

**Independent Oversight Review of  
Preparedness for  
Severe Natural Phenomena Events at the  
Lawrence Livermore National Laboratory**



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## Table of Contents

1.0	Purpose.....	1
2.0	Scope.....	1
3.0	Background.....	2
4.0	Methodology.....	3
5.0	Results.....	3
5.1	Objective 1: HAZMAT Release Determination.....	3
5.2	Objective 2: Emergency Equipment and Facilities.....	5
5.3	Objective 3: Training and Drill Program.....	17
5.4	Objective 4: Offsite Response Interfaces.....	19
5.5	Objective 5: Termination and Recovery.....	24
5.6	Objective 6: Emergency Medical Support.....	25
5.7	Objective 7: Corrective Action Implementation.....	27
6.0	Conclusions.....	30
7.0	Findings.....	30
8.0	Opportunities for Improvement.....	32
9.0	Items for Follow-up.....	36
	Appendix A: Supplemental Information.....	A-1
	Appendix B: Referenced Documents and Interviews.....	B-1

## Acronyms

ACFD	Alameda County Fire Department
ACRECC	Alameda County Regional Emergency Communication Center
BDBE	Beyond Design Basis Event
BNA	Baseline Needs Assessment
CAS	Central Alarm Station
DOC	Department Operations Center
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
EAL	Emergency Action Level
EMDO	Emergency Management Duty Officer
EMG	Emergency Management Guide
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
EPHA	Emergency Planning Hazards Assessment
EPIP	Emergency Plan Implementing Procedure
EPO	Emergency Programs Organization
ERG	Emergency Response Guidebook
ERO	Emergency Response Organization
EVA	Emergency Voice Alarm
F&I	Facilities and Infrastructure
FBI	Federal Bureau of Investigation
FMT	Field Monitoring Team
FY	Fiscal Year
HAZMAT	Hazardous Materials
HSD	Health Services Department
HSS	Office of Health, Safety and Security
IC	Incident Commander
ICS	Incident Command System
LEDO	Laboratory Emergency Duty Officer
LLEA	Local Law Enforcement Agency
LLNL	Lawrence Livermore National Laboratory
LLNS	Lawrence Livermore National Security, LLC
LFO	Livermore Field Office
MCI	Mass Casualty Incident
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NARAC	National Atmospheric Release Advisory Center
NFPA	National Fire Protection Association
NIMS	National Incident Management System
NNSA	National Nuclear Security Administration
NPE	Natural Phenomena Event
NRF	National Response Framework
OAG	Official Action Guide
OFI	Opportunity for Improvement
PAC	Protective Action Criteria
PAR	Protective Action Recommendation
PC	Performance Category
RAP	Radiological Assistance Program
REAC/TS	Radiation Emergency Assistance Center/Training Site
SECON	Security Condition

SEMS	Standardized Emergency Management System
S&H	Safety and Health
UPS	Uninterruptible Power Supply
USAR	Urban Search and Rescue

# **Independent Oversight Review of Preparedness for Severe Natural Phenomena Events at the Lawrence Livermore National Laboratory**

## **1.0 PURPOSE**

The Office of Enforcement and Oversight (Independent Oversight), within the Office of Health, Safety and Security (HSS), conducted an independent review of the National Nuclear Security Administration (NNSA) Livermore Field Office (LFO) and Lawrence Livermore National Laboratory (LLNL) Site 200 preparedness for severe natural phenomena events (NPEs). The HSS Office of Safety and Emergency Management Evaluations performed this review to evaluate the processes for identifying emergency response capabilities and maintaining them in a state of readiness in case of a severe NPE. This report discusses the scope, background, methodology, results, and conclusions of the review, and identifies six findings and several opportunities for improvement (OFIs).

## **2.0 SCOPE**

The scope of this review involves those aspects of the emergency management program that relate to emergency preparedness for a severe NPE. The primary areas of interest are the identification of needed facility response capabilities and their state of readiness. Lawrence Livermore National Security, LLC (LLNS) operates and manages LLNL. LLNS is a private corporation composed of Bechtel National, the University of California, the Babcock & Wilcox Company, URS Corporation, and Battelle. LLNL consists of two non-contiguous sites – the main laboratory campus (Site 200) and a remote explosives/experimental testing site (Site 300). Site 300 is situated 18 miles east of Site 200 with an approximate population of 200 employees on a 10 square-mile remote site. This review addresses only Site 200. In 2011, the City of Livermore annexed the land surrounding and including Site 200, which occupies one square-mile and has approximately 6,800 employees and 498 facilities, of which 11 could experience events causing the declaration of an operational emergency based on the nature of the hazardous materials (HAZMAT) present.

The LLNL Site 200 facilities covered by this review include:

- Emergency Operations Center (EOC)
- Alternate EOC
- Alameda County Regional Emergency Communications Center (ACRECC)
- Department Operations Centers (DOCs)
- Metal Finishing Facility
- Plutonium Facility.

This review includes portions of the following emergency management program elements outlined in U.S. Department of Energy (DOE) Order 151.1C, *Comprehensive Emergency Management System*:

- Technical planning basis
- Plans and procedures
- Training and drills
- Emergency medical support
- Emergency facilities and equipment
- Termination and recovery

- Offsite response interfaces.

### 3.0 BACKGROUND

Numerous examples of severe NPEs and other catastrophic events, such as earthquakes, tornadoes, floods, wildland fires, and manmade disasters, have emphasized the need to adequately plan and prepare for a large-scale event that could degrade or overwhelm a site's emergency response capability. Emergency planners at DOE/NNSA sites determine needed site emergency response capabilities based on site-specific attributes, such as types and forms of HAZMAT, demographics, and geography, using a variety of deterministic analyses. The primary means for determining needed response capabilities are the emergency planning hazards assessments (EPHAs). The analyses contained in the EPHAs should describe a spectrum of events that represent plausible HAZMAT release scenarios, such as operator errors, mechanical failures, fires, and explosions from unintentional or intentional initiators.

The facility-specific documented safety analysis (DSA) report contains scenarios used by personnel to reduce risk from operations to acceptable levels; these scenarios are referred to as design basis events. When establishing a facility design, DSAs do not analyze events that are more severe than the parameters defined for the design basis event. Such "beyond design basis events" include severe NPEs that represent the upper end of the consequence spectrum for which DOE/NNSA facilities are required to prepare, in accordance with DOE Order 151.1C.

To prepare for a severe NPE, emergency response staff must plan a means to provide for immediately protecting personnel, mitigating the consequences of a potential HAZMAT release, and establishing appropriate short-term recovery actions. Preparations include designating alternate emergency response facilities; having redundant and diverse communication systems in case an event renders the primary facilities and equipment unavailable; providing for coordination and integration with local, state, and Federal response organizations; and maintaining other specific planning and response capabilities needed for a comprehensive emergency management program.

Several factors present challenges to the LLNL emergency management program in complying with the requirements of DOE Order 151.1C to provide the appropriate response measures to protect workers, the public, the environment, and national security. These factors include:

- Planning by LLNL to include the City of Livermore
- Emergency response centers and alternate response centers near HAZMAT facilities
- Subcontract with Alameda County Fire Department (ACFD) for onsite fire services
- Site compliance with the California Standardized Emergency Management System (SEMS).

The impact of these factors on emergency planning, incident response, and command and control is discussed throughout this report.

The management structure responsible for strategic emergency planning, preparedness, response, recovery, resource management, readiness assurance, and associated maintenance activities at LLNL is the LLNS Emergency Management Department. Response to fire, medical, and HAZMAT incidents on LLNL property is provided by the ACFD under contract to LLNS. The ACFD staffs the LLNL fire stations with DOE security-cleared fire fighters and fire fighter/paramedics. Both LLNS and the ACFD have ongoing contacts and mutual-aid agreements with local response agencies.

According to the LLNL emergency plan, the initial response to a HAZMAT emergency is by the fire department, and the fire captain, an employee of ACFD, becomes the incident commander (IC) to establish control of the incident scene. The senior fire officer (fire captain or battalion chief) determines whether the emergency is a potential operational emergency and, if so, notifies the battalion chief. The battalion chief then relays information to the emergency management duty officer (EMDO) who is responsible for categorizing the operational emergency and further classifying the operational emergency as an Alert, Site Area Emergency, or General Emergency and, if required, provides revised protective action recommendations (PARs) to the appropriate offsite authorities. The specifics of this process are a focus of concern by Independent Oversight and discussed in further detail in the body of this report.

LLNS has a disaster/self-help program designed for response to NPEs impacting LLNL that cause limited or no immediate response from ACFD or other external emergency response organizations (EROs). LLNS relies on employees to make an initial and continued effort to respond to and control emergencies until other aid arrives. LLNS has placed disaster first-aid/self-help boxes that contain emergency supplies at designated assembly points for employees' use.

#### **4.0 METHODOLOGY**

Independent Oversight evaluated the processes for identifying emergency response capabilities and maintaining them in a state of readiness in case of a severe NPE. DOE Order 151.1C identifies the functional emergency response requirements for a DOE site/facility, and the emergency management guides (EMGs) associated with DOE Order 151.1C provide guidance for implementing these requirements. Independent Oversight used the order and associated guides to determine whether DOE requirements and expectations are met. Independent Oversight also referenced applicable DOE, Federal, state, and local requirements when determining compliance with the DOE order. The scope of this review is consistent with Objectives 1 through 7 of HSS Criteria, Review, and Approach Document 45-56, *Emergency Management Program Inspection Criteria, Approach, and Lines of Inquiry, Review of Preparedness for Severe Natural Phenomena Events*.

This Independent Oversight review was accomplished by reviewing the documentation that establishes and governs the LLNL site emergency management program processes, such as emergency plans, procedures, safety basis documents, program implementing checklists, records of program activities, and memoranda of agreement (MOAs); interviewing key personnel; and performing walkdowns of facilities and equipment.

#### **5.0 RESULTS**

The following sections discuss the observations made by Independent Oversight during this review, keyed to the objectives in HSS Criteria, Review, and Approach Document 45-56.

##### **5.1 Objective 1: HAZMAT Release Determination**

**The site has an effective mechanism for quickly determining whether an NPE results in the loss of a significant quantity of HAZMAT and is beyond the site's capability to respond.**

Independent Oversight reviewed the process guides that LLNS uses to develop their hazards survey and EPHAs, as well as the site hazards survey, EPHAs, and DSAs for the Metal Finishing Facility and the Plutonium Facility. The hazards survey and EPHAs were reviewed to determine the accuracy and adequacy of analyses conducted for severe NPEs. The DSAs were reviewed to determine the consistency

of the beyond design basis events (BDBEs) identified in both the DSAs and the EPHAs. Further, Independent Oversight reviewed the emergency action level (EAL) statements contained in the facility-specific EALs to determine whether the EALs were based on, and correlated with, the documented consequence analyses in the Plutonium and Metal Finishing Facility EPHAs. The EALs were also reviewed to determine their usability during plausible severe events (e.g., seismic event damaging multiple facilities on site) where the analysis concludes that such events would overwhelm or incapacitate the site's response capability.

Independent Oversight determined that LLNS has a means for quickly establishing whether a severe NPE results in the loss of a significant quantity of HAZMAT that is beyond the facility's capability to respond using the EALs. Independent Oversight also determined that LLNS appropriately analyzed plausible scenarios representing severe NPEs in the LLNL EPHAs and factored the results into the determination of assistance capabilities needed for an effective emergency response. However, Independent Oversight identified some usability concerns with the EALs and indications that the ICs may choose to use the Department of Transportation 2012 Emergency Response Guidebook (ERG) rather than the EALs for making protective action decisions, contrary to DOE guidance.

DOE Order 151.1C requires development of a hazards survey to examine the features and characteristics of the facilities and activities and to identify generic emergency events and conditions, including NPEs such as earthquakes and tornadoes, and the potential impacts of such emergencies. This order also requires that if the hazards survey identifies specific HAZMAT in quantities that, if released, could result in an operational emergency by causing an airborne health hazard, the potential release of these materials requires further analysis in an EPHA. DOE Guide 151.1-2, *Technical Planning Basis EMG*, recommends that analyses in the EPHA calculate the consequences at specific receptors of interest (i.e., facility boundary, onsite receptor locations, site boundary, and offsite locations of interest) and calculate the maximum distances at which consequences exceed the applicable protective action criteria (PAC) used to develop default initial protective actions.

LLNS has developed an adequate hazards survey and EPHAs to meet the requirements of DOE Order 151.1C and the LLNL procedure for developing and maintaining these documents. The LLNL procedure identifies the NPEs of earthquake, wind, and flood as potential initiating events at LLNL for analysis. LLNS analyzed these events in the Plutonium and Metal Finishing Facility EPHAs and determined an earthquake was the severe NPE of concern that represents the bounding BDBE. The conservative analyses contained in EPHAs identify a hydrochloric acid release at the Metal Finishing Facility and a plutonium fire at the Plutonium Facility as the worst-case events, both representing general emergencies.

The order requires the development of EALs for the potential operational emergencies identified in the EPHA, which must include protective actions corresponding to each EAL. Additionally, DOE Guide 151.1-2 recommends that EALs contain event indicators that are prompt, unambiguous, and reliably associated with the event or condition so that personnel can quickly recognize the event and apply the correct EAL. Although LLNS has technically based EALs, the lack of observable entry indicators makes it difficult for the user to select the correct EAL for a specific event and quickly formulate protective actions and event classification. (See Section 8.0, **OFI 1.**) For example, the Plutonium Facility BDBE (earthquake) EAL would require the user to know the exact quantity of plutonium involved in a release to within a fraction of a pound, which would be difficult or impossible for the user to determine during an emergency event.

Additionally, the EAL set does not completely reflect the results for all analyzed events in the EPHAs. (See Section 8.0, **OFI 1.**) For example:



- The EAL set for the Metal Finishing Facility does not contain an EAL specific to the EPHA-analyzed earthquake event for use in formulating protective actions and PARs.
- The EAL set for the Plutonium Facility contains an EAL specific to the EPHA-analyzed earthquake event; however, PARs are not explicitly identified to provide to offsite authorities.

Further, all of the LLNL EAL sets inappropriately implement protective actions that are dependent on weather conditions by implementing protective actions to downwind areas. This practice is contrary to DOE Guide 151.1-4, paragraph 4.5.2, that does not encourage the use of real-time weather data for initial protective actions and recommends a 360-degree protective action distance utilizing PAC as the initial protective action boundary.

The initial protective actions implemented by the IC for a HAZMAT release may not be consistent with DOE policy. LLNS emergency plan implementing procedures (EIPs) assign protective action tasks to the ACFD battalion chief (who has responsibilities beyond the LLNL boundary) or, in the absence of the battalion chief, to the ACFD fire captains. However, the fire captains are not required to take LLNL EAL training (discussed further in Section 5.3). Independent Oversight's interviews with ACFD personnel indicated that although they have the EALs, they would likely use the ERG for establishing initial protective actions because they are more familiar with its application. Use of the ERG is contrary to DOE guidance because the ERG is generally less accurate and usually less conservative for the following reasons (see Section 5.3, **Finding F-4** and Section 8.0, **OFI 2**):

- The ERG distances are a function of: (1) the Lethal Concentration 50 (LC50) of the substance, which is the concentration of a material in air that will kill 50 percent of those exposed when administered as a single exposure (typically 1 or 4 hours); and (2) the quantity of the substance, which is categorized as either small (less than 200 liters) or large.
- For radioactive waste, the DOE PAC distances are based on the Environmental Protection Agency (EPA) protective action guides for radioactive materials. For chemicals, the distances are based (in order of preference) on the acute exposure guideline level, emergency response planning guidelines, temporary emergency exposure limits, and a more accurate estimation of source terms based on administrative, engineering, or other controls.

These dissimilarities can result in significantly different protective action distances. For example, with chlorine, which is present on site, the EPA PAC-2 distance used for initial protective actions is 2800 meters, while the ERG protective action distance is 400 meters.

Overall, LLNS developed a means for quickly determining whether analyzed events result in the loss of a significant quantity of HAZMAT and are beyond the site's capability to respond. Although technically founded, the lack of observable entry indicators makes it difficult for the user to select the correct EAL, adversely affecting the ability to determine and coordinate protective actions. Further, the IC (ACFD battalion chief or captain) may use the ERG rather than the EALs that meet DOE requirements for implementing initial onsite protective actions and offsite PARs.

## **5.2 Objective 2: Emergency Equipment and Facilities**

**The site has the means to perform required emergency response functions using designated facilities and reliable onsite equipment in case of severe NPEs.**

Independent Oversight reviewed the site-level Plutonium Facility, and Metal Finishing Facility response plans, facilities, and equipment used to implement protective actions. The equipment includes:

- Normal and backup power sources
- Habitability systems
- Emergency response equipment
- Communication systems.

Facilities important for LLNL emergency response consist of the EOC, the ACRECC, DOCs in various buildings, and designated alternate facilities for use when an event renders the primary facilities uninhabitable or inaccessible. The DOCs are not required facilities by DOE policy, but the laboratory emergency duty officer (LEDO) may activate some or all DOCs as part of LLNS response. Independent Oversight examined three DOCs during this review: the Health Services Department (HSD) DOC, the Facilities and Infrastructure (F&I) DOC, and the Safety and Health (S&H) DOC.

Independent Oversight determined that LLNS has planned for the loss of primary command and emergency response facilities in accordance with DOE policy. However, some alternate facilities used in LLNL response plans are in relatively close proximity to the primary HAZMAT facilities, thereby increasing the likelihood both facilities will be unavailable during a HAZMAT release, placing the occupants health at risk, or causing an unnecessary disruption in event management while occupants relocate. Additionally, LLNS does not meet National Fire Protection Association (NFPA) standards in the areas of testing and maintenance of fixed diesel generators and emergency egress lighting at some of these facilities.

Independent Oversight also determined that with one significant exception, LLNS's communication systems facilitate information flow during an emergency. LLNS self-identified reliability and coverage concerns in their system that provides workers with time-urgent emergency notifications but did not institute compensatory measures while the system is undergoing repair or replacement. Further, Independent Oversight identified specific areas for improvement in siting of command and response centers, emergency egress lighting, radio preventive maintenance, emergency communication equipment testing, and the Metal Finishing Facility emergency response equipment procedure. These OFIs are discussed below and identified in Section 8.0.

### **5.2.1 Normal and Backup Power Systems**

Independent Oversight reviewed normal power and backup power sources for the primary EOC; ACRECC; selected DOCs); Plutonium Facility; and Metal Finishing Facility (a chemical HAZMAT facility). LLNL backup power sources addressed by this review consisted of diesel generators, uninterruptible power supply (UPS) systems, and batteries. Additionally, Independent Oversight examined the LLNS protocols used to ensure that sufficient and reliable fuel is available in case of a long-term loss of normal power. Independent Oversight reviewed design, maintenance, and test documents; interviewed personnel; and performed system walkdowns to reach its conclusions.

DOE Order 151.1C does not contain prescriptive requirements for normal and backup power systems supporting command centers and response equipment; rather, the order requires provisions for an alternate location if the primary command center is not available. In addition, DOE Order 151.1C requires the site to maintain facilities and equipment adequate to support critical response functions and ensure that the facilities and equipment are available and operable. DOE Guide 151.1-4, *Response Elements EMG*, further recommends that the EOC have alternate power supplies as one of the habitability systems.

Independent Oversight used the following NFPA documents in its review of LLNL facilities because LLNS is committed to adhering to these in authorization basis and design criteria documents and they are the basis for DOE-STD-3003-2000, *Backup Power Sources for DOE Facilities*:

- NFPA-72, *National Fire Alarm and Signaling Code*
- NFPA 101, *Life Safety*
- NFPA-110, *Standard for Emergency and Standby Power Systems*
- NFPA-111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*.

Overall, LLNL has adequate normal and backup generator capacity and sufficient UPS systems or battery sources to provide continuous power during generator start and loading operations. LLNL generators are in a state of readiness via their auto-start capabilities, fuel supply tanks are filled to a level for a minimum of eight hours of operation, and a periodic fuel analysis program is in place. LLNS has prepared for long-term generator operations via a contracted supplier with multiple fuel sources, large bulk storage tanks on site, and two LLNS operated fuel distribution trucks.

However, LLNS has not properly designated generators for the appropriate level of testing and maintenance per NFPA standards and has not established compensatory measures while emergency egress lighting problems are corrected over a long-term implementation schedule. Both of these conditions increase the likelihood that people may have to evacuate buildings in the dark if there is a loss of normal power.

### **Normal Power**

LLNL has a reasonably reliable source of power from offsite sources. Two offsite utility companies provide normal power to the LLNL site electrical distribution system through multiple substations. The LLNL electrical distribution system provides normal power through a dual loop underground electrical distribution system with manual cross-connect capability.

### **Backup Power**

LLNL has adequate backup power sources to power most of the EOC and other essential emergency response equipment. Fixed diesel generators provide backup power to essential equipment during a loss of normal power. UPS systems or batteries provide continuous power to important equipment while generators start and provide backup power for designated loads, and typically will power equipment for at least 30 minutes. Details of building-specific backup power capabilities and their state of readiness are further discussed in Sections 5.2.3 and 5.2.4. LLNS also has mobile generators of various sizes that are capable of powering the same equipment as the fixed generators. However, the LLNS diesel generator maintenance and test program does not fully meet NFPA-110 criteria for generators relied on for emergency egress lighting or the operator's supervisory station.

Although no official LLNS document clearly identifies LLNL fixed generators by their NFPA-110 level, type, and class, LLNS test personnel have stated that the Plutonium Facility generators are tested and maintained to NFPA-110 level-2 standards and all other generators are tested and maintained as optional generators, a designation to which NFPA-110 does not apply. Independent Oversight concluded that some of the optional generators should be tested and inspected as NFPA-110 level-1 generators, which is the most rigorous test and maintenance program, because they either provide backup power to the ACRECC, which serves as an operator's supervisory station under NFPA-72, or are relied upon for building emergency egress illumination. Additional details are discussed in section 5.2.3.

**Finding F-1: LLNS does not test and maintain diesel generators serving as backup power to emergency egress lighting as level-1 diesel generators, as required by NFPA 101, *Life Safety*, and NFPA-110, *Standard for Emergency and Standby Power Systems*.**

**Finding F-2: The operator's supervisory station is not equipped with a backup power source that can operate for 24 hours without refueling, and the diesel generator that provides backup power is not tested as a level-1 generator, as required by NFPA-72, *National Fire Alarm and Signaling Code*.**

LLNS has identified many buildings that do not meet NFPA-101 requirements for emergency egress illumination and is addressing this shortcoming through a ten-year corrective action plan. This condition was discovered in December 2010 when employees reported the lack of illumination to support building evacuations during a significant site power outage. LLNS's investigation concluded that this condition was widespread, affecting 115 buildings at Sites 200 and 300. Furthermore, backup power at many buildings that have emergency lights cannot be tested per NFPA-72 criteria because they are not equipped with local test capabilities. As an alternative, LLNS credits diesel generator tests for satisfying emergency egress light backup power testing. Although LLNS is making progress to remedy the lighting issues and has increased battery maintenance and replacement frequencies where NFPA standards are not met, Independent Oversight noted that LLNS has no compensatory measures in place to ensure that workers can safely evacuate the buildings that are not properly equipped with emergency egress lighting while implementing the ten-year corrective action plan. (See Section 8.0, **OFI 3**.)

### **Diesel Generator Refueling Plans**

LLNS has established adequate refueling plans for long-term diesel generator operations. LLNS has contracted with a single supplier that has multiple diesel fuel sources in the local area. Additionally, LLNS has two onsite bulk storage facilities – one 6000-gallon aboveground tank and one 10,000-gallon underground tank – and distributes fuel from these tanks to the generators via two 2000-gallon fuel distribution trucks. Furthermore, by LLNS design criteria, each fixed generator fuel tank is required to have sufficient fuel capacity to provide at least eight hours of generator operation. LLNS checks the generator fuel tank levels at a frequency that depends on the site's designated NFPA level of the generator.

LLNS ensures the purity of diesel fuel via periodic sampling and analysis of fuel in supply tanks. The diesel generator fuel tanks are sampled at least annually, and are analyzed by a contracted vendor, who has identified debris in some of the tanks, such as one of the Plutonium Facility diesel generator tanks. LLNS has corrected this problem by removing and filtering the fuel and refilling these aging tanks. The fuel debris has not caused problems during generator testing.

Overall, LLNL has an adequate normal power distribution system and maintains a capability to provide backup power to essential loads for an emergency response from backup diesel generators, UPS systems, and batteries. LLNS maintains adequate fuel supplies via a contracted supplier, large onsite bulk storage tanks, and a periodic fuel analysis program to ensure a reliable fuel supply for long-term generator operations.

Nevertheless, LLNS's diesel generator test and maintenance program and emergency egress lighting corrective action plan warrant improvements. One of the diesel generators provides backup power to the ACRECC, which is an operator's supervisory station under NFPA-72. Other generators provide backup power for emergency egress lighting, for which NFPA-101 and NFPA-110 establish a generator designation of level-1, with the most rigorous test and maintenance program. (See **Findings F-1** and **F-2**.) Further, LLNL is implementing a ten-year corrective action plan to install emergency egress

lighting to meet NFPA-101 but has not established compensatory measures to ensure that illumination is available to aid evacuees in case a loss of normal power in the interim. (See Section 8.0, **OFI 3.**)

## **5.2.2 Communication Systems**

Independent Oversight reviewed the key communication systems that the LLNL personnel – specifically, the EOC, EMDOs, HSD, S&H DOC, F&I DOC, ACRECC, and ACFD – use to communicate with each other; site personnel; and offsite local, state, and Federal agencies and organizations. The primary and backup systems were examined, along with the processes for maintaining and periodically testing the systems to ensure operability. Independent Oversight also reviewed the availability of alternate means to perform critical tasks when a primary system is out of service due to a severe NPE.

DOE Order 151.1C requires that equipment adequate to support an emergency response be available, operable, and maintained and that tests of the communication systems used to contact offsite agencies be performed at least annually. The order further requires that sites have the capability to notify employees of an emergency and to facilitate the safe evacuation or sheltering of employees. In addition, NFPA-1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*, discusses testing incoming telephone lines daily in facilities where 911-type calls are answered. DOE Guide 151.1-4 provides additional guidance for communication systems and states that systems relied on to provide notifications and activate the ERO should be tested and maintained regularly. The guide also states that backup communications, such as cellular and/or satellite telephones and radios, should be available and periodically tested. In addition, the guide specifies that sites should integrate their communication systems with offsite responders and should periodically verify all emergency telephone and facsimile numbers with offsite agencies.

The ACRECC dispatchers appropriately operate the emergency reporting telephone system and ensure continuous operability of the system. Emergency calls originating at LLNL also ring simultaneously in the central alarm station (CAS) and at the LLNL ACFD fire station. If the ACRECC dispatchers have to evacuate, they can transfer LLNL emergency calls to the CAS or the Alameda County Sherriff's Office. To meet the requirements of NFPA-1221, protective force personnel in the CAS test the LLNL 911 telephone system daily by calling the ACRECC dispatchers on the emergency line.

The LLNL Emergency Programs Organization (EPO) uses a variety of suitable methods to activate the ERO and conducts periodic tests to confirm operability. The EMDO activates the ERO using an automated notification system that transmits voice and text messages to the various devices registered in the system for each ERO member (i.e., pagers, work telephones, home telephones, and cellular telephones). A noteworthy feature of the automated notification system is the ability to access the system from any telephone, including the remote backup system located in Tennessee. If the automated notification system and remote backup system both fail, the EMDO can contact the ERO members individually using the site paging system. Furthermore, EPO performs both announced and unannounced tests of the automated notification system and uses the data from the tests in a monthly performance metric that measures the ERO's responses on availability. Testing data for fiscal year (FY) 2012 indicates an ERO availability of at least 98 percent.

LLNS is adequately equipped to provide appropriate emergency notifications to offsite organizations. The EMDO uses the automated notification system to record and transmit a verbal message to the offsite organizations containing the initial notification information. If the automated notification system fails, the EMDO can verbally provide the initial notification information to offsite organizations using the telephone contact list carried in the EMDO duty notebook. EPO validates the telephone and facsimile numbers for the offsite organizations quarterly by sending verbal and facsimile test messages. EPO uses

the data from the tests in a quarterly performance metric that measures the ability to reach the offsite organizations. Testing data for FY 2012 indicates an offsite agency response of 100 percent.

The LLNL radio system provides a robust and adequate mobile communications link. Field responders use radios as the primary method for communication in the field; the EOC, EMDO, and DOCs monitor the radio traffic during an emergency. LLNS uses a radio system that covers both LLNL sites and most of the surrounding area. To communicate with offsite responders, the LLNL-based fire fighters use a separate hand-held radio to reach the Alameda County radio system, because ACFD does not allow LLNS to program the LLNL-issued radios with the ACFD frequencies. Backup generators power the system's repeaters if normal power is lost. Additionally, the radio system can operate in simplex mode (limited to line-of-sight and reduced range) if all of the repeaters in the system fail. Notably, the Emergency Management Department has an MOA with a group of LLNS employees, who are licensed amateur radio operators, to provide additional radio services at the various ERO venues during an emergency.

LLNS performs appropriate periodic maintenance on the radio system, but the preventive maintenance process and EPO's testing practices do not ensure that the hand-held radios will function as needed. LLNS checks the radio system repeaters annually using the manufacturer's procedure; the remaining components of the radio system require minimal periodic maintenance. The manufacturer also recommends performing preventive maintenance on the hand-held radios every two years. LLNS tracks when preventive maintenance is due for these radios, but does not have a process to notify the user organizations when their radios are due for preventive maintenance. In addition, several of the ERO organizations interviewed by Independent Oversight were unaware that their radios needed preventive maintenance because no indicator of when preventive maintenance is performed or is due (such as a sticker) is present on the radios. Further, these ERO organizations were unaware of the LLNS policy that they must pay for radio repairs and preventive maintenance out of their own budgets, so they have not set aside funds to pay for the preventive maintenance required this FY. (See Section 8.0, **OFI 4**.) Additionally, an EPO EPIP requires monthly tests of the EOC radios and documentation that the tests were completed; however, EPO tests the radios by using them during drills and exercises (which do not occur every month) and does not document the tests as required per the EPIP. (See Section 8.0, **OFI 5**.)

The ERO venues are well equipped with telephones and facsimile machines. This equipment is periodically tested, but the testing practices are largely informal. All ERO locations are equipped with an adequate number of telephones and facsimile machines, and the EOC and ACRECC have several telephone lines routed through a telephone switch external to the LLNL site exchange. In addition, LLNS allows cellular telephones, which most ERO members possess, to be used throughout most of the LLNL site. The EOC is also equipped with a satellite telephone, and ring-down telephones are available to directly connect some of the ERO venues. Further, LLNS has access to the Wireless Priority Service, which provides priority cellular telephone access during periods of severe network congestion or disruption. Several ERO locations conduct only sporadic testing of their infrequently used telephones and facsimile machines to ensure operability. The HSD and F&I DOC coordinators test their telephones monthly, but their DOC procedures do not contain a testing requirement and they do not document the tests. Additionally, the S&H DOC coordinator tests their telephones by using them during drills and exercises, rather than monthly as specified by the S&H DOC procedure, and does not document the tests as required. Furthermore, an EPIP requires EPO to perform various checks of the EOC and alternate EOC telephones and facsimile machines, but it does not describe the testing methods and does not accurately describe how often some tests are performed. (See Section 8.0, **OFI 5**.)

LLNS has a limited number of methods for notifying employees of an emergency, and daily tests of the notification system provide limited value as currently conducted. The Emergency Voice Alarm (EVA) system is the ACRECC dispatchers' primary means of communicating emergency notifications and protective action instructions to workers. The EVA system provides coverage for the occupied buildings,

and it can be activated from multiple locations. Additionally, ACRECC dispatchers contact hearing-impaired employees using a dedicated alphanumeric pager group and broadcast the emergency information over the fire and alarm radio channels. The LLNL Alarms Division performs semiannual and annual tests of the EVA system as required by NFPA-72, *National Fire Alarm and Signaling Code*. The ACRECC dispatchers test the EVA system daily; however, because the test occurs before most of the buildings are occupied for the day and LLNS rarely uses the system for other types of announcements, building occupants would likely not know whether the EVA system is malfunctioning in their building. (See Section 8.0, **OFI 6**.)

Reliability and coverage issues in the EVA system substantially diminish LLNS's ability to provide prompt initial emergency notifications to site workers. The 2011 and 2012 exercise after-action reports identified frequent problems with the EVA system that included garbled messages, a loud screeching noise with no audible message, and inaudible messages. To correct these problems, LLNS is repairing and replacing the relevant portions of the system over a multi-year period but lacks the funding to complete all needed replacements. Moreover, LLNS did not implement compensatory measures to ensure that employees receive prompt initial emergency notifications in the interim. Furthermore, in 2011 and again in 2012, EPO self-identified that the limited number of outdoor speakers on the EVA system cannot ensure that notifications reach all outdoor workers. EPO developed corrective actions to address this issue, but none have been completed, and no compensatory measures are in place. Consequently, LLNS lacks a reliable method for providing timely emergency instructions to workers. (See **Finding F-3** and Section 8.0, **OFI 7**.)

**Finding F-3: LLNS cannot ensure that site workers receive prompt initial emergency notifications as required by DOE Order 151.1C.**

Overall, with one notable exception, the communication systems are sufficient to facilitate most information flow during severe NPEs. Redundant communication systems for most critical emergency response functions increase the likelihood that one or more systems can perform each function in case of a severe NPE. Nonetheless, limitations in preventive maintenance for radios and testing of some equipment diminish the robustness of the communication systems. More significantly, LLNS cannot ensure that workers receive prompt initial emergency notifications, including instructions to take protective actions, while LLNS resolves the reliability and coverage issues in the EVA system.

### **5.2.3 Emergency Response Facilities**

Emergency response facilities are primary and alternate buildings where emergency responders will assemble to perform their emergency response functions in accordance with the LLNS emergency plan. Independent Oversight examined two primary emergency response centers and their designated alternate locations, and three DOCs for their survivability and habitability in case of a severe NPE: the EOC, ACRECC, HSD, F&I, and S&H.

An earthquake is the most significant NPE of concern for LLNL facilities, and LLNS has been conducting seismic assessments and upgrades to LLNL facilities over the past decades for a variety of reasons. From the most recent seismic assessment, LLNS has identified buildings that are in need of seismic upgrades or demolition and has established building upgrade priorities based on building use and the amount of likely earthquake damage. LLNS has upgraded or demolished most of these buildings, but some remain in use without full resolution, and no funding is currently available for completion. Three of buildings are within the scope of this Independent Oversight review, namely, F&I, S&H, and the Metal Finishing Facility. Other buildings within the scope of this review meet or exceed the building codes that were in effect at the time of construction or have been rehabilitated to meet at least performance category (PC)-1 criteria.

## Emergency Operations Center

Independent Oversight reviewed the EOC's documented capability to withstand analyzed severe NPEs and its ability to survive and enable the ERO to remain in a safe environment to perform its emergency response functions. Items of interest include alert and warning systems, communication systems, habitability systems, backup power sources, and response procedures to support an emergency.

DOE Order 151.1C does not contain prescriptive requirements for EOCs; rather, it requires a viable command center where required emergency response functions can be performed, along with provisions for an alternate location if the primary command center is not available. DOE Order 151.1C also requires the site to maintain facilities and equipment adequate to support critical response functions and ensure that the facilities and equipment are available and operable. DOE Guide 151.1-4, *Response Elements EMG*, further recommends that the EOC have habitability systems and that an alternate EOC be located to minimize the risk of losing both facilities from the same event due to habitability or accessibility concerns. DOE Guide 151.1-4 defines a habitable EOC as one capable of remaining operable and life supporting for an extended period under accident conditions and maintaining its structural integrity under various design basis events, including a severe NPE. A habitable EOC must maintain a breathable atmosphere, provide sufficient shielding from radioactive material and other HAZMAT, and have a backup power supply.

The LLNL EOC is likely to survive all but the most severe earthquakes, but it is not fully equipped with the recommended habitability systems, and standby power sources are not tested to comply with the appropriate standards. The EOC is located in a PC-2 structure equipped with a habitability system, which only serves the EOC portion of the building, and a 600 kilowatt fixed diesel generator. Tests results in 2011 indicated that the carbon filter beds should have been replaced at that time but were not. Additionally, the EOC is subject to blackout conditions because it is in one of several buildings that are not fully equipped with emergency egress lights, and the lights that exist lack capabilities for local testing. For building lighting, LLNS relies on a generator, which NFPA-110 and -101 designate as a level-1 system for testing and maintenance; however, as noted, LLNS has designated it as optional. (See **Finding F-1**.) Furthermore, the building is not equipped with a central UPS system and the EOC space has no emergency lights, so if the generator does not start and power the equipment, the EOC would be in a blackout condition. To mitigate the consequences of this condition and maintain compliance with DOE 151.1C, LLNL has established alternate locations for use as an EOC.

## Alternate EOCs

Except for blackout conditions, the alternate EOC facility is susceptible to the same conditions as the EOC. The alternate EOC is in a building, which has been rehabilitated to meet PC-2 criteria, can be powered from a fixed optional diesel generator, and is equipped with properly tested emergency egress lighting. However, the alternate EOC is not equipped with the recommended habitability systems or a central UPS system, and it is located closer to several HAZMAT sources than the EOC. The alternate EOC also serves as the alternate call/dispatch center for Alameda County personnel. (See Section 8.0, **OFI 18**.) Although there is an agreement between LLNS emergency management personnel and Alameda County personnel to share the room, the LLNS fire marshal voiced his opposition of both organizations gathering together because the crowded space is not considered to be an effective work environment with the multiple communication activities occurring there. As another option, LLNS has designated a vehicle as a mobile alternate EOC, and Alameda County is planning to establish a building in the nearby city of Dublin as their alternate call/dispatch center later in 2013.



## **Alameda County Regional Emergency Communication Center**

The ACRECC is an important facility to remain staffed during operational emergencies. Alameda County personnel continually staff the facility because it serves as the county's primary call and dispatch center for local governments and the LLNL site. It also houses important LLNL equipment, such as the LLNL supervisory station alarm system and the EVA system maintained by LLNS.

The ACRECC is likely to survive all but the most severe earthquakes, but the functions performed there are susceptible to HAZMAT releases. It is a hardened facility that meets PC-2 criteria for seismic and wind except for the roof, which does not meet tornado criteria. Further, it is equipped with three fixed optional generators, UPS systems, and batteries, but lacks all recommended habitability systems. Although three fixed generators are available to power equipment within the building, their configuration and maintenance and test programs do not meet NFPA-72 criteria for an operator's supervisory station. The electrical distribution system consists of two separate subsystems, one dedicated to Alameda County operations and one dedicated to the LLNL EVA and fire monitoring and alarm systems. For Alameda County operations, there is one generator and a one-hour battery as backup power sources. LLNS, which performs all maintenance and test activities, has designated this generator as an optional generator for purposes of maintenance and testing, and the generator is equipped with only an eight-hour internal fuel supply. Therefore, the configuration does not meet the NFPA-72 criterion that generators used as backup power sources for an operator's supervisory station be maintained and tested in a level-1 program and be equipped with a 24-hour fuel supply tank. (See **Finding F-2.**)

The LLNS equipment in the ARECC has reliable backup power systems consisting of two diesel generators, UPS systems, and batteries. During normal operations, LLNS equipment is powered via a UPS unit from utility power, ensuring continuity of power in case of a loss of normal power. A second redundant UPS unit provides an additional power source if the first UPS unit fails. If both UPS units fail, power is provided by additional batteries that are separate from the UPS units. Two optional generators, configured in a lead/lag automatic start mode, are available to power LLNS equipment. Each of these generators has an integral eight-hour fuel tank.

LLNS has an adequate maintenance and test program for backup power sources for their equipment in the ARECC. LLNS tests the generators as optional standby generators, which require only a monthly manual start and a quarterly automatic start test. The UPS units are self-diagnostic and provide trouble alarms in the ACRECC operating space. LLNS also periodically tests and inspects the UPS units and replaces their five-year batteries every three years. UPS periodic testing includes an annual 30-minute discharge test. LLNS periodically tests and inspects the other batteries and replaces them on a four-year schedule.

## **Department Operations Centers**

The LLNS LEDO activates the DOCs to support the emergency management team in the EOC. LLNL emergency plans have established seven primary DOC facilities, and Independent Oversight examined three of these (HSD, F&I, and S&H) for survivability and habitability.

The HSD DOC is likely to survive all but the most severe earthquakes, but its habitability is susceptible to HAZMAT releases and blackout conditions. The facility housing the HSD DOC was exempt from the most recent seismic assessment because it is a relatively new facility and met the building code at the time of construction. The facility is equipped with an optional generator but lacks habitability systems, central UPS or other battery-backed systems, and locally testable emergency egress lights. LLNS depends on the generator for emergency egress illumination; therefore, per NFPA-110 and -101, the generator should be tested and maintained as a level-1 test generator rather than the optional program designated by LLNS. (See **Finding F-1.**)

LLNS has adequate plans in case of a loss of the HSD DOC for most events, where LLNS performs medical management of incident casualties, including medical decontamination of injured personnel. Except for a HAZMAT release, the alternate location for an uninhabitable facility is the adjacent lawn and parking area. This location is likely to allow access to medical supplies stored in the facility for all but the most severe NPEs and HAZMAT releases. The medical decontamination equipment would be unavailable during a facility evacuation, so LLNS plans to use other means to control contamination, such as wrapping of personnel.

The F&I DOC is not likely to survive or be habitable during a severe NPE, and LLNS has adequately planned for its loss. The most recent documented seismic assessment found the building housing the F&I DOC to be in an extremely poor seismic PC because of the potential for building collapse. To address this condition, the building is identified as a facility still in need of major structural rehabilitation, but no funding is currently available to rehabilitate the building. Further, the building has no habitability systems but is equipped with an optional diesel generator. In case of the loss of the building, LLNS has designated another building as an alternate location. The alternate location is more likely to survive an earthquake because it meets PC-1 criteria, but habitability concerns for the alternate location are nearly the same because it also lacks habitability systems, is near the building housing the F&I DOC, and shares the same optional generator. These conditions make it likely that the same event would render both the primary and alternate facilities unusable; however, the F&I DOC functions, which include coordinating and controlling personnel, equipment, and resources for plant maintenance and utilities, can be performed from anywhere with communication linkage to command personnel and equipment operators.

The S&H DOC is not likely to survive or be habitable during a severe NPE, and LLNS has planned accordingly. The most recent documented seismic assessment of the building housing the S&H DOC found that it is in a poor seismic PC but should not suffer a total collapse. Consequently, the building is identified as a facility in need of structural rehabilitation whenever funding becomes available or during a major remodeling of the building. The building is equipped with an optional generator but no other habitability systems. The loss of the building would not significantly impact the S&H DOC functions because the building primarily serves as a meeting place, with communications to the EOC. Therefore, LLNS plans to select an alternate facility, if needed, based on building habitability and communications at the time of the event, and to operate from laptop computers.

#### **5.2.4 Hazardous Material Facilities**

Independent Oversight reviewed the documented capability of the Plutonium Facility and the Metal Finishing Facility to withstand analyzed severe NPEs and the capabilities within these buildings to receive protective action information, implement planned protective actions, and account for personnel after an evacuation. Key items of interest include communication systems; power supplies; facilities and equipment used to perform protective actions, such as assembly stations, shelters, accountability mechanisms, and ventilation system controls; and abnormal operating procedures, emergency operating procedures, and safe shutdown procedures.

#### **B332 Plutonium Facility**

The Plutonium Facility is likely to survive all but the most severe NPEs. The increments of the facility, built at different times over decades, met the building codes in effect at the time of construction and have been rehabilitated since construction for a variety of reasons. LLNS documents indicate that currently, safety class portions of the structure meet PC-3 criteria and safety significant portions of the structure meet PC-2 criteria.

No habitability systems exist or are necessary in the Plutonium Facility control room or operations center. The control room is an unmanned and locked facility with a camera monitoring the control board for observation by operators from the facility operations center. The operations center is a workspace for operators and has communication systems that also exist at other locations within the fence line.

The Plutonium Facility has adequate backup power sources to implement protective actions and perform personnel accountability during operational emergencies. It has two fixed and redundant diesel generators, one dedicated mobile generator staged at the facility, a central UPS system, and batteries as backup power sources. Only one generator is required to power emergency equipment. Each fixed generator has a dedicated 2000-gallon fuel supply tank, with at least 1000 gallons of fuel to ensure at least 24 hours of operation before refueling is necessary. The mobile generator has an integral fuel tank sized for 8 hours of operation, and the UPS systems are designed for at least 30 minutes of operation.

LLNS implements adequate maintenance and test programs for backup power systems at the Plutonium Facility. LLNS maintains and tests the fixed generators as NFPA-110 level-2 generators and as required by the technical safety requirements surveillance requirements. LLNS also tests the emergency egress lighting in accordance with NFPA-72 criteria. The testing and maintenance programs are extensive and include:

- Annual testing of generators and automatic transfer switches for their automatic functions from a loss of power condition
- Annual 90 percent capacity load testing for 4 hours using a load bank
- Monthly automatic start testing for voltage and frequency to connected loads
- Visual inspection of generators immediately after major events
- Annual 30-minute discharge test of the UPS system
- Monthly 30-second and annual 90-minute tests of emergency egress lighting.

Adequate backup power sources are provided for important equipment used during an emergency response, including:

- Facility public address system
- Criticality alarm system
- Control room facsimile machine
- Badge readers (used for personnel accountability)
- Fence gate motor (used to bring in apparatus)
- Emergency egress lighting.

Additionally, a manual override for the gate motor and access to badge reader data from security systems via runners are available if backup power sources fail to operate.

Sitewide protective action protocols are in place to provide adequate means for implementing protective actions and aiding the fire department in their response. These include:

- Facility level emergency plan
- Designated assembly points for evacuation
- Designated shelter-in-place area in the room with the least air infiltration
- Assigned assembly point leader and building emergency coordinator for personnel accountability determinations
- Emergency egress lighting
- Building run sheet for fire fighters to use when responding to the facility

- Self-help emergency equipment.

LLNS has an adequate procedure for shelter-in-place protective actions. The relevant procedure is an abnormal operating procedure that details shutdown of ventilation systems and directs the closure of doors and windows.

Although the facility handles plutonium in various forms, operations do not require safe shutdown of specific equipment before a facility evacuation. Energized safety class equipment is for confinement purposes, primarily the ventilation system fans and controls. Energized safety significant equipment includes the criticality alarm system; continuous air monitors; control systems for hydrogen, argon, nitrogen, and toxic gases (which are not currently in use); detectors for oxygen, fire, and earthquake; and emergency egress lighting.

Independent Oversight found that written instructions are available for the operational tasks associated with this equipment. However, the instructions for the building emergency coordinator to perform inventories of emergency response equipment were not included in the LLNS controlled document system. (See Section 8.0, **OFI 8**.)

### **Metal Finishing Facility**

The Metal Finishing Facility is susceptible to earthquake damage and does not provide a significant level of protection for its occupants from an onsite HAZMAT release because it lacks:

- Seismic qualifications (and does not meet PC-1 criteria)
- Control room or safe area with habitability systems
- Air monitoring capability
- Means to secure ventilation without going outside
- Backup power sources.

Sitewide protective action protocols are in place to provide adequate means for implementing protective actions and aiding the fire department in their response. These protocols include:

- Facility level emergency plan
- Designated assembly points for evacuation
- Designated shelter-in-place area in the room with the least air infiltration
- Assigned assembly point leader and building emergency coordinator for personnel accountability determinations and reporting
- Emergency egress lighting
- Self-help emergency equipment
- Building run sheet for fire fighters to use when responding to the facility.

For facility evacuations, the Metal Finishing Facility has no need for a positive/electronic personnel accountability system because only five people normally work there.

For shelter-in-place protective actions, one room is designated as the muster area (the only room available), but air exchange with outside air cannot be fully secured. The facility manager is aware of this condition and the need to relocate for long-term sheltering from HAZMAT releases.

Although operations use hazardous chemicals, they do not require safe shutdown of specific equipment before a facility evacuation.

### 5.2.5 Protective Force

Independent Oversight reviewed the protective force capabilities that are essential for response to an emergency caused by a severe NPE. This review also determined whether offsite law enforcement agencies use any specific protocols for LLNL events.

Protective force emergency planning adequately addresses nearly all operational emergency events. LLNS provides the operational and workforce elements for the protective force in addition to the planning and oversight elements. Each LLNS protective force shift contains all of the disciplines necessary for a full security response. The protective force has various agreements with local law enforcement agencies (LLEAs) to ensure effective integration of supplemental personnel, equipment, and capabilities. In accordance with the *State Region II Mutual Aid Law Enforcement Plan*, LLNL has assistance agreements with the Livermore Police Department, Alameda County Sheriff's Department, and San Joaquin County Sheriff's Department to request and receive law enforcement assistance. Additional agreements establish a means of supplemental support from the California Highway Patrol, including helicopter support, when warranted, and the Federal Bureau of Investigation (FBI). Furthermore, LLNS plans for LLEAs to provide supplementary personnel to the protective force during an emergency event inside the LLNL site and has developed some pre-planned protocols with offsite agencies for support to the protective force, including operating under a joint incident command system (ICS). Aside from the FBI agreement, LLNS does not have site/facility-specific catastrophic event response procedures and would implement security condition (SECON) plans to support security operations after a severe NPE or catastrophic event with severe consequences.

Overall, the protective force is prepared to provide full security services and interact appropriately with offsite local law enforcement personnel in case of a severe NPE. LLNS has developed some protocols to support the planned use of LLEAs to supplement onsite LLNS protective force personnel during an emergency event.

### 5.3 Objective 3: Training and Drill Program

**The site has prepared emergency response personnel for a severe NPE through a systematic and coordinated training and drill program.**

Independent Oversight reviewed the site emergency plan, training plan and implementing procedures, training schedules, status reports, and personnel training records to determine whether personnel performing emergency response tasks are trained in their areas of responsibility. Independent Oversight also reviewed the drill implementing procedure, drill packages, and evaluation reports to determine whether ERO members have demonstrated their emergency response functions by participating in drills involving NPEs and multi-facility events.

With one exception, Independent Oversight determined that LLNS has established a coordinated training program consisting of formal training and hands-on drills for preparing ERO members in their assigned tasks. The exception is that LLNS does not require EAL training for the ACFD fire captains in the IC curriculum.

DOE Order 151.1C defines the ERO as a structured organization with overall responsibility for initial and ongoing emergency response and mitigation and specifies that an ERO must be established and maintained for each site. The ERO must establish effective control at the scene of an event/incident and integrate its activities with those of local agencies and organizations that provide onsite response services.

The order further requires that ERO personnel be initially trained and attend annual refresher training, in addition to annually participating in a drill, exercise, or actual event to demonstrate proficiency.

LLNL EIPs state that the IC is responsible for initiating the notification of LLNL onsite personnel who may be expected to perform specified actions, and that the IC determines whether the incident is a potential operational emergency. EIPs additionally state that upon categorization of an operational emergency, the IC assumes the role of emergency director (who is tasked with maintaining overall managerial command and control of LLNL's response) until the EOC is declared operational.

With the exception of EAL training for ACFD fire captains, the LLNL training program is adequately defined in the emergency plan and EIPs and establishes the appropriate curriculum to prepare ERO members for their assigned tasks. The training program comprehensively and systematically defines methods for accomplishing emergency management training goals, which include responses to severe NPEs affecting multiple facilities. Design, development, and implementation of training are conducted in accordance with an appropriately detailed institutional process. Plans and procedures provide for both initial and recurring training, as well as annual participation in drills and/or exercises. A detailed matrix ensures that any EIP changes result in the required changes to training lesson plans.

Nevertheless, LLNS does not require ACFD fire captains (who can serve as the IC) to complete ERO training specifically on the implementation and use of the EALs and relevant protective actions, even though the IC makes the decisions regarding the initial response to and mitigation of an emergency event. As discussed in Section 5.1, the ACFD has full responsibility and authority for onsite and offsite protective actions associated with a LLNL operational emergency event scene. ACFD procedures and LLNL EIPs task the fire captains with responsibility for implementing protective actions and PARs if the battalion chief is not available. Additionally, the ACFD subcontract does not require ACFD, and therefore the IC, to abide by the LLNL emergency plan and applicable LLNS response procedures, as discussed further in Section 5.4. Further, Independent Oversight interviews with the ACFD personnel demonstrated that they did not have a clear understanding of some basic DOE concepts: event discovery/recognition, indicators that the EMDO needs to appropriately determine categorization/classification, onsite protective actions, offsite PARs, and notifications. (See **Finding F-4** and Section 8.0, **OFI 9**.)

**Finding F-4: LLNS has not applied a coordinated program of training and drills to all emergency response personnel and organizations that LLNL expects to respond to onsite emergencies, as required by the DOE Order 151.1C.**

The training status of personnel on the ERO roster is well managed and effectively tracked. A detailed training matrix allows tracking of status for personnel assigned to ERO positions in the field, the EOC, and DOCs, and also provides the status of the required training, including annual drill participation. By sampling the training status reports for LEDOs, EMDOs, and ACFD battalion chiefs, Independent Oversight determined that all currently assigned personnel are entered into the computerized LLNL training records system and have completed the required training.

The LLNL drill program is well structured and provides ample opportunities for training ERO personnel and participating with offsite agencies, but the program has not been effective in getting offsite organizations to participate with LLNS personnel. LLNS conducts a significant number of drills for training its ERO personnel and practicing protective action and disaster/self-help concepts, specifically for a severe earthquake. Nevertheless, only two local counties have participated, mostly because the other offsite organizations decline LLNS invitations to participate in LLNL drills. Additionally, the National Atmospheric Release Advisory Center (NARAC) personnel have declined invitations to participate in LLNL drills. (See Section 8.0, **OFI 10**.)

Overall, the LLNL emergency plan and EIPs establish an appropriate framework for the training and drill program. A systematic approach to training has established the appropriate curriculum for all LLNS ERO positions, and the status of training is appropriately tracked and monitored for individual inclusion on the ERO duty roster. The LLNS drill program provides significant training and proficiency opportunities for ERO personnel, offsite organizations, and employees performing protective action activities. Nonetheless, weaknesses were identified in that some offsite organizations, including NARAC, have declined LLNS invitations to participate in drills and, more significantly, LLNL has not provided EAL training to the ACFD fire captains who may be tasked as the IC.

#### **5.4 Objective 4: Offsite Response Interfaces**

##### **The site's planning is adequate for obtaining and integrating offsite response assets for events beyond the site's response capability.**

Independent Oversight reviewed the site's planning and interactions with offsite response authorities and organizations responsible for protecting the public and augmenting site response resources. This review also looked at the routine dialogue and interfaces with organizations needed to establish and maintain emergency response roles, responsibilities, capabilities, and information needs, consistent with the requirements of the National Incident Management System (NIMS). Independent Oversight also examined written support agreements with offsite response agencies and organizations, evaluated related response plans, and assessed the adequacy of response procedures used after a severe NPE.

Independent Oversight determined that the site's planning is mostly adequate for obtaining and integrating offsite response assets for events beyond the site's response capability. However, although LLNL is located in a densely populated region of California with significant industrial developments, residential communities, and commercial areas, LLNS has not validated some capabilities needed to respond to a significant LLNL radiological event that may require the immediate implementation of offsite protective actions. Importantly, emergency planning does not adequately reflect the current concept of operations used by LLNS and the ACFD.

##### **Offsite Interactions**

DOE Order 151.1C requires that effective interfaces be established and maintained to ensure integration and coordination of emergency response activities with Federal, state, and local agencies and with organizations responsible for emergency response and protection of workers, the public, and the environment. Further, a formal exercise program must validate all elements of the emergency management program over a five-year period, including provisions to assess the potential or actual offsite consequences of an emergency. Additionally, consequence assessments must incorporate monitoring of specific indicators and field measurements and must be coordinated with Federal, state, and local organizations.

The LLNS emergency plan appropriately documents a comprehensive description of LLNL's required offsite relationships and includes detailed listings of Federal, state, and local organizations with emergency response or regulatory control responsibilities relevant to LLNL. Additionally, LLNS and LFO hold regular interface meetings with offsite response organizations to exchange information and discuss response issues to prepare for emergencies. LLNS also invites many offsite organizations to participate in site-level exercises designed to test offsite interfaces and capabilities and regularly incorporates organizations that provide field-level assistance in site exercises.

The State of California and Alameda County emergency planners/managers are familiar with NNSA asset capabilities. The most likely NNSA asset to support an emergency response at LLNL is the Region 7

Radiological Assistance Program (RAP) team (assembled from personnel located at LLNL and the Remote Sensing Laboratory in Nevada). The *DOE Region 7 RAP Regional Response Plan* covers basic response within the region and emphasizes that the primary responsibility for an emergency or incident involving radioactive material remains with the party having custody of the material. On request, Region 7 RAP teams can provide radiological monitoring and assessment services to help resolve LLNL incidents involving radiological materials.

Nevertheless, LLNS has not demonstrated, through exercises, an effective offsite radiological monitoring process for a postulated LLNL radiological material release. LLNS partially identified this concern as an opportunity for improvement in its 2012 self-assessment and determined that this condition results from difficulty in validating protocols that are not completely defined for the LLNL and other offsite field monitoring teams (FMTs). LLNS's FMT capability consists of three teams that perform onsite and offsite monitoring when deployed by the LLNS emergency director. These LLNS teams may interact with other available assets, such as the NNSA RAP and NARAC, but LLNS has not included the Region 7 RAP teams and NARAC in an evaluated exercise at LLNL. Additionally, neither the LLNL emergency plan nor the county and city emergency plans discuss the offsite field monitoring resources needed to help local governments identify the radiological plume and contaminated areas so they can formulate protective action areas and food control boundaries. The State of California also has FMTs, and their *Radiological Emergency Preparedness (CalREP) Plan* defines how actual or perceived offsite radiological hazards are to be monitored; however, LLNS has not interacted with the state for this common purpose. Likewise, offsite field monitoring could require integration with other potential offsite monitoring capabilities, including the California National Guard civil support teams, the DOE Federal Radiological Monitoring Assessment Center, EPA, or other Federal agencies, and LLNS has not addressed these interactions. (See **Finding F-5**, and Section 8.0, **OFI 11**.)

In addition, the LLNS exercise program has not validated all offsite interface elements over a five-year period as required by DOE Order 151.1C, including provisions to assess the potential or actual offsite consequences of a radiological emergency. Some LLNL emergency management program elements that have not been validated include NNSA assets, such as Region 7 RAP, NARAC, and the Radiation Emergency Assistance Center/Training Site (REAC/TS). (See Section 8.0, **OFI 12**.) Further, LLNL has not participated in an exercise with the DOE Headquarters emergency management team to demonstrate an effective capability to provide DOE Headquarters with up-to-date significant event information, as prescribed in the DOE Headquarters emergency management team situation report. (See Section 8.0, **OFI 13**.) Limited documentation exists to document that local and state governments have been invited to participate in past LLNL exercises. In summary, offsite agencies and decision-makers (State of California EOC, Alameda County EOC, and City of Livermore EOC) have not participated in an LLNL exercise designed to demonstrate an effective capability to provide a coordinated response requiring the implementation of offsite protective actions by the surrounding populations. (See Section 8.0, **OFI 14**.)

Overall, LLNS has appropriately documented a clear and comprehensive understanding of the relationships with local offsite authorities and frequently interacts with response agencies and organizations capable of augmenting LLNS response resources. LLNS actions to involve local governments with NNSA assets are not as evident, although city and county authorities are aware of some NNSA national assets capabilities and availability. Additionally, LLNS has not demonstrated the appropriate planning, coordination, and response capabilities to assist local governments in monitoring and identifying the radiological plume and contaminated areas for use in formulating protective action areas and food control boundaries after an LLNL radiological emergency. Furthermore, the exercise program has not participated with the DOE Headquarters emergency management team, Region 7 RAP, NARAC, and REAC/TS. Lastly, the exercise program has not validated the capabilities needed to assess the potential or actual offsite consequences of a significant radiological event and to coordinate with Federal, state, and local organizations responsible for protecting public health and safety.



## Support Agreements

DOE Order 151.1C requires that emergency plans and procedures document arrangements agreed to by local police departments, fire departments, hospitals, contractors, and state and local emergency response teams to coordinate emergency services. California legislation provides a statewide mutual aid and assistance agreement that benefits LLNL, so NNSA and LLNS need not execute individual mutual assistance agreements with all potential offsite response organizations. However, the agreement does recognize that some governmental entities may elect to provide aid and assistance under a separate agreement.

LLNS appropriately plans and prepares for the integration of offsite response assets as part of the ERO structure. The LLNL emergency plan describes and identifies the mechanisms for integrating local agencies and other external organizations into the LLNL site response. These mechanisms include policy letters, agreements, and memoranda of understanding (MOUs) between LLNS, NNSA, and external agencies. Local agencies entering into agreements with LLNL include area hospitals, local fire services, and LLEAs.

Overall, appropriate written support agreements exist between the LLNL and offsite response agencies and organizations.

## Offsite Response Planning

DOE Order 151.1C requires that contractors at all DOE/NNSA facilities coordinate with state and local agencies and organizations responsible for offsite emergency response and for protection of the health and safety of the public. The site emergency management program can incorporate or invoke by reference existing plans, such as catastrophic earthquake plans or mass-casualty plans detailing compliance with Federal or state standards. Additionally, contractors must develop a methodology for informing the public of planned protective actions before and during emergencies.

The LLNS emergency plan fittingly documents existing provisions for interfacing and coordinating with Federal, state, and local agencies responsible for offsite emergency response. An overarching factor in response planning is the location of LLNL, which is in a densely populated region of California with significant industrial developments and the associated residential communities and commercial areas. Importantly, a severe regional event is likely to affect both the site and the surrounding communities, making any initial offsite assistance unlikely.

The State of California mandates the use of the *Standardized Emergency Management System (SEMS)*. California's SEMS is a comprehensive, interwoven emergency response structure that integrates the *National Response Framework (NRF)*, *NIMS*, and the *California Incident Command System (ICS)*. California state legislation required SEMS to integrate the ICS protocol in 1993 for all California state agencies and its political subdivisions. SEMS requires the following five organizational response levels:

- State Level (State Operations Center in Sacramento).
- Region Level (Region 2 Mutual Aid Coordinator is the ACFD chief).
- Operations Area Level (encompasses Alameda County and all political subdivisions within the county – the Alameda County Operations Area Coordinator is the ACFD deputy chief).
- Local Government Level (local governments include cities, counties, and special districts).  
NOTE: although LLNL is not a special district, the ACFD is designated as a special district and is required to implement SEMS, which includes ACFD operations at LLNL.

- Field Response Level (SEMS regulations require the use of ICS at the field response level during an incident).

Several State of California, Alameda County, and City of Livermore emergency planning documents govern offsite emergency response for a major LLNL emergency:

- The *State of California Emergency Plan* describes the state’s planned responses to all hazards using SEMS and NIMS, and is consistent with the Department of Homeland Security NRF and the catastrophic concept-of-operations documents developed jointly by the Federal Emergency Management Agency Region IX and the State of California.
- The *San Francisco Bay Area Earthquake Readiness Response: Concept of Operations Plan (CONPLAN)* describes the resources expected from the Federal government but does not describe the specific response efforts of these entities.
- The *Alameda County Emergency Operations Plan* establishes protocols for all local agencies involved in emergency operations in accordance with SEMS.
- The *Livermore Comprehensive Emergency Management Plan* describes the City of Livermore’s responsibilities during emergencies and provides a framework for coordinating response and recovery efforts within the city in concert with local, state, and Federal agencies.

Consistently, the State of California, Alameda County, and City of Livermore emergency plans do not address LLNL as nuclear facilities requiring special emergency planning. Consequently, the state, county, and city plan to respond to emergency events at LLNL in accordance with their respective all-hazards plans and procedures. Significantly, in 2011 the City of Livermore annexed land that includes LLNL and LLNS has not appropriately planned for interaction with the city in their emergency plan or exercised such interaction during a simulated emergency. (See **Finding F-5**, and Section 8.0, **OFI 15**.)

Overall, LLNS has adequately documented provisions for interfacing and coordinating with Federal, state, and local agencies responsible for offsite emergency response in the emergency plan. Additionally, the State of California eliminated the need for the state, county, and city to have individual LLNL-specific emergency planning and response agreements. However, the recent annexation of LLNL by the City of Livermore changed the responsibility for protective action decision-making, and LLNS has not appropriately addressed that change in its emergency plan.

## **Response Operations**

DOE Order 151.1C requires appropriate application of resources to mitigate an emergency event at an NNSA site. In October 2007, LLNS elected to subcontract emergency services with the ACFD and authorized some initial response actions to the ACFD for mitigating an LLNL operational emergency event, in accordance with DOE Order 151.1C.

Nevertheless, the ACFD’s concept of operations stated in the LLNL emergency plan and EIPs do not accurately reflect the complying with SEMS and its associated command structure. For most LLNL events, such as fire, medical, HAZMAT, and special rescue operations, the IC is the senior responding ACFD officer. During a security event, such as an event involving weapons fire, security alarm response, hostage negotiations, or similar situations, the IC is the senior protective force officer. Typically, the senior fire department officer and the protective force officer form a unified command to manage and coordinate the activities of multiple response elements at the scene. However, Independent Oversight identified several areas in which the LLNL emergency plan and EIPs do not clearly establish the concept of operations required for use by the ACFD. (See **Finding F-5**, and Section 8.0, **OFI 16**.) Specifically:

- Applying SEMS greatly expands the ACFD IC's responsibilities beyond the event scene surrounding an involved LLNL facility/area. For example, if an LLNL event results in a general emergency declaration, the ACFD IC is responsible for managing the onsite incident scene and the associated offsite response, specifically the determination and implementation of any offsite protective actions for the surrounding public. This increase in responsibility and authority goes beyond the traditional DOE ERO structure and is not adequately described in the LLNL emergency plan and EIPs.
- In accordance with SEMS, the ACFD IC uses his/her professional judgment to identify and implement initial onsite and offsite protective actions, requiring the IC to use the run card to determine whether the incident is a potential operational emergency (as required by EPIP 41). However, LLNS does not require the ACFD to formally recognize events as an operational emergency and correlate the initial onsite and offsite protective actions with LLNS pre-planning for the event – that is, the ACFD IC is not required to use the planned initial protective actions associated with each EAL. This approach is inconsistent with the DOE Order 151.1C *Frequently Asked Questions on EALs and Planned Initial Protective Actions* dated March 25, 2008. Further, DOE requires the use of specific PAC methodologies, based on DOE Order 151.1C, for initial protective action decision making. Also, the LLNS event recognition concept incorrectly concludes that event discovery occurs only after the LLNS EMDO receives event information from the IC.
- SEMS requires ACFD to implement the California ICS, and the site's ICS must be compatible and integrated with SEMS. However, the LLNL emergency plan does not adequately describe the relationship of the LLNL ERO and offsite agencies using the SEMS/California ICS structure. Additionally, neither ACFD nor LLNS has developed a response procedure that clearly states the division of responsibility and authority between the ACFD and LLNS emergency management team, so jurisdictional boundaries are not defined or potential areas of overlap identified.
- When the LLNL EOC is operational, the ACFD IC maintains responsibility for providing event information to the City of Livermore, Alameda County, and the State of California, and the provided information is not required to receive formal review and approval by the LLNS emergency director or LFO. The Livermore/Pleasanton Fire Department has recognized the importance of this information and has verbally committed to send an officer to the ACFD event scene command post to facilitate the flow of decision-making information to the city, when available. However, the emergency plan and EIPs do not document these important decision-making protocols.
- The ACFD LLNL-specific guides/procedures do not reference the LLNL emergency plan and applicable response procedures. Additionally, some ACFD Official Action Guides (OAGs) do not reflect current response requirements/actions stated in the LLNL emergency plan and EIPs (ref. OAG 30.107 *LLNL Emergency Notifications*, and OAG 30.101 *Response to Emergencies in the Superblock at LLNL*). In addition, the ACFD subcontract does not require ACFD to abide by the LLNL emergency plan and applicable LLNS response procedures.

**Finding F-5: The LLNL emergency plan and EIPs do not adequately describe and establish the concept of operations required for all operational emergencies, as required by DOE Order 151.1C.**

Despite some shortcomings in the LLNL emergency plan, LLNS performed a baseline needs assessment (BNA) in accordance with DOE Order 420.1B, *Facility Safety*, and appropriately determined the necessary onsite fire, emergency medical service, and HAZMAT resources based on the conclusions in the emergency plan. The BNA identifies that:

- The ACFD is capable of responding to most fire emergencies at LLNL using only onsite ACFD assets.

- The fire department can meet the minimum response criteria identified in the BNA by a combination of on duty staffing and use of mutual aid.
- Response capabilities account for multiple types of events, including an emergency medical service incident in conjunction with a single event response, as well as contingencies for incident response through callback of off-duty personnel and reciprocal aid agreements.
- LLNS maintains several formal agreements for firefighting assistance with regional fire departments as identified in the emergency plan.

LLNS has appropriate provisions for important technical rescue capabilities in accordance with NFPA-1670, *Standard on Operations and Training for Technical Search and Rescue Incidents*. A variety of hazards, including earthquakes, manmade accidents, and terrorist activities, may result in the need for urban search and rescue (USAR) and could involve the location, extraction, and initial medical stabilization of victims trapped in confined spaces due to a structural collapse. The LLNS BNA requires ACFD to maintain an onsite staffing level of six technicians for technical rescue operations for such conditions as structural collapse, confined space, and vehicle/machinery extrication. However, neither the BNA or emergency plan identify that offsite organizations provide trench and excavation rescue capabilities. (See Section 8.0, **OFI 17**.) Additionally, the closest Federal Emergency Management Agency USAR team is the California-Task Force Four, a 70-person USAR task force based in Oakland, California. During a regional severe earthquake, LLNS does not expect a response from California-Task Force Four since its members come from regional response agencies/organizations, and LLNS has planned accordingly.

Likewise, LLNS has adequately planned for wildland fires in accordance with DOE Guide 420.1-3, *Implementation Guide for DOE Fire Protection and Emergency Services Programs*. DSAs and the hazards surveys have identified the potential for wildland fires on the LLNL site. Accordingly, LLNS has a response plan for wildland fires with Federal, state, and county agencies that identify and establish response capabilities for conducting wildland fire operations. A wildland firefighting capability is appropriately included in the subcontract between LLNS and ACFD.

Overall, the ACFD brings significant fire, medical, and HAZMAT emergency services capabilities to LLNL. However, the ACFD concept of operations in many respects is not consistent with DOE requirements, the LLNS emergency plan, and EIPs. Current LLNS and ACFD emergency planning has not adequately described SEMS implementation for LLNL events. Additionally, response planning does not clearly identify the actions expected from each interface agency and the information needed to respond effectively. The lack of adequate planning has probably contributed to the absence of a comprehensive exercise program and severely limits exercise evaluators' ability to validate the effectiveness of some emergency management program elements.

## **5.5 Objective 5: Termination and Recovery**

**The site has planned for an approach for event termination and recovery operations through established plans and procedures.**

Independent Oversight reviewed the site's process for termination of emergencies and the planning for recovery from a terminated operational emergency. DOE Order 151.1C requires that recovery from a terminated operational emergency must include communication and coordination with state and local government and other Federal agencies; planning, management, and organization of the associated recovery activities; and ensuring the health and safety of workers and the public. Additionally, the contractor must have the means for estimating exposure to HAZMAT and for protecting workers and the public from exposure during reentry and recovery activities.

In 1980, LLNL experienced an earthquake that resulted in the injury of 65 employees and \$10 million in property damage. Emergency planning in response to the 1980 earthquake led to the creation of recovery protocols documented in the disaster/self-help program. Notably, LLNL designed the disaster/self-help program to be self-sustaining for up to 72 hours.

LLNS adequately describes the basic framework for emergency event termination and recovery operations in relevant recovery plans and procedures but has not fully developed and practiced the planned concepts. The FY 2012 annual exercise was the first time at LLNL where they demonstrated a fundamental recovery plan outline. The LLNS self-assessment identified that at least one exercise each year should require the ERO to develop a recovery plan outline and formal review of termination criteria so that the recovery planning process becomes a matter of routine. Independent Oversight noted several additional limitations in termination and short-term recovery planning for severe NPEs. (See Section 8.0, **OFI 18.**) For example:

- The *LLNS Continuity of Operations Plan* identifies mission-essential functions. Referencing these functions in the LLNS emergency plan may help determine the priorities for restoration and mitigation efforts during a severe NPE scenario, but the plan documents only nominal reconstitution planning.
- For postulated severe NPEs, LLNL lacks specific event response planning or procedures that include short-term recovery actions, such as considering infrastructure damage and outages that may impede the normal response of onsite or offsite responders.
- Since LLNS has not participated in an exercise with state, county, and local EOCs, LLNS has not validated the coordination of recovery with affected offsite agencies prior to emergency termination.
- LLNS conducts some exercises that focus on severe NPEs, but few of these exercises postulate consequences that result in significant structural damage or building collapse and generate resource requirements that LLNL cannot meet.

Overall, LLNS has maintained a notable disaster/self-help program to be self-sustaining for up to 72 hours following a severe NPE. However, as self-identified by LLNS, the site has only recently focused on important recovery planning and validation of recovery elements in exercises.

## **5.6 Objective 6: Emergency Medical Support**

**The site has planned for sufficient medical support for contaminated or injured personnel, including documented arrangements with offsite medical facilities to transport, accept, and treat contaminated or injured personnel for mass casualty events.**

Independent Oversight reviewed the plans, procedures, and policies that the LLNL HSD and the ACFD fire fighters use to provide medical treatment to onsite workers during an emergency. Independent Oversight also examined planning for a mass casualty incident (MCI), exercise after-action reports that document the medical treatment received by contaminated or injured workers, and the MOUs with offsite medical facilities that have agreed to treat contaminated injured workers from LLNL. Finally, the protocols for sharing patient information with onsite and offsite health care providers were examined.

Independent Oversight determined that LLNS has planned for sufficient medical support for contaminated or injured personnel, including documented arrangements with offsite medical facilities. Only minor instances were noted where procedures and coordination with offsite agencies could be improved.

DOE Order 151.1C requires that sites provide medical treatment, plan for MCIs, and coordinate the sharing of patient information between onsite and offsite health care providers in advance of an emergency. In addition, the order requires that sites arrange and document agreements with onsite and offsite medical facilities to accept and treat contaminated injured personnel. DOE Guide 151.1-4 provides additional guidance for emergency medical support in the areas of mass casualty and HAZMAT event planning, resources, interfaces, sharing of medical records, training, drills, and exercises.

LLNS has appropriate arrangements in place for the medical treatment of injured or contaminated workers. The ACFD fire fighters provide the first responders for medical emergencies at LLNL. Three paramedics are on duty each shift, the remaining fire fighters are trained as emergency medical technicians, and all are equipped with appropriate personal protective equipment. In addition, the fire fighters based at LLNL possess DOE security clearances, and LLNS protocols are in place to expedite the entrance of offsite emergency medical responders. The fire fighters evaluate and provide first aid and basic life-support to the patients at the scene, decontaminate and/or wrap patients (if needed), and then transport the patients to the appropriate receiving facility, as follows:

- Basic life-support patients – HSD during normal working hours; ValleyCare Medical Center in Pleasanton during non-working hours
- Advanced life-support patients – ValleyCare Medical Center
- Trauma patients – Eden Medical Center (Level II trauma center) in Castro Valley.

The decontamination area in the HSD is adequately equipped, and staff authorized to work in the decontamination area receive radiation casualty management training from REAC/TS. HSD maintains an adequate supply of specialized medicines needed to treat certain hazards, such as calcium gluconate for hydrofluoric acid burns and chelating agents for internal transuranic contamination. In addition, the Site 200 fire station has two advanced life-support ambulances that are equipped with chelating agents and an information packet, which are given to the receiving physician when a contaminated patient who might require chelation therapy is transported off site.

LLNS has sufficient mechanisms in place to ensure that changes in hazards are incorporated into emergency medical response procedures and that medical staff members maintain proficiency in treating contaminated injured workers. Changes in facility-specific hazards are communicated to the fire fighters through quarterly updates of the run cards and to HSD through the LLNL work control process. Additionally, the LLNL drill and exercise plan requires that emergency medical support be included in an exercise annually. The fire fighters frequently participate in the LLNL drills and exercises each year; HSD participation is less frequent, but at least annually, and HSD conducts four drills per year on various aspects of treating injured and/or contaminated patients in order to maintain their accreditation for ambulatory health care.

LLNS has performed comprehensive planning for an MCI. The IC (fire or security), in consultation with the HSD Medical Director, declares that an emergency is an MCI when a situation may exist that could overwhelm existing onsite resources or require additional offsite resources. Upon this declaration, the ACRECC dispatchers initiate an MCI advisory and coordinate with offsite hospitals to determine bed availability, while the fire fighters perform triage at the incident scene and transport patients as directed. HSD staff members also perform triage for patients arriving at the HSD, using an adjacent, large open area next to the facility that allows direct access to the decontamination area and houses a storage shed with additional emergency supplies. Notably, the disaster/self-help program provides additional resources during an MCI through the efforts of approximately 150 first-aid trained volunteers located throughout Site 200. These volunteers can perform triage at the assembly points, administer first aid (using the first aid kits stored at each assembly point), and transport injured personnel to HSD. Further, HSD has pre-designated two areas that can serve as a temporary morgue until the Alameda County

Coroner arrives to take possession of the victims, although the morgue areas cannot currently be used because HSD has not submitted a mass casualty plan to the County Coroner. (See Section 8.0, **OFI 19**.) EPO conducts an MCI drill or exercise every other year, although the requirement to conduct an MCI drill or exercise is not included in EPO's five-year drill and exercise plan. (See Section 8.0, **OFI 20**.)

LLNS has appropriate agreements in place with offsite medical facilities to accept and treat contaminated injured personnel from LLNL and to share patient information. LLNS maintains MOUs with ValleyCare Medical Center and Eden Medical Center for services in the event of a chemical, biological, or radiological incident at Site 200 and agrees to provide each hospital with essential equipment and services, including:

- Equipment, calibrated instrumentation, medical treatment advisors (LLNS physicians and REAC/TS personnel), and personal protective equipment needed to treat a contaminated patient
- Material and personnel to help decontaminate equipment and hospital facilities, package the radioactive waste, and transport the waste to a disposal facility
- Access to training on radiological safety and chelation therapy
- An invitation to participate in an LLNL exercise every two years.

HSD and ACFD have appropriate protocols in place to provide advance notifications to receiving hospitals that include treatment administered to patients and their estimated time of arrival. Air ambulance support is available through Alameda County to transport trauma patients to Eden Medical Center, although LLNS has not determined whether any of the air ambulance services will take a contaminated trauma patient. As a result, transport of a contaminated trauma patient may be unnecessarily delayed, while the option of air ambulance transport is explored. (See Section 8.0, **OFI 21**.)

Overall, LLNS has sufficient medical plans and procedures in place to treat injured or contaminated workers, as well as documented arrangements with offsite medical providers to accept and treat contaminated injured workers. Changes in the hazards at LLNL are suitably communicated to HSD and the ACFD fire fighters, and medical responders are given ample opportunities to maintain their proficiency in treating contaminated or injured workers. LLNS has developed appropriate plans for responding to an MCI, and the large number of first-aid trained volunteers from the disaster/self-help program provides an additional noteworthy resource during an MCI. Suitable procedures have been established to share necessary patient information with offsite medical providers as needed. However, the documentation of exercise requirements, coordination with the County Coroner, and understanding of air ambulance services availability warrant improvement.

## **5.7 Objective 7: Corrective Action Implementation**

**The site/facility implements effective mechanisms for managing corrective actions from evaluations, assessments, and appraisals and lessons learned from external and internal reviews, facility training, drills, actual responses, and findings.**

DOE Order 151.1C requires that DOE/NNSA contractors conduct assessment of their emergency management programs based on specific standards and criteria issued by the DOE Office of Emergency Operations, that are published in the DOE Guide 151.1-3, Appendix D. Further, DOE clarifies the intent of the assessment requirement in their response to the DOE Order 151.1C frequently asked questions dated August 8, 2008, *Annual Self-Assessments and Exercises* and *The Role of Evaluation Criteria in Annual Self-Assessment*. Notably, it states that a true determination of the readiness of the overall emergency management program requires the combination of effective programmatic and exercise

evaluations. Additionally, the cognizant DOE/NNSA field element manager is required to review contractor assessment programs to ensure compliance with DOE/NNSA directives and policies. Emergency management programs must also effectively manage the issues and corrective actions identified through external and internal assessments. Furthermore, site office personnel should conduct follow-up assessments to validate the closure of the actions, including follow-on actions and interactions with contractor personnel, as a means to verify the effectiveness of completed actions.

Independent Oversight examined a sampling of the effectiveness reviews from the 2008 Independent Oversight inspection of the LLNL emergency management program that included Findings #1 through #4, #6, #8, and #10. Current LLNS program documentation and corrective action closure packages were reviewed and factored in with the results for the objectives previously discussed in this report.

Independent Oversight determined that LLNS has not ensured the adequacy of the effectiveness reviews conducted to validate the resolution of identified corrective actions.

Finding #1 identified that EPHA developers did not exercise sufficient care in developing temporary change notices to EPHAs and did not implement a HAZMAT screening process consistent with the provisions of DOE Order 151.1C, thereby detracting from the adequacy and effectiveness of the EPHAs. Additionally, inconsistencies between site facilities were identified in the screening process for HAZMAT. Independent Oversight examined the relevant LLNS corrective actions and concluded that this weakness has been corrected, based on revisions to the chemical tracking databases, written instructions to the chemical tracking system users, and revisions to the associated EIPs.

Finding #2 identified that LLNS had not developed detailed, facility-specific procedures for implementing shelter-in-place protective actions or for performing personnel accountability during block evacuation protective actions. Independent Oversight examined the relevant LLNS corrective actions and concluded that this weakness has been corrected, based on development of facility-level emergency plans for all buildings occupied by ten or more people, development of procedures for implementing shelter-in-place protective actions, and establishment of assembly point leaders for performing personnel accountability during block evacuations. Documented exercises verify the implementation of the procedures and training of personnel.

Finding #3 identified that drills involved limited participation by facility personnel and usually did not include a demonstration of shelter-in-place, evacuation, accountability, or identification of an event requiring an emergency response. Additionally, no process was in place to ensure that personnel assigned to self-help or facility-response positions participated in drills annually. Independent Oversight examined the relevant LLNS corrective actions and concluded that this weakness has been corrected, based on the implementation of the building emergency coordinator program and development of facility-level emergency plans to provide protective action and accountability instructions to all personnel. Additionally, facility managers now ensure that drills are conducted annually using EPHA and DSA scenarios.

Finding #4 identified that LLNS did not ensure that evacuation, accountability, and shelter-in-place processes at all HAZMAT facilities were evaluated and critiqued annually or that the facility's ability to integrate with the site response organization was evaluated periodically. Independent Oversight examined the relevant LLNS corrective actions and concluded that this weakness has been corrected, based on procedure revisions, documented evidence of executed drills and exercises, exercise schedules, and observations at facilities during this 2013 review.

Finding #6 identified that during limited-scope performance tests, EOC personnel did not always provide prompt, accurate employee notifications. Independent Oversight examined the relevant LLNS corrective



actions and concluded that this weakness has not been adequately corrected. The corrective actions focused primarily on general employee communications prepared by public affairs staff rather than notifications to employees conveying time-urgent protective actions, which were the focus of the finding. EPO performed an effectiveness review of six drill and exercise after-action reports and concluded that prompt and accurate employee notifications had been made. Independent Oversight's review of three of these after-action reports noted that the reports indicated continuing issues in the timeliness and accuracy of information given to workers. For example, the after-action report for the 2012 southwest quadrant annual exercise noted three deficiencies related to employee notifications:

- Delayed protective action announcements to employees
- Garbled employee notifications from the EVA system
- Failure to disseminate protective action orders to hearing-impaired employees.

Similarly, the 2011 full-scale exercise after-action report identified an issue regarding garbled and inaudible employee notifications from the EVA system, and the after-action report for the 2012 Site 300 full participation exercise documented a limited ability to notify employees to take protective actions and the failure of some EVA system speakers. The evidence from these after-action reports, along with the issues and finding noted in Section 5.2.2 of this report, indicates that the original finding has not been effectively resolved. (See Section 5.2.2, **Finding F-3** and Section 8.0, **OFI 7**.)

Finding #8 identified that during limited-scope performance tests, ERO responders did not always formulate and implement protective action decisions and PARs in a timely, efficient, and unambiguous manner. Independent Oversight examined the relevant LLNS corrective actions and concluded that this weakness has not been adequately corrected. EPO performed an effectiveness review of six different drill and exercise after-action reports and concluded that the corrective actions had been effective. Reviewing the drill and exercise after-action reports that EPO cited as proof of effectiveness, Independent Oversight found that LLNS demonstrated onsite protective action decisions in all six exercises. However, one was a tabletop exercise and did not validate capability, and four of the exercises did not require offsite protective action formulation and implementation. Furthermore, LLNS cited the 2011 full participation exercise, which did not demonstrate effective performance in formulating and implementing offsite PARs.

LLNL procedure PRO 0077 02, *Conducting an Effectiveness Review*, states that the purpose of an effectiveness review is to determine whether corrective actions have reduced the frequency or magnitude of the identified issue. Even though the 2011 full participation exercise after-action report indicated continuing issues in offsite protective actions and the other exercises did not require a demonstration of offsite protective measures, EPO concluded that those exercises met the acceptance criteria for an effectiveness review and closed the issue. Independent Oversight does not agree with LLNS that the offsite PAR issues were resolved and successfully demonstrated. (Section 8.0, **OFI 22**.)

Finding #10 identified that LLNS did not ensure that corrective actions were identified and tracked in a timely manner and that corrective actions were effective in resolving identified weaknesses. Independent Oversight examined the relevant LLNS corrective actions and concluded that this weakness has not been adequately corrected. LLNS completed corrective actions that involved developing a new issues and corrective action management procedure, revising an EPIP on emergency management program administration, and revising the LLNL emergency plan. EPO's subsequent effectiveness review found that the timeliness, tracking, and effectiveness of corrective actions had significantly improved, and EPO closed the finding. As indicated in this section, Independent Oversight found that although several of the findings from the 2008 inspection were resolved effectively, the corrective actions for two of the findings (Findings #6 and #8) were ineffective. Therefore, Independent Oversight concludes that weaknesses

remain in the implementation of the EPO corrective action processes regarding effectiveness reviews. (See **Finding F-6** and Section 8.0, **OFI 22.**)

**Finding F-6: LLNS has not implemented effectiveness reviews that successfully validate whether corrective actions resolved identified weaknesses, as required by the LLNL effectiveness review procedure and DOE Order 151.1C.**

## **6.0 CONCLUSIONS**

Independent Oversight noted several positive observations during its review of the LLNL emergency management program's preparedness for severe NPEs. Significantly, the Metal Finishing Facility and the Plutonium Facility have correctly incorporated requirements and guidance by using input from facility managers and facility safety basis personnel in developing and revising EPHAs, and they also document the BDBE analyses in the EPHAs. LLNL continues to address seismic issues under long-term programs and made seismic upgrades to the building housing the ACRECC, Metal Finishing Facility, and other buildings after the 1980 earthquake. LLNL has also established a coordinated training program of formal training and hands-on drills to prepare ERO members for their assigned tasks. Additionally, LLNS has planned for sufficient medical support for contaminated or injured personnel, including documented arrangements with offsite medical facilities.

Independent Oversight also identified a number of aspects of the emergency management program that warrant increased management attention to fully prepare for severe NPEs. Independent Oversight determined that LLNS's planning for alternate primary command and emergency response facilities is in accordance with DOE policy, but because the primary, and most alternate facilities, are near HAZMAT facilities, they will likely be unavailable during a HAZMAT release. Additional planning is needed to mitigate the degradation of these facilities during an event. Further, in a severe NPE with releases from multiple facilities, the ACFD fire captains, as the ICs, may have full responsibility and authority for onsite and offsite protective actions associated with an LLNL operational emergency event scene. However, ACFD fire captains are not required to take the LLNS ERO training on implementing and using the EALs and relevant protective actions, and they have been given the option of using their professional judgment to apply guidance other than the EALs for implementing initial onsite protective actions and offsite PARs. Finally, some corrective actions from the 2008 Independent Oversight assessment did not fully rectify weaknesses in implementation of the EPO corrective action processes for effectiveness reviews.

Independent Oversight concluded that LLNL needs to better integrate and coordinate planning with local, state, and DOE assets for response to a severe NPE. Once this planning is accomplished, ERO members need to demonstrate that these plans and procedures are effective in exercises, using scenarios that realistically portray the challenges faced in these situations.

## **7.0 FINDINGS**

Findings indicate significant deficiencies or safety issues that warrant a high level of attention from management. If left uncorrected, findings could adversely affect the DOE mission, the environment, the safety or health of workers and the public, or national security. Findings may identify aspects of a program that do not meet the intent of DOE policy and requirements.

**Finding F-1: LLNS does not test and maintain diesel generators serving as backup power to emergency egress lighting as level-1 diesel generators, as required by NFPA 101, *Life Safety*, and NFPA-110, *Standard for Emergency and Standby Power Systems*.**

LLNS relies on diesel generators where no emergency egress lighting is installed or there is no local testing of emergency capabilities. LLNS authorization basis and design criteria documents commit to NFPA-101, and NFPA-110 standards, which establish the most rigorous level-1 test and maintenance programs for diesel generators that are relied upon for emergency illumination. However, LLNS tests and maintains these diesel generators as “optional,” rather than level-1.

**Finding F-2: The operator’s supervisory station is not equipped with a backup power source that can operate for 24 hours without refueling and the diesel generator that provides backup power is not tested as a level-1 generator, as required by NFPA-72, *National Fire Alarm and Signaling Code*.**

The operator’s supervisory station receives backup power from a diesel generator that has an integral fuel tank with an eight-hour supply of fuel. LLNS authorization basis and design criteria documents commit to NFPA-72 and NFPA-110. NFPA-72 criteria stipulate that a backup diesel generator for an operator’s supervisory station be equipped with a 24-hour supply of fuel and be tested and maintained as a level-1 generator, as described in NFPA-110. However, LLNS tests and maintains this diesel generator as “optional,” rather than level-1.

**Finding F-3: LLNS cannot ensure that site workers receive prompt initial emergency notifications as required by DOE Order 151.1C.**

EPO is aware of significant reliability and coverage issues with the EVA system, which is the primary method for providing emergency notifications and protective action instructions to workers. The only other systems LLNS uses for worker notifications are an alphanumeric pager group for hearing-impaired employees and the radio channels for ACFD and the LLNL Alarms Division. Despite the known issues with the EVA system, EMD did not institute any compensatory measures to ensure that workers receive emergency notifications and protective action instructions while LLNS is repairing and replacing portions of the EVA system.

**Finding F-4: LLNS has not applied a coordinated program of training and drills to all emergency response personnel and organizations that LLNL expects to respond to onsite emergencies, as required by the DOE Order 151.1C.**

ACFD fire captains are responsible for implementing protective actions and PARs if the battalion chief is not available. However, fire captains are not required to attend training on the implementation of the EALs, which may result in the implementation of initial protective actions and PARs that are not in accordance with DOE standards.

**Finding F-5: The LLNL emergency plan and EIPs do not adequately describe and establish the concept of operations required for all operational emergencies, as required by DOE Order 151.1C.**

Independent Oversight identified several areas in which the LLNL emergency plan and implementing procedures do not accurately define the concept of operations used by the ACFD and LLNS, which may result in unnecessary delays and an ad hoc response to a time-urgent event. Importantly, LLNS and ACFD emergency planning does not adequately document SEMS implementation for LLNL events, and response planning does not clearly identify the actions expected from each interface agency and the information needed to respond effectively.

**Finding F-6: LLNS has not implemented effectiveness reviews that successfully validate whether corrective actions resolved identified weaknesses, as required by the LLNL effectiveness review procedure and DOE Order 151.1C.**

EPO effectiveness reviews did not identify that corrective actions had not sufficiently reduced the frequency or magnitude of issues associated with two of the findings from the 2008 Independent Oversight inspection of the LLNL emergency management program. Independent Oversight confirmed that significant issues remain pertaining to these two findings.

## **8.0 OPPORTUNITIES FOR IMPROVEMENT**

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

### **Lawrence Livermore National Security, LLC**

**OFI 1:** To improve specific planning for implementing protective actions and PARs, and to improve the timeliness and accuracy of event categorization and classification, consider revising the EAL sets by:

- Including specific instrument set points, such as radiation area monitor readings, where possible to facilitate timely classification of events.
- Ensuring that each one contains an EAL specific to the EPHA-analyzed BDBE.
- Ensuring that each one, where appropriate, contains PAR details to provide to offsite authorities.

**OFI 2:** To ensure that appropriate initial protective actions and PARs are implemented, consider formalizing the IC's duties to include the requirement to use the LLNL-developed EAL sets for onsite emergency events.

**OFI 3:** To ensure that evacuees have sufficient lighting to exit buildings safely, considered establishing compensatory measures to provide lighting in buildings that are not properly equipped with emergency egress lights and where emergency egress lights cannot be properly tested.

**OFI 4:** To improve the reliability of the ERO's hand-held radios, consider:

- Formalizing the preventive maintenance process requirements, including:
  - Timeframe that the radio will be out of service
  - Cost that the user organization can expect to pay
  - Action (such as disabling the radio) that LLNS will take on radios overdue for maintenance.
- Providing the radio preventive maintenance requirements to the user organizations.
- Ensuring that user organizations understand that their budgets need to include the cost for repairs and preventive maintenance for their radios.
- Notifying user organizations when their hand-held radios are due for preventive maintenance.
- Adding a sticker or other indicator to the radios to show when preventive maintenance was last performed and when the next maintenance is due.

**OFI 5:** To strengthen the testing of the ERO's communications equipment, consider:

- Specifying the testing frequency (e.g., daily, monthly, or quarterly) for each type of communications equipment.
- Determining the method for testing the operability of each type of equipment (such as the ability to transmit and receive a message).
- Documenting the completion of communications equipment testing using a checklist or form.
- Capturing the requirements for testing frequency, methodology, and documentation for the communications equipment in the ERO's procedures.

**OFI 6:** To increase the effectiveness of the daily tests of the EVA system, consider:

- Conducting the daily test at a time when workers are normally present in the buildings.
- Publicizing the time of the daily test so that building occupants will know to contact the LLNL Alarms Division if issues (such as garbled messages, screeching noises, or inaudible messages) are encountered during the tests.

**OFI 7:** To improve LLNS's ability to provide employees with emergency notifications, consider:

- Expediting the identification of funding needed to repair and replace portions of the EVA system.
- Establishing a method to broadcast emergency notifications over all radio channels and requiring at least one person in each group of outdoor workers to carry a radio.
- Developing a process for sending employee emergency notifications using the Public Affairs Office mass notification system and requiring outdoor workers and workers in buildings awaiting EVA system upgrades and repairs to register with the notification system.
- Expanding the alphanumeric pager group for hearing-impaired employees to include outdoor workers and workers in buildings waiting on EVA system upgrades and repairs.

**OFI 8:** To ensure that personnel clearly understand their authority, responsibility, and the expectations of management and that they perform work consistently, completely, and safely, consider incorporating the written instructions used at the Plutonium Facility for installing the mobile generator and conducting emergency response equipment inventories into appropriately controlled procedures.

**OFI 9:** To ensure that the ACFD personnel responsible for providing initial protective actions and PARs, in accordance with DOE expectations, are appropriately trained, consider:

- Developing a training course on basic DOE concepts to provide to all ACFD personnel.
- Offering, and eventually requiring all LLNL-based ACFD fire captains the EAL training.
- Formalizing the IC duties to include the requirement to use the LLNL-developed EAL sets for onsite emergency events.

**OFI 10:** To ensure that ERO personnel understand NARAC products provided during emergency events, consider periodic drill participation with NARAC personnel to demonstrate their capabilities.

**OFI 11:** To improve emergency planning for offsite radiological support for Alameda County, the City of Livermore, and the State of California, consider:

- Developing a comprehensive plan for offsite field monitoring that defines an overall monitoring and sampling strategy, including minimum resources (personnel and equipment), command and control, data acquisition protocols, communications, and safety-related guidelines.

- Emphasizing that the primary objective for offsite monitoring is to verify the absence of an airborne plume and identify the boundaries of the area contaminated with a HAZMAT deposition (i.e., “bound the plume”).
- Ensuring that monitoring capabilities include airborne sampling, direct measurement of the radiation dose rate or contamination levels, and sampling with appropriate radiological analysis of air, water, soil, and vegetation.
- Developing standard operating procedures for offsite monitoring that include staffing, assignment of responsibilities, control of field teams, and specific sampling and monitoring protocols.

**OFI 12:** To ensure validation of all emergency management program elements over a five-year period and to optimize the usefulness of annual exercises, consider:

- Using a scheduling matrix to assist with long-range planning for future exercises and short-range planning for the current year’s exercises.
- Ensuring that all response program elements are tested and validated over a five-year period.
- Coordinating, via LFO, the participation of DOE radiological emergency response assets (e.g., NARAC, REAC/TS, and RAP) in the exercise plan, as appropriate.

**OFI 13:** To demonstrate an effective capability to provide required event information, consider periodic exercise participation with the DOE Headquarters emergency management team.

**OFI 14:** To improve the validation of an effective capability to provide a coordinated response requiring the implementation of offsite protective actions by the surrounding populations, consider:

- Ensuring that LLNS offers offsite response organizations the opportunity to participate in an exercise every three years.
- Designing offsite participation exercises that postulate a radiological material release as the primary concern, in order to validate coordinated response capabilities for the worst-case radiological release scenarios identified in the LLNL EPHAs.
- Reviewing and revising the annual and five-year exercise schedules to ensure that LLNS evaluates offsite protective action exercises at least once every five years.
- Incorporating information on the exercises conducted over the previous five years that specifies the initiating event, facilities, hazards, emergency response program elements, and site-level ERO elements that were included, in order to ensure that all program elements are validated.

**OFI 15:** Consider improving response planning for General Emergency events with the City of Livermore:

- Develop a coordinated plan that implements an integrated response between LLNS, ACFD, and the City of Livermore to a hazardous material event at LLNL that may result in a General Emergency declaration.
- Revise the LLNL emergency plan and EIPs to reflect the coordinated actions taken by LLNS, ACFD, and the City of Livermore in response to a General Emergency hazardous materials event at the LLNL, describing the most effective utilization of local, state, and Federal resources to ensure a minimum risk to citizens.
- Conduct periodic emergency exercises with the City of Livermore to validate effective implementation of the offsite planning.

**OFI 16:** To improve overall emergency planning and appropriately define the concept of operations used during an operational emergency, consider:

- Revising the emergency plan to clearly describe and document the concept of operations implemented by the LLNL ERO, ACFD, and offsite agencies using the SEMS/California ICS structure. Additionally, unambiguously define the division of responsibility and authority between the ACFD and LLNS emergency management team, to ensure well-defined jurisdictional boundaries and areas of overlap.
- Developing a comprehensive command and control procedure to implement the integrated concept of operations written in the emergency plan.
- Establishing formal methods of communication and communication protocols to facilitate the flow of decision-making information to the city and county EOCs.
- Using the City of Livermore's pre-designated geographic areas for protective action to identify special needs populations and other locations of significance with regard to HAZMAT releases.
- Ensuring that response plans and procedures provide effective flow down of actions expected from each interface agency and that the pathways for acquiring official supporting information are identified.

**OFI 17:** To improve site-specific planning for technical rescue operations, consider:

- Establishing and documenting, in the BNA, job performance requirements for technical rescue capabilities.
- Documenting, in the BNA, any specific functional rescue capabilities provided by offsite assistance, along with reference to applicable mutual aid agreements.
- Including in the emergency plan all technical rescue capabilities, how they are provided, and applicable agreements.

**OFI 18:** To continue to improve site-specific planning for severe NPEs at LLNL, consider:

- Siting command and response centers or their alternate facilities outside of areas under protective actions identified in the EPHAs.
- Planning for response to NPEs that could have a significant and widespread impact on the site and surrounding community emergency response infrastructure.
- Integrating NPE response planning with applicable state and Federal catastrophic event plans.
- Referencing other appropriate site-specific emergency planning documents as annexes to the emergency plan (e.g., the SECON plan and continuity-of-operations plan).
- Developing functional (e.g., protective force operations, power and utilities, fire protection, telecommunications, shift operations, and critical facilities/operations) emergency response procedures, matrices, or checklists needed to respond to a severe NPE.
- Developing an incident action plan template for a multiagency response at LLNL that includes a statement of objectives, SEMS/ICS organization, tactics and assignments, and supporting materials (e.g., maps, communications plan, medical plan, traffic plan, and special precautions).
- Pre-determining the types of additional resources needed by the site, the availability of those resources, and logistical requirements once the resources arrive at the site.
- Continuing to include severe NPE scenarios in the LLNL drill and exercise program.
- Conducting tabletop exercises with appropriate Federal, state, and local response agencies and organizations that would respond to a LLNL event caused by a severe NPE, a manmade disaster, or terrorism.
- Updating response plans and procedures to reflect information extrapolated from severe NPE planning workshops, drills and exercises, and lessons learned from past disasters.

**OFI 19:** To ensure the usability of the pre-designated morgue areas, consider expediting the submission of the HSD mass casualty plan to the Alameda County Coroner.

**OFI 20:** To ensure that an MCI drill or exercise is conducted every other year, add a requirement for this type of drill or exercise to the *LLNL EPO Five-Year Drill and Exercise Plan*.

**OFI 21:** To clarify emergency transport options for contaminated trauma patients, consider determining whether any of the air ambulance services will transport a contaminated trauma patient and establishing MOUs as appropriate.

**OFI 22:** To ensure an effective corrective action process, consider improving the usefulness of effectiveness reviews by:

- Ensuring the effectiveness review confirms assurance of prevention of recurrence.
- Expanding the focus of the review to determine whether the evidence indicates continuing problems in the issue topical area.
- Increasing the use of performance-related criteria that require a clear demonstration of adequate performance.
- Reviewing the need to re-open the issue and generate additional corrective actions when effectiveness reviews identify continuing weaknesses.

## **9.0 ITEMS FOR FOLLOW-UP**

As part of its oversight activities, Independent Oversight will follow the closure of the findings identified in Section 7.0 and monitor the disposition of the OFIs. Because this review encompassed only select emergency management elements identified in DOE Order 151.1C, future assessments should consider focusing, in part, on additional elements of the emergency management program, and the utilization of limited scope performance tests, drills, and exercises to validate plans and ERO performance in the coordination and integration of response activities. Upon request, Independent Oversight can conduct follow-up to clarify the issues addressed in this report or the adequacy of proposed corrective actions.



## **Appendix A Supplemental Information**

### **Dates of Review**

Scoping Visit:	February 5-7, 2013
Onsite Data Collection Visit 1:	February 25-28, 2013
Onsite Data Collection Visit 2:	March 11-13, 2013
Validation and Outbrief:	March 14, 2013

### **Office of Health, Safety and Security Management**

Glenn S. Podonsky, Chief Health, Safety and Security Officer  
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### **Independent Oversight Site Lead**

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### **Independent Oversight Reviewers**

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## **Appendix B**

### **Referenced Documents and Interviews**

#### **Referenced Documents**

- Department of Homeland Security, National Response Framework, January 2008
- DOE Guide 151.1-2, Technical Planning Basis Emergency Management Guide, 7/11/07
- DOE Guide 151.1-4, Response Elements Emergency Management Guide, 7/11/07
- DOE Guide 420.1-3, Implementation Guide for DOE Fire Protection and Emergency Services Programs, 9/27/07
- DOE Order 151.1C, Comprehensive Emergency Management System, 11/2/05
- DOE Order 420.1B, Facility Safety, 12/22/05
- *Effectiveness Review Report of the Independent Oversight of Emergency Management – Finding 1-4, 6, and 8*
- Emergency Planning and Community Right-to-Know Act of 1986, Title III, Public Law 99-499, no date
- HSS Criteria, Review, and Approach Document 45-56, Emergency Management Program Inspection Criteria, Approach, and Lines of Inquiry, Targeted Review of Site Preparedness for Severe Natural Phenomena Events, Rev. 0, 1/3/13
- LLNL EPO Five-Year Drill and Exercise Plan, Rev. 5, 11/12
- NFPA-72, National Fire Alarm and Signaling Code, 2012
- NFPA-1221, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems, 2002
- NFPA-1670, Standard on Operations and Training for Technical Search and Rescue Incidents, 2009

#### **Interviews**

- ACFD Battalion Chief
- ACFD Division Chief
- ACFD Emergency Medical Services Division Chief
- ACFD Office of Emergency Medical Services
- ACFD Office of Emergency Services Manager
- ACFD Office of Emergency Services Specialist
- ACRECC Dispatch Manager
- California Emergency Management Agency
- California Emergency Management Agency Region 2
- City of Livermore Police Department
- LLNS Alarms Division Manager
- LLNS B253 Facility Manager
- Metal Finishing Facility Manager
- Metal Finishing Facility Building Emergency Coordinator
- Plutonium Facility Facility Manager
- Plutonium Facility Building Emergency Coordinator
- Facility Manager s for facilities housing the EOC, F&I DOC, and HSD
- Point of Contact for the facility housing the EOC
- LLNS Consequence Assessment Team Lead
- LLNS Electrical Engineer

- LLNS Disaster/Self-Help Program and Drills Specialist
- LLNS Disaster/Self-Help Program Manager
- LLNS Emergency Management Department Head
- LLNS Emergency Management Exercise Specialist
- LLNS Emergency Management Subject Matter Expert
- LLNS Emergency Preparedness Specialist (Facilities & Equipment)
- LLNS Emergency Programs Manager
- LLNS Engineering Manager for Trunked Radio, Microwaves, and Paging
- LLNS EPO Manager
- LLNS EPO Training Specialist
- LLNS ES&H DOC Coordinator
- LLNS F&I DOC Coordinator
- LLNS Fire Marshal and Fire Protection Manager
- LLNS Heavy Equipment Shop Supervisor
- LLNS HSD Medical Director
- LLNS HSD Registered Nurse
- LLNS Generator Test Planner
- LLNS Generator Test Supervisor
- LLNS Lead Emergency Exercise and Drill Specialist
- LLNS National Security and Engineering Division Leader
- LLNS Project Management, Engineering, and Construction Department Structural Engineer
- LLNS Protective Force Commander
- LLNS Protective Force Manager
- LLNS Radcon Manager
- LLNS S&H DOC Coordinator
- LLNS Security Organization Division Leader
- LLNS Seismic Quality Assurance Manager
- LLNS Technical Lead (Radios)
- LLNS Technical Training Specialist
- LLNS Telecommunications Group Supervisor
- LLNS Worker S&H DOC Coordinator
- Livermore/Pleasanton Fire Department