledgeable of facility processes and inventory quantities and locations. Furthermore, facility management is involved in developing, reviewing, and approving the hazards survey, and the completed document is submitted to the Livermore Site Office for review and approval.

The hazards survey identified 16 facilities that require an EPHA. LLNL has developed an EPHA for each of these facilities, and revisions are conducted on a triennial cycle. The EPHAs are well organized; consistently formatted; use an accurate method to develop source terms; and, with the exception of the screening process, contain information and methodologies prescribed by DOE Order 151.1C. Important consequence analysis outputs, such as distances to protective action criteria and thresholds for early lethality, are carried forward

into the EPHA event consequence tables and are used for EAL and EPZ development. EALs are accurately developed for each of the analyzed scenarios that resulted in a classifiable emergency, and the EPHA results are used appropriately as the basis for the EAL protective action distances. Discretionary EALs (to ensure the hazardous materials and activities that have not been recognized can be addressed) have also been developed. In addition, the Emergency Response Guidebook is utilized to derive protective actions and protective action criteria distances for those materials that do not have a facility-specific or discretionary EAL. The EPHA calculated distances to thresholds for early lethality are used appropriately to develop facility EPZs and serve as the technical basis for the LLNL composite EPZ. Furthermore, LLNL has addressed one of the EPHA findings identified during the 2005 Independent Oversight inspection by ensuring that the EPHAs and associated EALs are consistently reviewed and updated in a timely manner. However, weaknesses in the screening of hazardous materials, which were also identified in the 2005 Independent Oversight inspection, remain.

Fourteen of the 16 EPHAs required revision to reflect the requirements of DOE Order 151.1C. These EPHAs were written to DOE Order 151.1B requirements; consequently, the hazardous material screening process removed from consideration any hazardous material that either does not have a published Code of Federal Regulation threshold quantity or has an inventory below the threshold quantity, irrespective of the potential effects that loss of control of the material could cause. To meet contract requirements for implementing DOE Order 151.1C, EPO personnel developed temporary change notices (TCNs) for these 14 EPHAs. The TCNs were developed as an addendum to the unrevised EPHAs to ensure that the screening process conformed to the screening criteria stipulated in DOE Order 151.1C until each of the EPHAs is updated during its triennial revision.

However, the EPHA developers did not exercise sufficient care in developing the TCNs and did not implement a hazardous material screening process consistent with the provisions of DOE Order 151.1C. With one exception, the hazardous materials (and quantities) originally screened from analysis in the EPHAs for each of the 14 facilities are identical to those screened from analysis in the TCN. That is, the results obtained from each of the TCNs incorrectly indicate that none of the EPHAs required immediate revision even though the screening criteria embodied in DOE Order 151.1C can be markedly different, both in terms of the nature of the hazardous chemicals that must be considered and the screening quantities that trigger the need for further evaluation. Additionally, inconsistencies were identified in the screening process for hazardous materials between site facilities. Weaknesses in the screening process, as well as identified inconsistencies (as indicated below), detract from the adequacy and effectiveness of the EPHAs and associated TCNs as emergency planning and response decision-making tools.

- Chromic acid, oxalic acid, and hydrochloric acid used in the Metal Finishing Facility (B322) were not analyzed in the facility EPHA or TCN. These materials have health hazard ratings greater than 2 and quantities greater than laboratory scale. Furthermore, the TCN for Building 322 identified that hydrochloric acid exceeded laboratory scale quantities and should have been analyzed further. However, it was screened from further analysis because, as incorrectly stated in the TCN, "the inventory is maintained below the TQ/TPQ levels."

- Dichlorosilane and sulfuric acid used in the Microfabrication Facility (B153) were not analyzed in the facility EPHA or TCN even though these materials have health hazard ratings greater than 2 and quantities greater than laboratory scale (i.e., require further consideration per DOE Order 151.1C). EPO personnel justified their exclusion in subsequent discussions, but the justifications have not been formally documented.

- The EPHA for the Decontamination and Waste Treatment Facility (B695) contains consequence analyses for 55 to 600 gallons of 50 percent sodium hydroxide with associated classifiable

emergencies, whereas the EPHA and TCN for Building 322 indicate a facility limit of approximately 250 gallons of ≤ 98 percent sodium hydroxide, but the material was not screened or assessed.

Finding #1: The Lawrence Livermore National Security, LLC (LLNS) emergency planning hazards assessments and their associated temporary change notices do not adequately screen and then assess hazardous chemicals for potential impact on site workers and the public, as required by DOE Order 151.1C, *Comprehensive Emergency Management System*.

Furthermore, LLNS has not developed a documented understanding between EPO planners and facility managers concerning facility hazardous material quantity limits that will prevent hazardous material inventories from exceeding agreed upon maximum quantities. For example, the EPHA and TCN for Building 153 indicates that the "maximum inventory" of hydrochloric acid is 36 pounds, but, according to the current chemical database listing and walkdown of the facility, the hydrochloric acid inventory is 48 pounds. Although this material is segregated in the facility in quantities that would not require further evaluation, no control exists to require this segregation or the notification of EPO of such material movements. The active participation of facility managers in determining and documenting such limits would preclude larger quantities of hazardous materials than those analyzed in the EPHAs from being brought into the facility without prior EPO notification.

It should be noted that when the Independent Oversight team identified the EPHA and TCN problems for Building 322, EPO personnel immediately developed and issued compensatory EALs to ensure that pre-determined protective actions appropriately reflect the impact of potential releases of hydrochloric acid from Building 322. In addition, EPO planners completed a revision of the EPHA for Building 322 that identifies and screens all hazardous materials within the facility. The revision to this EPHA and the compensatory EALs provide an appropriate and timely compensatory measure for Building 322.

To summarize, LLNS has improved its hazards survey and EPHAs since 2005 by correcting the majority of the identified weaknesses. LLNS implemented a process procedure for developing the site's hazard survey, EPHAs, EALs, and EPZs that meets order requirements and developed a sitewide mechanism to ensure that the developers of the hazards survey and EPHAs are notified prior to significant changes in facility operations and hazardous materials. The hazards survey correctly implements procedural requirements and identifies applicable planning and preparedness requirements. The EPHAs comprehensively consider emergency events, consistently calculate source terms, correctly develop EALs, and establish an accurate composite EPZ. However, TCNs developed for 14 of 16 EPHAs to ensure that new screening requirements were appropriately considered lacked the attention to detail necessary to ensure compliance with the provisions of DOE Order 151.1C and consistency of application. Consequently, despite the numerous positive aspects of the EPHA development process and the EPHAs themselves, there is reduced confidence that the combination of existing EPHAs and their associated TCNs comprehensively captures all hazardous chemicals that need to be evaluated for inclusion in the site's emergency planning basis. When notified of these concerns, EPO personnel initiated prompt actions to revise the EPHA for Building 322, implement compensatory EALs to provide an interim set of response tools for this facility, and determine the extent of condition for TCN errors.

C.2.2 Program Plans and Procedures

The 2005 Independent Oversight inspection of the LLNL emergency management program did not specifically include the evaluation of emergency plans and procedures. The 2002 inspection identified that LLNL had

established and was further improving a set of plans and procedures that, in general, adequately supported the many response activities that might be needed during an emergency at LLNL. However, the LLNL emergency response procedures still contained significant weaknesses in the areas of protective action determination and event categorization and classification that contributed to performance weaknesses observed during the performance tests. This 2008 inspection found that LLNS has continued to improve plans and procedures in most areas to reflect DOE policies and LLNL program changes. However, as was identified in 2002, plans and procedures at the facility level do not provide the details needed by facility personnel to implement protective measures under all conditions, and the facility-level documents do not reflect the impact of various program changes.

The LLNL emergency management program is institutionalized via the site Environment, Safety, and Health (ES&H) Manual. The ES&H Manual provides an adequate standard to establish the requirements for developing essential program documents such as the LLNL Emergency Plan, emergency plan implementing procedures, EPHAs, EALs, EPZ, the LLNL self-help program, and FSEPs. The ES&H Manual establishes an LLNL emergency management program that is appropriately founded on DOE Order 151.1C and the State of California Standardized Emergency Management System (SEMS), which is consistent with the DOE policy to implement the National Incident Management System for response organizations. The ES&H Manual also assigns responsibilities for developing and maintaining emergency management program documents and provides descriptions of the response organizations that implement the emergency management and self-help programs. Furthermore, the manual describes the operational concepts employed at LLNL, although the manual does not yet reflect the recent addition of the emergency management duty officer (EMDO) position and the name change of operational support centers to department operations centers.

The LLNL Emergency Plan adequately documents the emergency management program and describes the provisions for responding to an operational emergency. The emergency plan has been updated to include provisions required by DOE Order 151.1C and SEMS. Specifically, the plan:

- Is consistent with DOE Order 151.1C and the associated EMG in its content and format.
- Describes an emergency response organization (ERO) that is consistent with National Incident Management System concepts.
- Defines the ERO chain of command.
- Identifies and assigns roles and responsibilities to ERO members and program administrators.
- Provides for a level of response that is commensurate with site hazards.

Currently, a significant revision of the emergency plan, that includes the incorporation of the new EMDO response position, is nearing completion. This position is assigned the categorization and classification function and the initial notification duties previously performed by the fire department incident commander.

LLNS has developed a set of emergency plan implementing procedures that adequately describes how to implement the emergency plan. Implementing procedures have been established for all topical areas outlined in the emergency plan in order to address response functions, provide additional details in various emergency management program areas, and identify program administrative requirements. Furthermore, LLNS revised the protective action implementing procedure to correct the weakness observed during the 2002 Independent Oversight inspection regarding the use of the block zone maps for formulating protective actions. LLNS has developed agreements with offsite entities, as described in the emergency plan, that establish offsite support

from law enforcement, local hospitals, and medical transport. To enable a quick response, each position on the LLNL emergency operations center cadre has been provided with a checklist that adequately guides the execution of assigned tasks, although LLNS has not developed a response checklist for responders outside the emergency operations center, such as the security duty officer and the laboratory emergency duty officer, and several required actions are absent from the EMDO questionnaire. As discussed further in Appendix E, some of these checklist weaknesses may have contributed to several response weaknesses during limited-scope performance tests. EPO maintains the implementing procedures and checklists as controlled documents that receive annual reviews to keep them current with the operational concepts and administrative requirements. These reviews and processes are effective in maintaining copies of procedures at appropriate locations. Two isolated procedure-related weaknesses were observed: the notification procedure and offsite notification form do not contain any references to some items delineated in DOE Order 151.1C, including the time of the event, operational impacts of nearby facilities, and the level of media interest; and some procedures contain roles and responsibilities for the Alameda County Fire Department and the LLNS Protective Force Division even though these organizations are not procedure signatories.

LLNS has established a technically-based and controlled set of EALs for use by key decision-makers in categorizing and classifying emergency events and identifying appropriate protective actions. The protective action distances included in the EAL tables address the weakness observed during the 2002 Independent Oversight inspection regarding formulation of protective actions. However, as has already been identified by LLNS, although the EALs provide all of the information necessary to support decision-making, the construct of the EALs adds unnecessary difficulties for users, and the EALs do not reflect all current LLNL program elements. For example:

- Units for protective action distances in the EALs are not consistent with those used by the fire department (meters versus feet).
- Multiple EALs exist for similar events that have the same severity classification and nearly the same protective action distances.
- EALs are read from right to left for making classification decisions.
- EALs contain an analyzed scenario description column that may not apply to an actual event.
- EALs do not reflect the preferred acute exposure guideline levels for protective action criteria.
- EALs do not reflect EMDO categorization/classification tasks.

In recognition of these EAL usage issues, EMDOs recently started to meet weekly to determine what changes to the EALs are needed to improve their ease of use and reflect EMDO responsibilities.

Supplemental response procedures are provided in the form of facility safety plans and FSEPs; their content is governed by the institutional ES&H Manual, and responsibilities for their development and maintenance are assigned to facility managers. FSEPs generally follow the outline established by the ES&H Manual; therefore, all FSEPs are similar in the topical areas addressed. The topics contained in the FSEPs include the important areas of notification, safe equipment shutdown, sheltering, evacuation, and personnel accountability. FSEPs are also well integrated with the LLNL self-help program, a program designed to protect, care, and account for site personnel when the ERO is overwhelmed by the magnitude of an event, such as an earthquake. The accountability procedures, which are primarily defined by the self-help program, provide adequate instructions for performing personnel accountability for the situation for which they were designed. However, the self-help plan and associated procedures are designed for use with the pre-planned

self-help zone map and not for use with the block zone map used by the ERO and described in the protective action implementing procedure. Access to key program elements staged for the self-help program, such as accountability rosters and other equipment staged at self-help assembly points, may not be available during block evacuations to support personnel accountability. Additionally, similar to the conditions observed during the 2005 Independent Oversight inspection, these procedures do not provide detailed instructions regarding the shutdown of ventilation systems in order to increase the effectiveness of shelter-in-place protective actions. Incorporation of detailed instructions regarding ventilation systems is pending the results of an ongoing study by LLNL, which started in early calendar year 2008, to determine the necessary actions for each building. The majority of activities planned for this study are expected to be completed in September 2009.

Finding #2: LLNS has not developed detailed, facility-specific procedures for implementing shelter-in-place protective actions or for performing personnel accountability during block evacuation protective actions, as required by DOE Order 151.1C.

Finally, LLNS facility managers are not consistently updating FSEPs to reflect the current program status, although this concern does not significantly impact their usefulness. For example:

- Hazardous materials identified in some of the FSEPs are not always consistent with those in the EPHAs.
- Protective action criteria described in the FSEPs are not current with DOE Order 151.1C requirements (emergency response planning guidelines vs. acute exposure guideline levels).
- FSEPs still refer to "operations support centers," which have been superseded by the SEMS nomenclature of department operations centers.

To summarize, the LLNL ES&H Manual establishes a suitable framework for the site emergency management program, including sitewide requirements for the site's emergency plan, self-help program, and FSEPs. The emergency plan adequately describes the LLNL concepts of operation and roles and responsibilities for emergency response, as well as key program and administrative elements. An appropriately detailed, controlled, and up-to-date set of operating procedures provides adequate instructions to the ERO and program administrators to implement the emergency plan. Additionally, the self-help program provides a well-planned response to a large-scale event, such as a severe earthquake, that would likely overwhelm the ERO. FSEPs provide instructions for facility-level response and are well integrated with most emergency plan concepts and self-help program features. However, the inspection identified a few areas of concern in an otherwise sound element. FSEPs do not include instructions for performing personnel accountability during block evacuations or shutting down ventilation systems during shelter in place; this continues to be an ongoing initiative. Furthermore, although technically founded, weaknesses in EAL construction adversely affect their usability in determining and coordinating site protective actions.

C.3 Ratings

A rating of NEEDS IMPROVEMENT is assigned to the area of hazards survey and EPHAs.

A rating of EFFECTIVE PERFORMANCE is assigned to the area of program plans and procedures.

C.4 Opportunities for Improvement

This Independent Oversight inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are offered to the site to be reviewed and evaluated by the responsible line management and accepted, rejected, or modified, as appropriate, in accordance with site-specific emergency management program objectives and priorities.

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- Enhance the quality and completeness of EPHAs by adding additional details and ensuring accurate and conservative mechanisms are used during the EPHA development process. Specific actions to consider include:
  - Fully implement the hazardous material identification process to ensure that the chemical inventories used during the development of hazards surveys and EPHAs are accurate.
  - Document in the EPHAs all of the hazardous materials that were reviewed against screening criteria.
  - Establish planning quantities with hazardous material facility managers and perform consequence assessment analyses for these quantities rather than estimated historical quantities.
- Consider performing a cross check of hazardous material screenings of the same type of material in different facilities to ensure that they are evaluated consistently or that reasons for inconsistencies are properly evaluated and documented.
- To ensure that all response organizations understand and agree with their assignments in the implementing procedures prepared by EPO, consider obtaining approval signatures from all organizations that have delineated responsibilities in such procedures.
- To improve the timeliness and completeness of a response, consider developing checklists to guide the security duty officer, EMDO, and laboratory emergency duty officer in performing important tasks.
- To improve the timeliness and accuracy of event categorization and the classification and formulation of corrective actions, consider revising the EAL set to make them more user friendly by:
  - Removing the event descriptions of analyzed scenarios contained in the EPHA.
  - Reorganizing the tables so that they are read from left to right for analyzing event indicators that lead to event classifications and minimum protective action decisions.
  - Stating protective action distances in feet to be consistent with the units used by the fire department incident commander.
- To ensure offsite notifications include as much of the required information listed in DOE Order 151.1C as possible, consider adding entries to the notification form, such as the time of event/event discovery and the number of known casualties, and providing instructions in the notification procedure for all entries on the notification form.

- To keep the ES&H Manual current with the planned response and consistent with site terminology, consider revising the ES&H Manual to reflect the new EMDO responsibilities, the reduced fire department responsibilities, and the name change of the operations support centers to department operations centers.

APPENDIX D
Emergency Preparedness

D.1 Introduction

A coordinated program of training, drills, and exercises is necessary to ensure that emergency response personnel and organizations can effectively respond to emergencies impacting a specific facility or the site as a whole. This response includes the ability to make time-urgent decisions and take action to minimize the consequences of the emergency and to protect the health and safety of responders, workers, and the public. To be effective improvement tools, exercises should be used to validate all elements of an emergency management program over a multi-year period using realistic, simulated emergency events and conditions, and to provide emergency response organization (ERO) members an opportunity to practice their skills. An effective emergency public information (EPI) program provides the public, news media, and U.S. Department of Energy (DOE) employees with accurate, timely information during an emergency event. In part, effectiveness is based on having in place a long-term, documented program to educate the public and the media about actions that may be required during an emergency response.

The Office of Independent Oversight team evaluated the training, drill, and exercise program used to support the Lawrence Livermore National Laboratory (LLNL) ERO. As part of the programmatic review of the training, drill, and exercise elements, the Independent Oversight team evaluated the plans and procedures that support these elements and reviewed training and proficiency records for key site emergency responders. Drill documentation and exercise reports were also reviewed for indications that they are being used effectively to enhance responder proficiency and evaluate the level of the site's response preparedness. The Office of Independent Oversight team also evaluated EPI plans and applicable processes for an emergency at the LLNL site.

D.2 Status and Results

D.2.1 Training, Drill, and Exercise Program

Training and Drills

During the 2005 inspection, the Independent Oversight team concluded that LLNL had established the framework for a comprehensive performance-based training program with clearly defined training and evaluation requirements. The drill program provided many well-considered opportunities for responders to practice their skills in team settings and for site workers to practice their evacuation and accountability procedures. However, weaknesses in implementing training processes had the potential for allowing unqualified responders to be placed on the ERO roster. This 2008 inspection found that the emergency plan and implementing procedures continue to provide a solid basis for the training and drill program, and implementation of the program has improved. Nevertheless, some weaknesses in the training and drill program, such as limited participation of facility personnel in drills, were noted.

The LLNL training and drill program is well defined in the LLNL Emergency Plan and implementing documents, which establish the framework for an effective program. The emergency plan establishes

expectations for participation in training and drills by members of the ERO and the self-help program. The emergency plan is supported by a detailed training program plan and an implementing procedure that provide additional requirements and implementing actions for the program. Design, development, and implementation of training are conducted in accordance with an appropriately detailed institutional process. Plans and procedures provide for initial and recurring training, including annual participation in drills or exercises and demonstration of proficiency in the ERO position.

The training program consists of a good mix of well-developed classroom and web-based training modules and drills. The program is based on a functional analysis of 28 ERO positions and task-to-training matrices that were completed following the previous 2005 Independent Oversight inspection. The resulting training was developed and delivered during fiscal year 2007 and included practical training and evaluation modules for a number of key positions. Overall, training materials are thorough and include detailed course objectives, learning objectives, instructor guides, and student handouts. The ERO, redesigned in 2008 to incorporate the National Incident Management System and Standardized Emergency Management System concepts, resulted in an increased number of personnel, reassignment of some tasks (e.g., categorization and classification) to different positions, and changes in procedures. This year's training emphasized these new organizational concepts to ERO personnel, as well as training of those assigned to some new positions such as the emergency management duty officer. Although the changes in the ERO structure resulted in a lower overall percentage of training completion by ERO members, the new organization was implemented through a significant number of drills and the new training is expected to be completed by the end of the calendar year. Nevertheless, the recently adopted changes to the organization and implementing procedures are not yet included in the training program functional analysis or training materials. Additionally, although practical demonstrations of performance were implemented in 2007, they have been suspended during the transition to the National Incident Management System – Standardized Emergency Management System ERO organization; consequently, proficiency for a number of critical positions, such as emergency director and consequence assessment lead, has not been demonstrated during their participation in drills or exercises this year.

The training status of personnel on the ERO roster is well managed and effectively tracked. Personnel assigned to an ERO position complete a questionnaire for the Livermore Training Records and Information Network (LTRAIN) system that results in the identification of required training in their individual training plans and entry into the tracking system. Lawrence Livermore National Security, LLC (LLNS) uses a detailed training matrix to track the training status of personnel assigned to positions in the field, emergency operations center (EOC), and department operations centers. The training matrix includes the status of both initial and recurring training and annual drill participation. Most positions have adequate numbers of qualified personnel available, although the expansion of positions in the ERO has required that some individuals be assigned several positions. The process for tracking status includes reminders for training and actions to be taken when training is delinquent. Although the process is generally sound and supported by effective computer-based tools, several weaknesses detract from its overall effectiveness. For example:

- A number of ERO members are over 90 days delinquent on required training and should have been removed from their positions, but they remain on the roster.
- Annual refresher training does not ensure that changes to the program or lessons learned will be communicated in a timely manner; that is, personnel are allowed twelve months (from the date of last completion) to complete annual refresher training, which in some cases means nine to eleven months after the training was first issued.

- There is no program for evaluating procedure changes to identify and implement short-term training, such as required reading, if necessary.

In addition, although expected to respond to emergencies, facility personnel who may be required to participate in an emergency event (for example, conduct building exit sweeps or implement shelter in place) are not identified as part of the ERO. Consequently, their training requirements have not been analyzed and their training status is not included in the ERO training program administered by the Emergency Programs Organization (EPO). Furthermore, a sample of the training status of zone supervisors and assembly point leaders (members of the self-help program) revealed that not all currently assigned personnel are entered into LTRAIN for those positions and that some assigned personnel have not completed the required training.

The LLNL drill program is well structured and provides ample opportunities for training ERO personnel and participation with offsite agencies. LLNS conducted a significant number of drills for testing and training its ERO personnel during the last two fiscal years. Drills were conducted at all of the hazardous material facilities; addressed both radiological and chemical hazards; and included, for example, personnel from security, medical, local offsite agencies, and the Office of Secure Transportation. In addition, LLNL conducts annual self-help drills that are designed to prepare site personnel for emergencies, such as earthquakes, in which first responder availability is limited by the scope of the emergency. Drills are well designed, and drill packages are constructed to achieve the stated objectives. During this fiscal year, EPO conducted a significant number of drills in the EOC to train personnel on the new organization. During fiscal year 2007, few improvement items were noted in the after-action reports, but after-action reports for this year's drills are notable for their improved identification of items requiring corrective action. Notwithstanding the above, some weaknesses in the implementation of the drill program were noted. For example, although drills were conducted at all of the hazardous material facilities, the drills involved limited participation by facility personnel and most often did not include the demonstration of shelter in place, evacuation, accountability, or identification of an event requiring an emergency response. EPO personnel previously identified this weakness, and the drill schedule for the current fiscal year includes a number of shelter-in-place drills. In addition, LLNS lacks a process to ensure that personnel assigned to self-help or facility response positions participate in drills annually. Finally, drills at the facilities often involved a significant number of players who were credited with drill participation without evaluating or documenting their degree of participation.

Finding #3: LLNS has not ensured that facility-level personnel with emergency response duties are included in the training and drill program and proficient in their response functions, as required by DOE Order 151.1C.

To summarize, the LLNL Emergency Plan; Environment, Safety, and Health Manual; and subordinate plans establish an appropriate framework for the training and drill program, which is implemented through a set of subordinate procedures. Training is based on a functional analysis of the ERO positions and includes a good mix of well-designed classroom and web-based training. Training requirements have been established for most ERO positions, and EPO personnel adequately track completion of training. Training requirements have also been established for members of the site's self-help organization, though they are not always tracked sufficiently. LLNL has executed a mostly effective drill program that provides an adequate number of training opportunities for both ERO personnel and those from offsite agencies. Nonetheless, several weaknesses were identified in the training and drill program, including some associated with the transition to the new ERO organization. Some personnel remain on the ERO roster despite not completing annual training requirements in a timely manner, and reviews of the ability of some ERO personnel to perform proficiently at their positions have not been conducted this year. More significantly, other than self-help program response to earthquakes, facility personnel expected to respond to facility emergencies and implement protective actions are not identified, and the performance functions for their positions are not analyzed and included in the ERO training and drill program.

Exercises

The 2005 Independent Oversight inspection identified that the exercise program structure and administration were adequate and improving and that drill packages provided plausible scenarios and documentation to promote program improvements. Independent Oversight personnel evaluated the site's annual exercise and concluded that LLNL personnel demonstrated the ability to plan an exercise that addressed the expected topical areas. However, several weaknesses in exercise planning, conduct, and performance were observed, including a lack of specificity in the exercise evaluation criteria. This 2008 inspection found that the exercise program structure and administration have continued to improve. Exercises are well designed, planned, conducted, and critically evaluated (using a suitable set of evaluation guides), but facilities have not always participated fully in exercises or evaluated drills.

The LLNL Emergency Plan and associated implementing procedure establish a suitable set of expectations and supporting structure for an effective exercise program. The emergency plan provides for management of the planning process; defines the contents of the exercise planning package; and establishes expectations for the conduct, evaluation, and follow-up of the exercises. The emergency plan also requires an improvement process that uses the lessons learned and corrective action programs, including the analysis of findings and observations. Design and development of exercises are governed by a detailed implementing procedure and executed by a sitewide planning committee. The plan and procedure include the use of a suitable set of evaluation objectives and detailed criteria that are implemented using appropriately thorough check sheets.

LLNS has implemented a satisfactory program of site exercises and facility-based evaluated drills; however, some important weaknesses in implementation were identified. LLNS conducted thorough, well-planned site exercises and evaluated drills during the past two fiscal years. In addition, evaluated drills, conducted for the hazardous material facilities, included an appropriate mix of chemical and radiological material release drills in 2007 and combined security drills in 2008. The Laboratory also conducts a single sitewide evacuation and accountability drill annually (for earthquake) to implement and evaluate the self-help program. A review of the completed exercise documentation revealed that evaluation check sheets have been effectively utilized to evaluate the drills and exercises. Completed check sheets and after-action reports provide evidence of improved self-critical evaluation of performance and identify a number of needed program improvements, although (as discussed in Section F.2.2) there have been some delays in entering these issues in the site's tracking system. Nevertheless, some weaknesses in the exercise program were noted. Several facilities are missing from the procedural table that identifies the requirements for drill/exercise participation for evacuation and accountability at hazardous material facilities. Additionally, although the current five-year exercise schedule improves the breadth and scope of the planned exercises, past exercises have not been rotated sufficiently to include each hazardous material facility in an integrated response over a five-year period. Finally, annual evaluated drills (or exercises) at the hazardous material facilities have not included facility participation for such actions as recognition of the emergency event, facility evacuation and accountability, or shelter in place.

Finding #4: LLNS has not ensured that evacuation, accountability, and shelter-in-place processes at all hazardous material facilities are evaluated and critiqued annually or that the facility's ability to integrate with the site response organization is evaluated periodically, as required by DOE Order 151.1C.

To summarize, through the emergency plan and an associated implementing procedure, LLNL has established and implemented a satisfactory program of exercises and evaluated drills for emergency responders assigned

to the EOC, incident command post, and department operations centers. LLNS personnel satisfactorily planned, conducted, and evaluated exercises, and identified follow-up corrective actions. However, exercises and evaluated drills have not assessed the ability of facility personnel to implement important protective actions, such as accountability and shelter in place, or assessed the ability of facility personnel to integrate effectively with the site organization.

D.2.2 Emergency Public Information

The 2005 Independent Oversight inspection concluded that the Livermore Site Office (LSO) and LLNL had developed and demonstrated a well-conceived, integrated, and comprehensive concept of EPI operations. The team noted that a few areas within the EPI plan and implementing procedures required further detail, but that overall the site's EPI program was well documented and effectively implemented. This 2008 inspection found that LSO and LLNS appropriately addressed the previous EPI programmatic weaknesses regarding their expectation for timeliness of the initial news release and the rumor control process, and the EPI program continues to be mostly well documented and effectively implemented. However, some planning and preparedness provisions governing employee notifications and the training of the EPI cadre are either incomplete or inconsistent.

With very few exceptions, the LLNL EPI program is well defined and includes an EPI plan and supporting checklists that provide the framework for a comprehensive, integrated program that addresses all of the EPI elements required by DOE Order 151.1C, including development of the initial news release within one hour of the event and an extensively documented rumor control process. These EPI documents and the LLNL Emergency Plan and its supporting checklists collectively implement the EPI processes; identify required personnel, resources, facilities, and coordination processes; and delineate the operation of the public affairs department operations center (PA-DOC – also known as the media center) and joint information center (JIC). Complementing the EPI plan is a well-developed public education component that effectively informs site workers and the public of emergency plans and protective actions. This program is primarily the responsibility of the LLNL Office of Public Affairs and was developed in coordination with Alameda County and the city of Livermore. The program includes a proactive outreach strategy that consists of an emergency response guide with offsite protective actions, a community newsletter to residents and local government and school officials, a public affairs website where news releases are posted during site emergencies, and participation with the offsite emergency response organizations such as the quarterly Valley Emergency Planning Working Group meetings.

The EPI program includes adequate provisions for the PA-DOC and JIC, where multiple jurisdictions gather, process, and disseminate public information during an emergency. Both facilities include support operations such as rumor control, media monitoring, public and media telephone inquiry teams, and include communication equipment such as computers, video projectors, and facsimile machines. The PA-DOC is staffed by LLNS EPI personnel who transmit approved news releases that are developed at the EOC to the media. Upon activation of the JIC, the PA-DOC initiates a well-conceived transition process to transfer operational responsibilities to the JIC. The LSO public affairs director serves as the LSO spokesperson at both the PA-DOC and the JIC. However, LSO has only one fully trained individual to fill both LSO EPI functions, and there are no qualified backups. The very limited availability of LSO public affairs personnel, who possess the appropriate level of expertise to serve not only as the representative in the EOC but also as the spokesperson in the PA-DOC or JIC, is a concern.

Finding #5: LSO does not possess the trained staff necessary to fill its core emergency public information response positions, as required by DOE Order 151.1C.

The EPI plan and supporting checklists also document the process and mechanisms needed to promptly develop, approve, and disseminate accurate event information, although some minor weaknesses were identified. Specifically, the plan provides two mechanisms for the EOC Public Affairs Office (PAO) manager to develop and issue timely and accurate initial information for release to the media and the public. The first mechanism is the authority to verbally disseminate information received from the emergency director, and/or taken from the offsite notification form, to the news media, followed with a hard copy of the information that was provided. The second mechanism is the use of a pre-formatted and pre-approved news release, which is updated with event details and then requires further approval by the emergency director and the LSO emergency manager. Both methods are addressed in the EPI checklists. However, the requirement for additional approval of the "pre-approved" release limits the effectiveness of this quick response EPI tool, and, as observed during the second day of the performance tests, employment of the pre-formatted process for the initial news release contributed to a delay in issuing the initial news release.

Although the EPI program is mostly well defined, three aspects of the site's EPI program are inconsistent or lack sufficient detail to ensure consistent implementation. First, the EPI plan appropriately requires the development of prompt, accurate, and continuous employee communications, and the checklists task the EOC PAO manager and newswriter with developing the employee notifications and the LLNL employee communications manager with approving and distributing the notification. However, the EOC checklist for the position of "public information manager" (which is the governing checklist for the EOC PAO manager position and is contained within the implementing procedure for EOC activation and operation) does not address any aspect of the responsibilities for developing or distributing employee notifications, and no checklist includes disseminating the information to Fire Dispatch, where the announcement is made. Secondly, the checklists mentioned above contain several ambiguities or missing elements regarding the process for activating the PA-DOC. For example, the requisite action steps detailing activation of the PA-DOC are not addressed in any of the checklists for the EOC PAO manager, public information manager, or the PA-DOC/JIC manager.

Finally, there are some weaknesses in the training program for EPI staff. The EPI plan requires that all members of the EPI cadre participate in ERO training, receive initial training on the plan and its relationship to the site response effort, and participate in a minimum of one drill or exercise per year. The plan further requires specialized skill training for technical briefers and spokespersons. However, the EPI plan does not specify requirements regarding a practical demonstration of proficiency prior to be added to the EPI cadre. The LLNL ERO Training Program Plan identifies the required coursework for nearly all of the EPI cadre but not for technical briefers and spokespersons. This training includes significant ERO training for the EOC PAO manager, and the PA-DOC and JIC cadre members are required to take either initial ERO training, ERO refresher training, or orientation to the EOC and PA-DOC (based on their functional role in the cadre), and participate in an annual drill or exercise. In an effort to improve the proficiency of each cadre member, LLNS developed, but has not yet fully implemented, a concept of participation in a tabletop/limited-scope performance test that will become a pre-requisite for participation in the annual drill or exercise requirement. However, this training concept is not yet documented in either the EPI or the LLNL Training Plan, and the LLNL Office of Public Affairs has not developed lesson plan materials or conducted training for technical briefers and spokespersons since the implementation of the new EPI program in 2004.

To summarize, LLNL and LSO have developed a mostly well-defined EPI program, including an EPI plan and supporting checklists, that provides the framework for a comprehensive, integrated program that addresses all

of the required programmatic elements. Further, the EPI program incorporates processes and mechanisms for the development, approval, and dissemination of timely, accurate information; addresses rumor control; and includes a well-equipped media center and JIC. The program is supported by an extensive, well-developed public education component, which effectively informs the public of emergency plans and prepares them for protective actions during emergencies. However, processes for activating the PA-DOC and JIC cadre are not fully addressed in the procedures, and not all components of the EPI training program are appropriately defined and documented. Nonetheless, on balance, the observed weaknesses do not significantly detract from the overall soundness of the EPI program.

D.3 Ratings

A rating of NEEDS IMPROVEMENT is assigned to the area of training, drills, and exercises.

A rating of EFFECTIVE PERFORMANCE is assigned to the area of emergency public information.

D.4 Opportunities for Improvement

This Independent Oversight inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are offered to the site to be reviewed and evaluated by the responsible line management and accepted, rejected, or modified, as appropriate, in accordance with site-specific emergency management program objectives and priorities.

Livermore Site Office

- To help ensure that an appropriately trained person is available at the EOC to perform as the LSO Public Affairs representative and at the PA-DOC or JIC to serve as spokesperson, consider training at least four people to serve as representatives of the LSO Office of Public Affairs.

- To promote consistent performance from the LSO Office of Public Affairs representative, consider training LSO staff to a documented training program that prepares them for all assigned tasks at the EOC, the PA-DOC, and the JIC.

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- Enhance the ability of the training program to prepare ERO members for their emergency response roles. Specific actions to consider include:

  – Review and revise the functional analyses of the ERO positions to reflect the positions, roles, and responsibilities created by the recent ERO reorganization.

  – Identify those positions that require training or retraining on the new roles and responsibilities.

  – Revise the training materials (initial, retraining. or recurring) to reflect the new functional analyses.

  - Develop practical training and proficiency demonstrations for positions with critical response tasks.
  - Establish and implement a schedule to conduct training.
  - Evaluate the proficiency of those individuals whose positions include critical performance tasks.

- To ensure that ERO members are ready to perform their response tasks, remove personnel who are delinquent in training from the ERO roster.
- To improve the process of informing ERO members of emergency program changes, consider the following:
  - Implement a formal process to review plan and procedure revisions and identify changes that require short-term training.
  - Develop and implement appropriate training for the changes, such as required reading, broadcast training bulletins, or web-based revision notices.
  - Revise the expected completion date of the annual requalification module so that training is completed by all ERO members in a timely manner.
- Consider expanding the EPO training and drill program to include additional facility personnel with emergency response actions. Specifically, consider the following actions:
  - Identify facility personnel with emergency response actions, such as assisting facility evacuation, performing accountability, implementing shelter in place, or identifying emergency conditions.
  - Analyze facility personnel tasks and develop and implement training appropriate to the tasks.
  - Provide facility personnel with ample drill opportunities to gain proficiency in their assigned tasks.
- To improve the ability of the exercise program to validate the site's emergency response capability, consider the following actions:
  - Update the exercise program procedure to reflect the drill and exercise participation requirements for all of the site's facilities.
  - Review and revise the annual and five-year exercise schedules to ensure hazardous material facilities' integrated response with the site organization is evaluated at least once every five years.
  - Revise the site's annual exercise schedule to include an exercise or evaluated drill involving facility response at each hazardous material facility.
- Consider strengthening the activation process of the PA-DOC for regular and off hours by comparing the ERO implementing procedures with the EPI plan to ensure that these documents are consistent and appropriately detailed.

- Strengthen the process for the development, approval, and provision of initial news releases. Specific actions to consider include:
  - Develop a pre-formatted, pre-approved initial news release template that requires only the date, time, and acknowledgement of the incident, and can be quickly prepared for immediate release.
  - Revise the procedures/checklists so that they contain a requirement for the EOC PAO manager to make a record of the contents of the initial news release when it is only provided orally.
  - Develop a mechanism that ensures the newswriter is aware of the contents of any oral news releases provided to the media.
  - Review and update EPI checklists and EOC checklists to ensure accuracy, consistency, and unambiguous identification of the LLNS public affairs lead position on the emergency management team.
  - Include oral and print news release mechanisms in the applicable EOC checklists.
- To ensure that onsite employees periodically receive prompt, accurate communications concerning an emergency and protective actions, consider the following:
  - Review the current employee communication development, approval, and distribution process to ensure that it meets the expectations for the emergency management team.
  - Assign an ERO position to provide employee communiqués to Fire Dispatch for dissemination to employees, in addition to the distributions made via the LLNL E-Line computer e-mail, the LLNL emergency communication telephone message system, offsite local commercial radio, and the LLNL website.
  - Review and update the emergency plan, the EPI plan, and the emergency public affairs checklists to reflect the expected employee communications approval and distribution processes.
- To ensure that all EPI personnel are consistently trained and appropriate records of training are available, consider the following:
  - Develop written performance expectations for all PA-DOC and JIC positions.
  - Revise all PA-DOC and JIC position checklists so that they reflect performance expectations.
  - Develop lesson plans for each PA-DOC/JIC position and include a demonstration of proficiency for all PA-DOC/JIC cadre members.
  - Develop written lesson plans for spokesperson and technical briefer training.
  - Adopt the use of LTRAIN for tracking the status of EPI staff training.
- Strengthen the LLNL ERO and specialized employees training program for EPI personnel. Specific actions to consider include:

- Coordinate the LLNL specialized employees training and the LLNL PAO subject matter expert training to ensure that courseware developed by these two organizations is integrated and that the minimum required training is effectively developed and administered.

- Develop training completion milestones that correspond to the schedule contained in the EPI plan for training the PA-DOC/JIC cadre.

- Update all applicable planning documents to reflect the training required for all EPI staff.

APPENDIX E
Emergency Response

E.1 Introduction

The ultimate objective of emergency planning and preparedness is to prepare emergency responders so that they can apply their skills, procedures, and training to make appropriate decisions and to properly execute actions to protect emergency responders, workers, and the public. Critical elements of the initial response include formulating protective actions, categorizing and classifying the emergency, and notifying onsite personnel and offsite authorities. Concurrent response actions include reentry and rescue, provision of medical care, and ongoing assessment of event consequences using additional data and/or field monitoring results.

The information provided in this section is based on observations from two sets of emergency management limited-scope performance tests (LSPTs) evaluated by the Office of Independent Oversight. Each set of LSPTs involved a combined assessment of response activities by the emergency management duty officer (EMDO), the laboratory emergency duty officer (LEDO), and emergency response organization (ERO) members in the emergency operations center (EOC). Additionally, one set of LSPTs involved the tactical operations center (TOC), security duty officer (SDO), and Protective Force Division watch commander. The Lawrence Livermore National Laboratory (LLNL) EOC teams included a Livermore Site Office (LSO) EOC emergency manager, Lawrence Livermore National Security, LLC (LLNS) emergency director, LSO and LLNS public affairs officers, and selected EOC support staff, including a consequence assessment team (CQT).

Two operational emergency scenarios were developed for the LSPTs: a facility operational event that results in release of a hazardous chemical, and a malevolent act involving potential release of a hazardous chemical. During the first scenario, it was expected that the event would be classified as a Site Area Emergency because of the accidental release of nitric acid and associated consequences, in accordance with LLNL emergency action levels (EALs). During the second scenario, it was expected that the event would initially be categorized as an Operational Emergency due to the malevolent act, in accordance with LLNL EALs, and later classified as a General Emergency due to the hazardous materials. The LSPT scenarios, which were developed by Independent Oversight in conjunction with LLNS trusted agents, were presented to the participants by the LLNS trusted agents to ensure scenario validity and delivery of accurate event cues.

E.2 Status and Results

In the event of a non-security event emergency, the Alameda County Fire Department senior officer serves as the incident commander (IC) and provides direction and control of the LLNL emergency response until the EOC is activated. The IC is responsible for command and control at the event scene and for making key decisions regarding the safety of emergency responders. Based on information provided by the IC, the EMDO categorizes and classifies the event, identifies and disseminates protective actions for site workers and protective action recommendations (PARs) for offsite populations, initiates notifications to offsite authorities, and initiates recall of the ERO until relieved by the EOC emergency director. The LEDOs, who are senior Laboratory managers, provide on-call management support to the EMDO and IC during abnormal and emergency situations. After the EOC is operational, the LEDO assumes the role of the emergency director, who oversees the overall response and assumes EMDO functions. Key emergency director responsibilities are

to ensure appropriate EMDO decisions regarding event categorization, classification, and protective actions, and to review and approve offsite news releases and information provided to all site workers regarding the event. The LSO emergency manager reviews the emergency director's decisions and provides concurrence or additional direction, as necessary. The CQT validates the initial protective actions and supports the emergency director by identifying areas that could be affected by event hazards and by recommending event classification and predetermined protective action plans for implementation.

The Protective Force Division staffs the TOC, which supports the security IC in tactical matters and the EOC emergency management team (EMT) in operational emergency response. If the emergency is security driven, the TOC serves as the primary focal point for the security IC and as the point of contact for outside law enforcement agencies. The SDO provides the EMDO response information to enable event categorization and classification within 15 minutes of event discovery.

In 2005, Independent Oversight personnel evaluated the site's annual exercise; no other performance tests were conducted. The team identified a number of positive observations in the LLNL ERO response, including effective command and control and use of the incident command system. The team noted that the EOC team provided most of the expected support to the local responders, and emergency public information (EPI) personnel provided effective communications to offsite stakeholders. Inspection team members also observed that protective actions and PARs for the postulated chemical spill were not formulated in accordance with procedural requirements or properly verified by EOC personnel, and consequence assessment analyses were not always accurate or useful in supporting ERO decision-makers. This 2008 inspection identified a number of positive observations, including effective performance by the EMDO and the mostly effective support provided to the EOC cadre by the CQT using a variety of dispersion modeling programs to generate accurate consequence predictions based on worst-case and real-time assessments. However, Independent Oversight observed several weaknesses related to providing prompt, accurate employee notifications and news releases; maintaining effective communications among EOC, TOC, and the field incident command post; and the ability of the EOC to consistently formulate and implement protective actions and PARs.

E.2.1 LLNL Emergency Response Organization

EMDOs provided prompt initial response actions for event categorization and classification determinations, initial offsite notifications, and ERO activations. EMDOs consistently used the EMDO procedure and associated attachments (offsite emergency notification form and EMDO situation status report questions) to support these tasks. Additionally, following receipt of event discovery information, EMDOs recognized, categorized, and classified Operational Emergencies using EALs. Initial offsite notifications were accurate and timely, and EMDOs provided verbal notification to the U.S. Department of Energy (DOE) Headquarters Watch Office within 15 minutes of the emergency declarations. Furthermore, EMDOs effectively collaborated with the LEDOs to establish an appropriate level of ERO activation. Lastly, the EMDOs effectively activated the EOC cadre using the computer-based notification system.

Overall, LEDOs established managerial command and control of the LLNL emergency response, assuming the role of emergency director after the EOC was declared operational. Emergency directors and LSO emergency managers demonstrated effective command and control, decision-making, and leadership within the EOC. Additionally, emergency directors formally announced and recorded the transfer of the emergency director function in the EOC, and emergency directors established appropriate initial response priorities and objectives for the EOC using the command structure.

During the security event scenarios, the SDO made decisions and directed the response of the security organization to the event; however, SDO responses were inconsistent and did not always result in timely EMDO notification. For example, on day one, the SDO did not promptly notify the EMDO of the suspicious package that had prompted a security response. Following repeated unsuccessful attempts to contact the SDO, the TOC called the EOC. The EMDO finally learned of the ongoing emergency by answering the call (from outside his office) in which the TOC attempted to determine if the EOC was operational. Thirty minutes after event discovery, the EMDO was able to make contact with the SDO, acquire the initial event information, and categorize the event as an Operational Emergency. Further, as observed in both security event scenarios, the SDO was burdened with dual performance priorities of supporting the needs of the EMDO and the security organization, both of which required time-urgent response. For example, SDOs concurrently evaluated the security threat and provided tactical support to the IC and TOC; briefed the EMDO to support categorization/classification, notification, and protective action decision-making; and provided essential information for the EMT and EOC staff regarding the security events.

In most cases, response teams provided effective and accurate event response using EOC capabilities. EMTs were appropriately involved in key decision-making processes that included notifications, onsite protective actions, and offsite PARs. Likewise, LEDOs verified minimum staffing and formally declared the EOC operational. Also, useful information was displayed in the EOC on maps and electronic displays to support decision-making by the emergency director. Except for the limited ability to display the impact of plumes moving offsite, all venues are well equipped with maps, databases, meteorological information, and communication equipment to support the ERO. Most ERO functions used a position-specific checklist, with the exception of the TOC. Because checklists have not been developed for the SDO, EMDO, and LEDO, some response functions, as further identified below, were not performed or completed in a timely manner. In addition, some weakness and inconsistency were observed related to compliance with the LLNL Emergency Plan and associated response procedures. For example, as discussed below in further detail, emergency directors did not ensure that all requirements were met before declaring the EOC operational, the IC was not notified before upgrading event classifications, and offsite agencies were not notified each time onsite protective actions were revised. Lastly, periodic EOC briefings did not ensure a consistent understanding of events and response activities within the EMT and the Operations team areas.

E.2.2 Event Categorization and Classification

EMDOs and emergency directors consistently used EALs to categorize and classify events; however, use of EALs did not always result in consistent and accurate classification decision-making. For one of the chemical scenarios, the EMDO incorrectly used an EAL that is based on 10,000 kilograms of material even though the amount of material at risk recorded by the EMDO was 27 gallons. Furthermore, the IC determined a protective action zone of 500 feet using the Department of Transportation *Emergency Response Guide*, which resulted in a protective action distance of 1000 feet using the protective actions grid map. However, the EAL that was used specifies a protective action distance of over 2,100 feet, which required implementation of protective actions for a significantly larger area. The EMDO did not recognize this disparity and did not notify the IC that onsite protective actions were less conservative than those actions identified in the chosen EAL, as required by the protective action implementing procedure. Furthermore, although emergency directors and LSO emergency managers generally referred to EALs to ensure understanding and verify event classification, they did not always confirm the accuracy of the selection.

E.2.3 Notification and Communications

In nearly all cases, initial offsite notifications, update notifications, and upgrade notifications were successfully completed. However, during the day-one chemical scenario, an excessive amount of time (greater than 40 minutes) was required to issue the first offsite notification form. This delay is potentially significant given the absence of any verification that the computer-based notification system message was received by each offsite notification point of contact.

Emergency directors held frequent discussions and demonstrated established protocols for the timely review and approval of news releases, while liaison officers periodically telephoned offsite agencies to provide and coordinate event information and to advise them to expect a DOE situation report. Public information managers and newswriters were aware of their responsibilities for developing timely and accurate news releases and informing site workers of the emergency event. Also, public information managers consistently shared EPI information with LSO and initiated the appropriate approval process for news releases. However, some weaknesses were observed related to EPI activities. For example, during the day-one security scenario, the initial news release was verbally disseminated (as allowed by the EPI process); however, the follow-up written news release was not completely consistent with the information initially provided verbally, and the information provided verbally was not captured in hard copy form, as required by the EPI plan. In addition, initial news releases issued during the day-two scenarios were somewhat delayed when the emergency director modified the pre-formatted, pre-approved news releases included in the EPI plan, which were then reviewed and approved (as required by site response protocols) by both the emergency director and LSO emergency manager. This contradicts the utility of having pre-formatted, "pre-approved" news releases.

EMTs consistently set high priority on employee notification of the events. However, weaknesses were observed related to notification of employees. During three of the four scenarios, employee notifications issued by the EOC were not timely or accurate. For example:

- During the day-one chemical scenario, the employee notification was not made until 63 minutes after the Site Area Emergency declaration despite implementation of significant onsite evacuations and closure of the south gate.
- During the day-one security scenario, the employee notification advising the site of the incident and areas to avoid was not made until 80 minutes after the Operational Emergency declaration, although a significant onsite evacuation was implemented and offsite evacuations were being implemented by the county.
- During the day-two security scenario, two employee notifications were issued; however, the first was issued 41 minutes after two access gates were closed and a significant portion of the site had been identified to be avoided for health and safety precautions.
- During the day-two security scenario, the second employee notification did not include all of the blocks in which evacuation was ordered (blocks 5300 and 6300).

Finding #6: During limited-scope performance tests, emergency operations center personnel did not always provide prompt, accurate employee notifications, as required by DOE Order 151.1C and the LLNL Emergency Plan.

WebEOC was used to display important information regarding significant event conditions at the EOC and TOC. However, often the data was not used directly as displayed but instead was duplicated on hardcopy

maps and documents. This practice, which expended resources unnecessarily, also created an additional potential source of confusion. For example, in the day-one chemical scenario, the status board near the operations section chief stated that eight containers were involved in the accident, while in actuality (and as stated in WebEOC) there were nine containers involved. Similarly, in the day-two security scenario, neither the emergency director nor EOC staff realized for 15 minutes that both the identity and quantity of hazardous materials had not been reported from the event scene because TOC personnel, who had made a WebEOC entry providing the information, did not immediately report the information verbally to operations team staff.

Furthermore, communications between the EOC and the IC were not always adequate to ensure an appropriate understanding of site response actions that may impact the field response. For example:

- During all four test scenarios, EMDOs and emergency directors did not establish and define the incident scene boundaries with the IC, as required, which in some cases resulted in confusion about the implementation of protective actions.
- During the day-two security scenario, the EOC did not know the rationale used by the IC to establish initial standoff distances for the potential bomb threat.
- During the day-two security scenario, the EOC did not convey information to the IC regarding additional shelter-in-place grids or the change in security posture.
- In general, EOC personnel assumed that the IC had received key information about the event response that was not communicated. For example, during both security event scenarios, the emergency director did not confer with the Security IC before upgrading to a General Emergency, as required by the implementing procedure for categorizing and classifying events.
- Some confusion existed among EMT members (on day one) regarding the difference between a credible bomb, a credible bomb threat, and a suspicious package. This uncertainty resulted in several variations of the bomb status being communicated via the various calls and messages in which the significance of the differences was relevant.

EMT briefings provided an adequate exchange of information between venues; however, the briefings removed key response staff (section chiefs) from other essential response tasks. Typically, EMT briefing information was repeated by the section chiefs to the respective sections following the EMT briefing. A more efficient method is to communicate the EMT briefing throughout the EOC to ensure that the entire cadre receives the same information on the status of the event and any related strategies or tasking. Additionally, the "Requests/Issues Board" located on the wall behind the operations chief was not effectively used by either team to record and track the status of each specific tasking. Finally, time displays on the EOC and TOC clocks, times indicated on telephones and fax machines, and times displayed on computer screens are not synchronized to reflect the actual time of recorded events.

Finding #7: During limited-scope performance tests, emergency response organization responders did not maintain effective communications among emergency operations center, tactical operations center, and incident command components to ensure accurate, consistent understanding of the event status, as required by DOE Order 151.1C and the LLNL Emergency Plan.

E.2.4 Protective Actions and Protective Action Recommendations

In most cases, protective actions for onsite personnel were conservative and initiated quickly, usually in accordance with the EAL; however, some implementation weaknesses were noted. For example:

- During both security scenarios, the TOC did not use the available bomb blast chart to verify the safe standoff distances (implemented by the IC) from a credible, suspicious package.
- During only one of the four scenarios did the EMDO confirm the appropriateness of protective actions implemented by the IC based on the EAL.
- During the day-one security scenario, the EMT performed a qualitative verification of the adequacy of the onsite evacuation area rather than drawing the 1250-foot bomb blast standoff distance on the block map. Consequently, the EMT missed the fact that blocks 5300 and 6300 should also have been evacuated.

Typically, emergency directors formulated a well-planned course of action based on their current knowledge of the event situation; however, some weaknesses were observed related to execution of responsibilities and situational awareness. The most significant issue involved protective actions for which the EOC did not conduct any follow-up to determine the status. For example:

- Personnel evacuation and accountability were not tracked and verified during the LSPTs.
- Shelter in place was also not tracked to ensure completeness or verify the status of compliance that building ventilation systems were secured.

Lastly, some difficulty was encountered by emergency directors and EMTs in arriving at PARs for the security event scenarios. During both events, emergency directors demonstrated appropriate (conservative) decision-making in declaring a General Emergency; moreover, EMTs were sensitive to escalating event conditions and the potential for serious health and safety impacts on site and off site. However, the declaration was not based on a determination of the distance to a specific protective action criteria, as required by the protective action implementing procedure. Analysis of the potential hazardous materials release was not readily available from the CQT, and, rather than wait for CQT analysis, emergency directors chose to declare a General Emergency and issue offsite notification without PARs. Issuing the offsite notification for General Emergency without PARs was inconsistent with other offsite communications, which recommended protective measures for the surrounding offsite populations. Although consequence projections were not immediately available, protective action guidance was accessible to derive PARs using the *Emergency Response Guide*, as stated in the LLNL Emergency Plan and associated response procedures.

Finding #8: During limited-scope performance tests, emergency response organization responders did not always formulate and implement protective actions and protective action recommendations in a timely, efficient, and unambiguous manner, as required by DOE Order 151.1C and the LLNL Emergency Plan.

E.2.5 Consequence Assessment

As event information became available, CQTs developed dispersion plume plots using a variety of dispersion modeling programs, meteorological monitoring systems, and the information provided by EOC staff regarding the amount of material at risk. The resultant consequence predictions were adequate and appropriately used

to ascertain protective actions for both worst-case and real-time assessments. With the exception of the day-one security scenario, CQT personnel used and followed their position-specific checklists.

In most cases, the CQT effectively demonstrated proficiency in the use of dispersion modeling programs. However, some inconsistency and weakness were observed with a few CQT activities. CQTs did not consistently verify all EAL selections to ensure appropriate event classification and determination of protective actions. Additionally, the CQT was unable to post the plume plot in WebEOC, and, during one of the chemical scenarios, the CQT was unable to overlay the plume plot onto a MARPLOT map. Furthermore, the CQT did not demonstrate the capability to connect to the National Atmospheric Release Advisory Center dispersion modeling program, which is a Departmental expectation for sites that have the potential for an Operational Emergency classified as a General Emergency. Lastly, during both security scenarios, operations personnel in the EOC did not provide timely information to the modeler, which delayed timely initial assessment by the CQT of the hazardous materials involved.

E.3 Conclusions

During LSPTs, Independent Oversight observed the response of two sets of LLNL ERO personnel to two postulated emergency events. EMDOs demonstrated effective event categorization and classification and activation of the EOC. With one minor exception, all offsite notifications were completed in a timely, accurate manner. Likewise, LEDOs effectively established managerial command and control of the emergency response and assumed the role of emergency director. In most cases, EMDOs and emergency directors promptly verified the event classification and associated protective actions. Emergency directors demonstrated effective decision-making and leadership within the EOC and established a suitable set of priorities and course of action for each event. Emergency directors also consistently placed high priority in initiating employee notification of the events, and performed timely review and approval of news releases. The emergency directors were well supported by the EMT and EOC cadre, including the CQT, which performed accurate consequence predictions based on worst-case and real-time assessments. However, EMDOs, emergency directors, and EMTs demonstrated some weaknesses in confirming the onsite protective actions. In addition, EOC personnel had some difficulties formulating protective actions and PARs for the security event. Significantly, emergency directors, EMTs, and EOC personnel did not verify implementation of protective actions, such as personnel evacuation, accountability, or shelter in place. In addition, EOC personnel did not always provide prompt, accurate employee notifications and news releases. Finally, some ineffective communications among response components resulted in inaccurate or inconsistent understanding of event status within the EOC, TOC, and incident command post, which to some degree adversely impacted the overall response. To a large extent, these communication weaknesses reflect the lack of experience with an integrated response by the SDO, TOC, EOC, and recently-implemented EMDO position. Collectively, the various response weaknesses described in this section indicate that for an actual event, there is reduced assurance that LLNL emergency responders outside the event scene can respond in a fully effective manner.

E.4 Rating

A rating of NEEDS IMPROVEMENT is assigned to the area of Emergency Response.

E.5 Opportunities for Improvement

This Independent Oversight inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are offered to the site to be reviewed and evaluated by the responsible line management and accepted, rejected, or modified, as appropriate, in accordance with site-specific emergency management program objectives and priorities.

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- To enhance the ability to accurately classify events and select appropriate protective actions, consider having LSO personnel perform EAL and protective action verification reviews.

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- To provide a more effective response, consider the following actions:
  - Pre-authorize ERO activation levels (without the need for the EMDO to consult the LEDO) for a declared Operational Emergency or Alert, similar to those that exist for Site Area Emergencies and General Emergencies.
  - Incorporate the EMDO position into the EOC structure, similar to the LEDO position, to improve the exchange of event information and overall emergency response.
- During exercises, consider limiting ERO participation to test performance with minimum staffing to facilitate the evaluation of individual proficiency.
- When strengthening the ERO's communications protocols, consider the following actions:
  - Provide an improved capability to record, sequence, validate, and track the flow of initial emergency information that provides improved situational awareness at all venues.
  - Emphasize the use of WebEOC and event status boards during drills and exercises to strengthen the use of available information systems.
  - Include provisions to have ERO members provide more comprehensive records on their checklists.
  - Broadcast EOC EMT briefings throughout the EOC so that the entire EOC cadre is kept current on the status of event conditions, response taken, and assigned tasks.
  - Improve the accuracy of transmissions and displayed information by promoting the use of repeat-backs and reconciliation of differences between information provided by responders and other sources.
  - Elect a standard unit of measurement, English or metric, to ensure consistent communication between response venues.

- To enhance the operational awareness of response activities, consider tracking assigned tasks via status boards or assigning an EOC cadre member to keep a separate log of tasks and by keeping an electronic map displayed and updated in the EOC with the following information:
  - Isolation zone and protective action distances
  - Locations of staging areas, traffic control points, and command post
  - Wind direction
  - Buildings evacuated and evacuee relocation facilities
  - Locations where workers are being sheltered.
- Strengthen notification and communications processes. Specific actions to consider include:
  - Streamline initial notification and communications between the Protective Force Division and the EMDO during security events so that the EMDO is notified upon determination of an emergency condition.
  - Assign the EOC operations section the responsibility to monitor field responder radio transmissions and post significant information from the event scene and incident command post on WebEOC.
- Strengthen the process of implementing onsite shelter-in-place protective actions. Specific actions to consider include:
  - Validate shelter-in-place performance during exercises.
  - Develop a process for an EOC member to verify that shelter-in-place orders have been implemented in facilities required to do so.
  - Use available "key-hole" software to overlay on site maps to determine blocks and specific facilities that are in need of protective actions.
- Consider building upon existing ERO knowledge of the Emergency Response Guidebook by providing training for its use in making event classification determinations and formulating protective actions. As part of the training, provide information on hazardous materials transported within the Laboratory and then drill responders on different types of hazardous material releases.
- To improve event classification, protective action decision making, and consequence assessment functions, consider more frequent training and exercises that include the following:
  - Use of the National Atmospheric Release Advisory Center dispersion modeling program.
  - Use of tools to post plume plot projections within WebEOC for viewing by the ERO cadre and DOE Headquarters Watch Office.
  - Joint exercises with security, facility operations, and emergency management assets periodically.

- Objectives for applying bomb blast standoff charts for selecting safe shelters and standoff distances.
- Scenarios that have a potential for a hazardous material release and require time-sensitive employee notifications.

APPENDIX F
Readiness Assurance

F.1 Introduction

Emergency management program administration includes elements of readiness assurance as well as performance of some planning and response functions. Readiness assurance activities ensure that emergency management program plans, procedures, and resources of the Livermore Site Office (LSO) and Lawrence Livermore National Laboratory (LLNL) will facilitate an effective response to an emergency at the site. Readiness assurance activities include implementation of a coordinated schedule of program evaluations, appraisals, and assessments. Key elements of the readiness assurance program include the active involvement of National Nuclear Security Administration (NNSA) line organizations in monitoring program effectiveness, implementing self-assessment programs, and ensuring timely corrective actions are taken for identified weaknesses. U.S. Department of Energy (DOE) field elements also have direct responsibility for performing some emergency response activities, including oversight of the site's emergency response, and activities related to the release of emergency public information to site workers and the public.

This inspection examined the processes by which LSO provides guidance and direction to and maintains operational awareness of the LLNL emergency management program. The inspection included reviews of LSO emergency management program assessment processes and LLNL emergency management self-assessment and issues management processes.

F.2 Status and Results

F.2.1 NNSA Line Program Management

The 2005 Independent Oversight inspection concluded that LSO was adequately executing its responsibilities for oversight of and participation in the LLNL emergency preparedness program. LSO used performance measures effectively to address programmatic shortfalls. Readiness assurance activities, such as functional assessments and exercises, were utilized to provide feedback on LLNL performance, and LSO effectively followed the completion and closeout of corrective actions. However, LSO had not formally assessed all of the emergency management functional areas at the required frequency, and the LSO training program did not include position-specific training and demonstrations of proficiency. This 2008 inspection found that LSO continues to use performance measures and assessments to provide valuable feedback on Lawrence Livermore National Security, LLC (LLNS) performance and has improved the training program for LSO responders. However, some weaknesses were noted in LSO's validation that LLNS corrective actions had been completed and were effective in resolving the findings from the 2005 inspection.

The NNSA Office of Emergency Management Implementation (NA-43) provides active oversight of the LSO and LLNL emergency management programs. NA-43 activities include frequent interaction with LSO regarding current issues, status of deliverables, and other topics of interest. In addition, NA-43 provides assistance with the review of the emergency planning hazards assessments (EPHAs) and evaluations of

exercises. Further, NA-43 assisted LSO with the effectiveness review for three of the seven findings from the 2005 inspection.

LSO uses varied and effective processes for routine monitoring of the LLNL emergency management program. The consolidated emergency readiness assurance plan (ERAP) provides a comprehensive summary of the status of the LSO and LLNL emergency management programs. Additionally, the LSO emergency management program manager holds frequent meetings with the LLNS Emergency Programs Organization (EPO) to provide routine feedback on program performance, and LSO effectively uses contract performance incentives to improve the quality of the LLNL emergency management program. LSO has also delineated clear responsibilities for the review and approval of emergency management documents and has recently begun including facility representatives and other subject matter experts in the reviews of EPHAs.

LSO has established an effective training program for its emergency response organization (ERO) members through an internal procedure that identifies the training based on the assigned position. The training program includes position-specific required reading and annual participation in a drill or exercise in addition to classroom and web-based courses. The LSO emergency management program manager effectively tracks and documents the training status of LSO ERO personnel, and all personnel are current on their required training.

LSO uses well-defined processes for conducting self-assessments and contractor assessments and conducts generally detailed evaluations of the LSO and LLNL emergency management programs. LSO has established comprehensive processes for conducting self-assessments and contractor assessments that include the use of objective evaluation criteria and the review of implementation evidence, and require documentation of objective evidence used to determine how criteria were met. LSO conducts annual self-assessments of their emergency management program that include all appropriate elements. LSO also assesses the 15 elements of the LLNL emergency management program over a three-year cycle, with a few exceptions made in the last few years to balance the workload at five assessments per year. Further, assessments are well documented and generally thorough, but tend to focus on whether procedures and plans contain all applicable requirements and only occasionally include whether the requirements are implemented as stated in procedures and plans. The annual self-assessments and contractor assessments have appropriately identified several weaknesses that require corrective actions, and the ERAP contains concise summaries of assessment results. However, LSO has not assessed some aspects of their emergency management program responsibilities over the past few years, such as reviews of LLNS self-assessments. Similarly, LSO has not reviewed a few aspects of the LLNL emergency management program such as security response actions during an emergency and the LLNL emergency management corrective action program. Collectively, these omissions somewhat diminish the value of the completed assessments since issues have been identified in the past for some of these areas.

LSO has established and implemented a comprehensive issues management process for weaknesses identified during self-assessments and contractor assessments. The LSO issues management procedures appropriately include root cause analysis, tracking of issues using a computerized database (Pegasus), validation of completion of corrective actions, and verification of effectiveness of corrective actions in resolving the issue. In addition, LSO actively tracks the status of open issues from their self-assessments and contractor assessments. Further, the LSO emergency management program manager and the EPO manager discuss the status of corrective actions at twice-weekly meetings. One minor weakness was noted regarding the LSO issues management procedures, which do not include a description of the process used to modify corrective actions after they have been approved.

LSO actively participated in the closure of the corrective actions developed in response to the findings from the 2005 Independent Oversight inspection. LSO provided timely concurrence on the closure of corrective actions by LLNS and appropriately delayed concurrence on the closure of some actions when LLNS had closed actions prematurely or without sufficient evidence that actions had been completed. In addition, LSO accurately determined that two findings from the 2005 inspection were only partially effective in resolving the underlying issues. Specifically, for a finding that LLNS did not ensure that personnel on the ERO roster had completed all training requirements and demonstrations of proficiency, LSO identified that the reminders to the ERO about delinquent training were not timely and that the ERO roster was out of date. In another case, LSO properly identified that shelter-in-place plans had not been developed for all LLNL buildings and that LLNS had only sparingly assessed facility-specific, shelter-in-place capabilities in response to a finding related to shelter-in-place actions.

However, several weaknesses were noted in LSO's validation that corrective actions had been completed and verification that actions had been effective for the findings from the 2005 inspection. LSO concurred on the closure of some corrective actions, although the stated actions had not been fully completed, as discussed in further detail in Section F.2.2. In addition, LSO did not note in the DOE Headquarters Corrective Action Tracking System (CATS) that some actions listed by LSO as being complete had been found by LSO to have been closed prematurely by LLNS in the LLNL Issues Tracking System (ITS) and that LSO was awaiting additional documentation before concurring that the action was closed. Furthermore, LSO verified that corrective actions were effective for five of the seven findings from the 2005 inspection; however, in some cases, LSO did not assess whether the underlying issues had been resolved. For example, LSO did not verify that issues were being entered into ITS in a timely fashion, which is identified as a continuing issue in Section F.2.2. Additionally, LSO noted in the CATS summary screen that the corrective actions for the seven findings were closed and that the actions effectively resolved the findings. LSO did not refer to their determinations that actions for two of the findings were deemed only partially effective or that LLNS had initiated additional actions based on weaknesses identified during their effectiveness review. Further, LSO did not add these additional corrective actions to CATS or Pegasus. As a result, LSO senior management and NNSA Headquarters management do not have an accurate depiction of the effective resolution of findings and completion of all necessary corrective actions.

Finding #9: LSO has not ensured that LLNS corrective actions are consistently effective in resolving identified weaknesses, as required by LSO Work Instruction 226.1.1, *Writing and Managing Contractor Assessments, Issues, and Corrective Action Plans in Pegasus*; DOE Order 151.1C; and DOE Order 414.1C, *Quality Assurance*.

To summarize, NA-43 has frequent interactions with LSO and provides assistance with EPHA reviews, exercise evaluations, and effectiveness reviews. LSO effectively uses contract performance incentives to guide improvements in the LLNL emergency management program and clearly defines its responsibilities for review and approval of emergency management documents. Further, LSO has established an effective training program for LSO ERO members that includes training courses, required reading, and annual participation in a drill or exercise. LSO performs comprehensive assessments of the LSO and LLNL emergency management programs based on objective evaluation criteria and identifies issues requiring corrective actions by LSO and LLNS. LSO has also implemented a comprehensive issues management process that actively tracks issues from self-assessments and contractor assessments, and LSO performed a mostly comprehensive effectiveness review for the findings identified during the 2005 Independent Oversight inspection. However, LSO concurred on closure of some corrective actions that LLNS had not fully completed and conducted an effectiveness review that did not effectively consider whether the underlying issues had been resolved for some findings. Finally, LSO did not accurately describe in CATS or Pegasus that corrective actions for two

findings were only partially effective or that additional corrective actions were underway for some findings. Notwithstanding these weaknesses, LSO continues to effectively oversee and provide appropriate guidance and direction to LLNS regarding the LLNL emergency management program.

F.2.2 Contractor Feedback and Improvement

The 2005 Independent Oversight inspection concluded that, despite progress in improving the Laboratory's emergency management program through annual program self-assessments and implementation of most of the corrective actions related to the previous 2002 Independent Oversight inspection, LLNL had not yet implemented an effective readiness assurance function for emergency preparedness. The organization's procedures lacked needed specificity, and follow-up from self-assessments and exercises had not led to timely implementation of corrective actions. Furthermore, some corrective actions did not effectively address the underlying issues, as indicated by a longstanding, unresolved concern regarding the ability of site personnel to effectively shelter in place. This 2008 inspection found that LLNS has continued to improve the emergency management program. However, weaknesses were still noted in the readiness assurance function as entry of corrective actions into the ITS tracking system was frequently not timely, and the corrective actions for some of the findings from the 2005 inspection were not fully effective in resolving the underlying issues.

EPO uses the ERAP as an effective management planning tool, which accurately communicates the condition of the contractor emergency management program. Status information on updates to the hazards survey and EPHAs is included, along with the most dominant potential operational emergency for each facility with an EPHA. In addition, a drill and exercise schedule for the upcoming year is included, along with a detailed description of programmatic issues and planned actions to address the issues.

The LLNL emergency management program has developed an informative lessons learned program, although implementation of the program for the ERO has been limited. LLNS has an institutional-level lessons learned program that includes a detailed methodology for preparing, evaluating, and disseminating lessons learned. EPO recently submitted a lessons learned from a drill to the institutional lessons learned program that was then distributed site wide. Furthermore, EPO has developed additional lessons learned from drills, exercises, and actual events that are posted on the emergency preparedness and planning website, which is available to all site personnel. However, EPO does not notify ERO members when new lessons learned are posted on the website, which limits the intended purpose of the lessons learned to provide feedback and continually improve performance.

With a few exceptions, EPO has established and implemented an effective process for conducting self-assessments of the emergency management program. LLNS has fully implemented a contractor assurance system that provides broad institutional-level requirements for conducting assessments. EPO performs an annual self-assessment of the emergency management program using standards and criteria commensurate with the complexity of the program and includes all 15 elements of the emergency management program, although emergency public information was not included until fiscal year 2008. Further, EPO uses the annual self-assessments to verify the effectiveness of previously implemented corrective actions. The fiscal year 2008 self-assessment was particularly effective in identifying program and performance weaknesses, including the fact that EPO is not being notified in a timely manner of changes in facility operations or material inventories and that findings from drills and exercises are not being entered into ITS in a timely manner. In addition, EPO recently assisted management at facilities with EPHAs in conducting self-assessments that focused on the implementation of the emergency management program at those facilities. However, as was noted in the 2005 inspection report, detailed and specific directions for performing the annual emergency management self-assessment (such as expectations for documenting objective evidence and reviewing implementation of

requirements) are not included in assessment procedures or plans; as a result, the quality of the assessment is largely dependent on the expertise and diligence of the assessor. Additionally, the LLNS implementing procedure requirement for management at facilities with EPHAs to perform annual self-assessments of the implementation of facility-specific emergency management requirements has not been formalized in a laboratory-wide document.

LLNS has established a well-defined issues management process for emergency management weaknesses and has developed a comprehensive institutional issues management process that includes root cause analysis, formal change control for corrective actions, and tracking of corrective actions to completion. Issues and corrective actions are tracked in ITS, which provides for automatic reminders to action owners when corrective actions are overdue. In addition, overdue corrective actions are discussed at senior manager monthly meetings. With some exceptions, emergency management issues are systematically captured, addressed, and tracked to closure, and, for the findings identified in the 2005 inspection report, implemented actions were verified to be effective in resolving the finding. When actions were found to have been ineffective, LLNS appropriately developed additional corrective actions, and follow-on effectiveness reviews were performed when those actions were completed.

However, several weaknesses were noted in the implementation of corrective action processes for emergency management. Issues are frequently not entered into ITS in a timely manner, as was noted in a finding in the 2005 inspection. For example, corrective actions have not been developed and entered into ITS for two issues from a May 2008 assessment of the LLNL emergency management program. Similarly, most corrective actions resulting from drills conducted three to nine months prior to this inspection have also not been entered into ITS. Further, some of the corrective actions for the findings in the 2005 inspection report were closed prematurely in ITS by LLNS. For example:

- A corrective action to document in a procedure the qualification process for ERO members was closed based on the development of a draft document that ultimately required another three months before being officially issued.

- A corrective action to group facilities into three categories for shelter-in-place actions and include appropriate shelter-in-place guidance in the Environment, Safety, and Health Manual for each of the groups was closed before the facilities had been grouped, and the guidance for each group has not been added to the manual.

Additionally, effectiveness reviews conducted by LLNS for several of the findings from the 2005 inspection either did not determine whether the underlying issues had been resolved or noted that corrective actions had not been wholly effective but were nonetheless closed in ITS. For example:

- The effectiveness review for a finding related to the identification and screening of hazardous chemicals did not include confirmation that the revised hazardous material screening process more completely identified hazardous chemicals that might pose a hazard to site workers and the public and that the EPHAs reflected the new process. As discussed in Section C.2.1, this Independent Oversight inspection identified several hazardous chemicals that had not been appropriately screened in either the EPHA or the associated temporary change notice.

- The effectiveness review for a finding regarding the implementation of timely corrective actions noted that entry of identified deficiencies and issues into ITS was still not timely in all cases. Nonetheless, the finding was judged to have been effectively resolved. This issue was the subject of a finding from the 2005 inspection, and, as noted above, problems in data entry remain.

- The effectiveness review for a finding related to shelter-in-place actions included a review of the implementation of shelter-in-place actions at a sample group of facilities. The review indicated that shelter-in-place plans had not been developed for all of the facilities sampled and that some personnel did not know how to alter the ventilation system for their buildings. As noted in Section C.2.2., although LLNS has made limited progress, this finding has not been effectively addressed.

For those items that LLNS indicated were completed but not fully effective and that were submitted to LSO for closure in CATS, LLNS usually completed additional corrective actions but did not enter these actions into ITS or otherwise link the corrective actions to the original issue, thus reducing visibility and complicating traceability. When considered collectively, these weaknesses indicate that implementation of the LLNL corrective action process remains only partially effective in addressing weaknesses in the emergency management program.

Finding #10: LLNS has not ensured that corrective actions are identified and tracked in a timely manner and that corrective actions are effective in resolving identified weaknesses, as required by the LLNL Environment, Safety, and Health Manual and DOE Order 151.1C.

To summarize, LLNS provides an accurate description of the emergency management program in the ERAP, including discussions of programmatic issues and planned actions. Self-assessments have been effective in identifying issues requiring resolution, and LLNS recently initiated annual assessments of emergency management programs at facilities with EPHAs. Additionally, the issues management process effectively uses ITS to tracks issues and associated corrective actions. Furthermore, LLNS conducted effectiveness reviews for each of the findings from the 2005 Independent Oversight inspection and developed additional corrective actions for some unresolved issues. However, several weaknesses were noted in the LLNS feedback and improvement program. As noted in the 2005 inspection, LLNS provides limited guidance for conducting and documenting annual emergency management self-assessments and has not included the requirement for facility management to conduct annual assessments of emergency management implementation at facilities with EPHAs in a lab-wide document. Furthermore, timely entry of issues and associated corrective actions into ITS continues to be a weakness, as indicated by excessive delays for some issues and corrective actions. Additionally, LLNS closed in ITS some corrective actions resulting from the 2005 inspection before all actions were completed. More significantly, some LLNS effectiveness reviews did not assess whether the underlying issues had been resolved and, in other cases, identified that some corrective actions had not been fully effective, but nonetheless resulted in the closure of the associated issues. Consequently, some of the findings from the 2005 inspection remain unresolved.

F.3 Ratings

A rating of EFFECTIVE PERFORMANCE is assigned to the area of NNSA line program management.

A rating of NEEDS IMPROVEMENT is assigned to the area of contractor feedback and improvement.

F.4 Opportunities for Improvement

This Independent Oversight inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are offered to the site to be reviewed

and evaluated by the responsible line management and accepted, rejected, or modified, as appropriate, in accordance with site-specific emergency management program objectives and priorities.

Livermore Site Office

- To promote comprehensive reviews by the recently expanded EPHA reviewer cadre and continued timely approvals of emergency management documents, consider developing written protocols that:
  - Include checklists and/or procedural guidance to address such review activities as verifying facility material-at-risk quantities, sampling release calculations, reviewing protective action criteria and associated distances, understanding the derivation of emergency action levels and associated protective actions, and reviewing the determination of the emergency planning zone.
  - Establish an overall timeline and due dates for all reviews.
  - Incorporate a mechanism that ensures emergency management documents are sent to NNSA Headquarters as documents are approved.
- Consider modifying the LSO Functional Responsibilities and Authorities Manual to include all emergency management documents that require LSO approval and transmittal to NNSA Headquarters.
- Enhance the ability of the assessment program to identify and correct weaknesses in the emergency management program. Specific actions to consider include:
  - Emphasize the use of performance-based assessments whenever possible.
  - Vary the evaluation criteria used for assessments from year to year to ensure thorough coverage of the topical area.
- To improve the closure process and to provide a method for corrective action modifications, consider additional actions in the LSO corrective action procedures. Specific actions to consider include:
  - Emphasize closure of corrective actions based only on programs or documents that are approved and implemented.
  - Add a description of the process used to modify corrective actions once entered into Pegasus.

Livermore Site Office and Lawrence Livermore National Security, LLC

- To improve the usefulness of effectiveness reviews, consider the following actions:
  - Increase the use of performance-related criteria.
  - Provide training in the conduct of performance-related reviews.
  - Allow sufficient time for implementation of new processes to fully demonstrate whether underlying issues have been fully resolved.

  - When effectiveness reviews identify continuing weaknesses, review the need to re-open the issue and add additional corrective actions.

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- Consider improving the effectiveness of the lessons learned program by ensuring that all appropriate ERO members are notified when new lessons learned are posted.
- Enhance the ability of the assessment program to identify and correct weaknesses in the emergency management program. Specific actions to consider include:
  - Formalize the responsibility to conduct annual self-assessments of the facilities with EPHAs in the appropriate LLNL document with sitewide applicability.
  - Provide additional written guidance and training to evaluators on the application of inspection criteria, the standards of acceptable performance, and the expected level of detail in assessment reports.
  - Emphasize the use of performance-based assessments whenever possible.
- To further improve the corrective action process for emergency management findings, consider implementing the following specific actions:
  - Specify due dates for developing and entering corrective actions into ITS for weaknesses identified during assessments, drills, and exercises.
  - Close corrective actions based only on programs or documents that are approved and implemented.