Office of Enterprise Assessments Review of the Los Alamos National Laboratory September 2015 Functional Exercise of Selected Emergency Response Capabilities

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Acronyms

Ci	Curies
CMR	Chemical and Metallurgical Research Facility
CRAD	Criteria, Review and Approach Document
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
EAL	Emergency Action Level
ED	Emergency Director
ED-R	Los Alamos Field Office Emergency Directorate-Representative
EOC	Emergency Operations Center
EPHA	Emergency Planning Hazards Assessment
EPIP	Emergency Plan Implementing Procedure
ERO	Emergency Response Organization
ETSC	Emergency Technical Support Center
HAZMAT	Hazardous Material
IC	Incident Commander
LAFD	Los Alamos Fire Department
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
MSC	Materials Science Center
NA-LA	Los Alamos Field Office
NARAC	National Atmospheric Release Advisory Center
NNSA	National Nuclear Security Administration
OE	Operational Emergency
OFI	Opportunity for Improvement
PAR	Protective Action Recommendation
Pu	Plutonium
SIP	Shelter-in-Place

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Response Capabilities

EXECUTIVE SUMMARY

The Office of Emergency Management Assessments within the U.S. Department of Energy (DOE) independent Office of Enterprise Assessments (EA) conducted a review of the National Nuclear Security Administration (NNSA) Los Alamos National Laboratory (LANL) functional exercise. Los Alamos National Security, LLC (LANS) operates LANL, and the NNSA Los Alamos Field Office provides Federal oversight. EA performed this review from September 15 to September 17, 2015.

LANS designed this functional exercise to test and demonstrate the proficiency of selected emergency response capabilities of the LANL emergency response organization (ERO) to respond to a severe event. During this review, EA evaluated the ability of various site response organizations to recognize specific hazardous situations, notify appropriate onsite and offsite organizations and agencies, implement appropriate protective actions, establish command and control of a simulated event, and mitigate the event's consequences. EA also evaluated LANS conduct and evaluation of the exercise.

The exercise package met the requirements of the DOE order and guides, and the LANS emergency plan and exercise manual, by including exercise objectives, evaluation criteria, teams of evaluators and controllers, hotwashes, critiques, and exercise evaluation guides that established an adequate framework for evaluations. However, during the exercise, EA identified weaknesses in the LANS implementation of the most critical functions of the ERO (i.e., command, control, and communications). Use of decision aids and information displays to support the command and control functions of the ERO were lacking. The ERO did not use available status boards/displays to depict and track effluent releases, environmental monitoring and protective actions, initial and follow-up notifications, and personnel accountability. Data critical to command and control (i.e., protective actions, classification, etc.) was not readily available to appropriate ERO personnel in the emergency operations center. Consequently, information that decision makers needed to make critical, informed decisions was not readily available, resulting in different depictions of event and response conditions among the command centers.

Exercise evaluation relies on objectives that are specific, attainable, and measurable. LANS exercise evaluation guides provided parameters and actions derived from specific plans and procedures for use in evaluating these objectives. However, the LANS exercise evaluation guides lacked the depth and breadth necessary to fully assess the stated exercise objectives, limiting the usefulness of the exercise to evaluate/validate the ERO performance.

Overall, LANS has the guidance necessary for exercise program conduct and evaluation, and developed an adequate exercise plan. However, EA noted weaknesses in the exercise program that limit its effectiveness to evaluate/validate the ERO's ability to implement plans and procedures and accomplish the goals of emergency response to mitigate consequences and protect people and the environment. During the exercise, inadequate communications and information management degraded situational awareness and prevented a common operating picture from being developed and maintained between the site and offsite organizations, degrading the overall response.

**Office of Enterprise Assessments Evaluation of the
Los Alamos National Laboratory September 2015 Functional Exercise of Selected Emergency
Response Capabilities**

1.0   PURPOSE

The Office of Emergency Management Assessments within the U.S. Department of Energy (DOE) Office of Enterprise Assessments (EA) reviewed an emergency management exercise at the National Nuclear Security Administration (NNSA) Los Alamos National Laboratory (LANL) as part of its periodic oversight activities. EA conducted the review from September 15 to 17, 2015, as an independent evaluation of the site's response to a postulated operational emergency (OE) during a Los Alamos National Security, LLC (LANS) planned exercise and subsequent LANS evaluation activities.

EA performed the evaluation to assess LANL's preparedness for responding to a classifiable OE as established by DOE Order 151.1C, *Comprehensive Emergency Management System*. During this evaluation, EA evaluated the ability of various site response organizations to recognize specific hazardous situations, notify appropriate onsite and offsite organizations and agencies, implement appropriate protective actions, establish command and control, and mitigate consequences for a postulated severe event. EA also evaluated LANS conduct and evaluation of the exercise.

2.0   SCOPE

This review assessed the preparedness of LANS) to respond to a simulated OE and LANS's ability to conduct an emergency management exercise. EA observed the exercise at five critical venues: the emergency operations center (EOC), an incident command post (established in a conference room in the EOC), the emergency technical support center (ETSC), and the radio room, which are all located in the same building, and a workstation that is outside the EOC where consequence assessment activities occurred before the emergency response organization (ERO) was recalled to the EOC.

3.0   BACKGROUND

LANL designs nuclear weapon components and performs scientific studies. LANS operates LANL and the NNSA Los Alamos Field Office (NA-LA) provides Federal oversight of LANS. LANS and NA-LA provide staffing to the ERO. DOE Order 151.1C requires LANL to have a hazardous material (HAZMAT) program because of its inventory of radioactive material and hazardous chemicals.

On September 16, 2015, LANL conducted an exercise, entitled the *2015 Fourth Quarter Functional Exercise*, to test and demonstrate the proficiency of selected emergency response capabilities of the LANL ERO to respond to a severe event. EA and LANS evaluated the response based on the site's emergency plan and procedures and DOE Order 151.1C. As a functional exercise, there is a lower level of exercise plan approval, exercise realism, and level of participation than for a required annual full-scale exercise. Therefore, the incident command post was not at an event scene and protective actions, damage reports, and personnel accountability protocols were simulated through a control cell. Nearly all exercise activities occurred in the EOC building.

The initiating event for this exercise was a postulated earthquake that damaged three emergency planning hazards assessment (EPHA) facilities: the Chemical and Metallurgical Research Facility (CMR), the

Sigma Complex, and the Materials Science Center (MSC). The facility damage resulted in radioactive and chemical HAZMAT releases or concerns and a fire with a collapsed building wing at CMR. Rock fall and other debris made some LANL access roads impassable, restricting the number of usable roads in and out of the site and complicating the safe routing of ERO members to the EOC. All buildings (except those equipped with standby generators) simulated a loss of power. One of the two main communications routers also simulated a loss of power for a while, necessitating the use of alternate communication mechanisms. Additionally, calls saturated cell phone coverage disrupting service for three hours. Controllers injected reports of building damage and numerous injuries (some contaminated by radioactive material) that were characterized as minor, serious, severe, critical, or life threatening, but did not postulate any fatalities. Controllers also injected personnel accountability reports from site buildings that included 34 missing workers.

The EA oversight program is designed to enhance DOE safety and security programs by providing DOE and contractor managers, Congress, and other stakeholders with an independent evaluation of the adequacy of DOE policy and requirements and the effectiveness of DOE and contractor line management performance in safety and security and other critical functions as directed by the Secretary of Energy. The EA oversight program is described in and governed by DOE Order 227.1B, *Independent Oversight Program*, and EA implements the program through a comprehensive set of internal protocols, operating practices, inspector guides, and process guides.

4.0   METHODOLOGY

EA performed this review using the portion of Criteria, Review and Approach Document (CRAD) 45-61, *Exercise Program Review and Severe Event Response Evaluation*, that is applicable to an exercise evaluation. EA provided independent evaluators to assess the response to and conduct of an OE exercise scenario using the exercise package, exercise evaluation guidelines, and response tools that LANS developed. EA personnel used the same evaluation criteria that LANS developed and used for its exercise evaluation, and were collocated with LANS evaluators to determine the effectiveness of a response to a severe event and compliance with DOE Order 151.1C.

5.0   RESULTS

The results of this evaluation are organized according to EA's observations at the evaluated venues (incident command post, radio room, EOC primary and secondary rooms, and ETSC) and a cross-cutting topical area (i.e., the overall conduct of the exercise).

Criteria:
*An exercise validates elements of an emergency management program by initiating a response to simulated, realistic emergency events/conditions in a manner that, as nearly as possible, replicates an integrated emergency response to an actual event. Planning and preparation use an effective, structured approach that includes documentation of specific objectives, scope, time lines, injects, controller instructions, and evaluation criteria for realistic scenarios. Exercises are conducted, controlled, evaluated, and critiqued effectively and reliably and result in lessons-learned, corrective actions, and program improvements for identified program weaknesses. (Paraphrased from CRAD 45-61, *Exercise Program Review and Severe Event Response Evaluation*)*

5.1 Incident Command

At the start of the exercise, LANS staffed the incident command post with three qualified emergency managers who quickly recognized the earthquake condition as an OE and appropriately categorized the event in accordance with the ERO-EPIP-210, *Operational Emergency Categorization/Classification*. The duty emergency manager also immediately transitioned to become the incident commander (IC) and directed the tactical response to the event. The IC evacuated the EOC, performed personnel accountability, verified habitability of the EOC, and then established an incident command post in the EOC and effectively delegated response tasks to the other emergency managers and support staff. Likewise, the IC appropriately formed a unified incident command with the Los Alamos Fire Department (LAFD) battalion chief when he arrived at the incident command post. The unified incident command quickly requested offsite assistance through the Intrastate Mutual Aid System.

Effective command, control, and communication are critical functions to maintaining situational awareness and a common operating picture at all command centers. However, EA observed inadequate communications and information management resulting in different understandings of the event and the site's response among the site and offsite organizations. Most significantly, the LANS information flow processes were ineffective at acquiring, recording, and disseminating timely and accurate event information among the ERO and offsite response organizations. NA-LA also identified weaknesses with communications and information management during the exercise critique.

EA noted several issues that limited effective command, control, and communications for the incident command staff. For example:

- As discussed in Section 5.2, LANS made several unsuccessful attempts to make initial protective action recommendation (PAR) notifications using the mass notification system (Los Alamos County Central Dispatch, New Mexico State EOC, and DOE Headquarters). In addition, the Los Alamos County emergency management director stated she did not receive timely notification, which delayed activation of the Los Alamos County Code Red notification system until thirty minutes after the declaration of the General Emergency.

- LAFD only received partial information about the CMR structural collapse and the HAZMAT release. When LANS identified the CMR fire, LAFD could not acquire adequate information (e.g., the material on fire, the location of the fire, or how to get to the fire) to extinguish the fire. The LAFD evaluator identified that a LANS controller had to inject a message that the fire self-extinguished about 90 minutes after it began.

- The unified incident command post, located in a conference room in the EOC, did not include participation of the LANL protective force. As a result, the IC did not receive a protective force briefing on response actions for ninety minutes following establishment of the command post.

- The IC was unable to acquire timely support and information from the ETSC staff regarding safe routing instructions, which resulted in significantly delaying the recall of the ERO.

- Communications did not foster interoperability among onsite and offsite response facilities; offsite decision-makers were unable to view emergency data and technical products that the LANL ERO had produced and was necessary for timely and accurate decision-making, as identified by the Los Alamos County emergency management director.

- LANS did not use its automated information management system (WebEOC) during the exercise, and the chronology document used in its place did not provide an adequate information management tool for recording and disseminating timely and accurate event information among the ERO, especially with the increased volume of information generated during a site-wide severe event. (See **OFI-LANS-1**.)

EA identified several additional weaknesses during this review, but did not document the additional OFIs or finding because LANS included these deficiencies in its exercise after-action report.

Additionally, controllers provided damage reports for facility conditions that a runner had brought from the radio room to the incident command post. The reports gave information regarding releases, building conditions, casualty information, and personnel accountability status. Although the IC used the reports to determine the extent of damage and facility conditions, an effective means to identify, track, and treat injured workers (135 injured, 7 contaminated), or identify missing workers (34 missing) was not initiated. The IC informed the site occupational medical facility, which was staffed with two doctors and seven nurses to treat non-life threatening injuries and illnesses, that it could expect as many as 1000 patients. Injury reports consisted mostly of minor injuries, but five were reported as severe, critical, or life threatening. The *Operational Emergency Categorization/Classification* procedure defines a mass casualty event as one that requires more than four people to be transported off site to a hospital; however, during the exercise, there was no discussion of a mass casualty plan or how to treat contaminated injured workers. See further discussion in section 5.2.

Overall, LANS promptly established an incident command post in the EOC and effectively delegated response tasks to the emergency managers and support staff. Additionally, LANS appropriately formed a unified incident command with the LAFD battalion chief when he arrived at the incident command post. However, EA observed inadequate communications and information management during the exercise that degraded situational awareness and prevented a common operating picture among the site and offsite organizations. Importantly, LANS did not use its WebEOC application during the exercise, and the method of documenting incident chronology did not provide an adequate information management tool for recording and disseminating timely and accurate event information among the ERO and offsite organizations. Consequently, command and control of the event was sometimes ineffective in ensuring a timely and planned response strategy that all command centers understood, which affected the response to injured, contaminated, and missing workers postulated within the exercise scenario.

5.2 Radio Room

The radio room serves as the LANL central notification center, responsible for sending onsite protective action instructions, sending notifications to offsite organizations with PARs (if warranted), logging important information that radio room operators have received, and serving as an information conduit between the field and the EOC. At the start of the exercise, the radio room staff evacuated with the rest of the facility personnel to the parking lot until the all clear was given to reenter the building. Once back in the radio room, the staff immediately activated all workstations, established communications with the field responders, and began logging all communications from field responders and facility personnel (controller inject reports). The radio room staff completed the DOE required notifications in a timely manner, including initial and update notifications to offsite authorities, protective action messages to onsite workers with clear and concise instructions, and an initial press release. Furthermore, the radio room staff successfully sent a message and received replies regarding whether mission essential functions could be performed as part of continuity of operations.

LANS assigns a dedicated staff member to each primary task within the radio room (communicating with the field, sending offsite notifications, sending protective action instructions, and creating a log), along

with a radio room coordinator to manage all operations, which supported the timely completion of required notifications, swift distribution of protective action messages, and compilation of a voluminous log.

Nevertheless, EA noted a few issues that limited effective command, control, and communications for the radio room staff. For example:

- The event task tracker tool on the wall of the radio room, designed to capture critical information about the emergency and ensure the radio room staff knew the current status of the emergency, was not used.

- The radio room coordinator did not provide periodic briefings on the emergency to the radio room staff as required by ERO-EPIP-150, *Radio Room Coordinator*, and EM-FORM-063, *Radio Room Coordinator Checklist*, until near the end of the exercise (i.e., 3.5 hours after the simulated earthquake occurred), which further limited the radio room staff's ability to understand the full ramifications of the emergency. LANS self-identified these issues in its exercise after-action report. (See **OFI-LANS-2**.)

- The radio room logger did not capture all of the specific, critical information received from facilities (through controller message injects) regarding the number and type of injuries and whether personnel were missing, which limited the usefulness of the EOC log. For example:

  o CMR reported 14 noncritical injuries and 1 critical injury, but this information was instead entered in the log as only "some known injuries."

  o MSC reported 10 personnel with respiratory issues and 1 minor injury, but this information was not entered in the log.

  o LANS did not enter in the log when numerous other facilities that reported minor and critical injuries and missing personnel. (See **OFI-LANS-3**.)

EA noted issues with the radio room staff's use of the mass notification system to activate the EOC, provide offsite PARs and notifications, and issue onsite protective actions. For example:

- ERO-EPIP-150 requires the radio room staff to ensure that notifications (such as EOC activation, offsite notifications, PARs, and protective actions) are made; however, the staff did not check whether the intended recipients received the various messages sent using the mass notification system. LANS identified this issue in its exercise after-action report.

- Reports generated by the mass notification system showed that many of the intended recipients did not confirm that they received the message. For example:

  o Organizations that did not confirm receipt of the initial offsite PARs included the state of New Mexico EOC, DOE Headquarters Watch Office, and Los Alamos County Central Dispatch.

  o 62% of intended recipients confirmed receipt of the query on whether recipients had sheltered in place.

- o 50% of intended recipients confirmed receipt of the query on whether recipients had evacuated.

- The radio room staff did not use the alternate notification systems described in ERO-EPIP-160, *Notifier Levels I, II, and III*, such as telephones, Site-wide Area Notification System radios located in individual buildings, or radio broadcasts to all channels to ensure a larger number of personnel received the information.

- Personnel replied to the query messages with one person replying that he was unable to SIP and another that she was unable to evacuate; however, the radio room staff did not review the system reports to note that these replies were received and the radio room staff did not perform any follow-up to determine whether these personnel needed assistance.

- The radio room staff also did not confirm that the appropriate offsite agencies received the OE notification forms and understood that LANL had issued PARs for affected offsite areas, including four organizations not included in the mass notification system distribution (i.e., Bandelier National Monument, Santa Fe National Forest, San Ildefonso Pueblo, and Santa Fe County). (See **Finding F-LANS-1** and **OFI-LANS-4**.)

Finding F-LANS-1: LANS did not effectively provide emergency notifications to workers, emergency response personnel/organizations, appropriate DOE/NNSA elements, and local organizations. (DOE Order 151.1C)

EA also noted issues relating to inaccurate and incomplete information in the OE notifications sent to offsite organizations; LANS identified most of these issues in its exercise after-action report. For example:

- The second notification form indicating declaration of a General Emergency did not correctly state the following critical information that was known or available at the time:

  - o HAZMAT release at Sigma Complex.

  - o Level of media interest (left blank).

- The third notification form providing an update on the emergency did not correctly state the following critical information that was known or available at the time:

  - o Onsite protective actions included evacuation of personnel from Sigma Complex, CMR, and MSC.

  - o Isolation zone and downwind protective action distances for CMR, Sigma Complex, and MSC.

  - o Mitigation activities (left blank). (See O**FI-LANS-4**.)

- The radio room staff did not number or time stamp the notification forms to distinguish between the various forms distributed, making it difficult to determine which form contained the latest update on the emergency. (See **OFI-LANS-5.**)

Overall, LANS completed required notifications in a timely manner, sent protective action messages with clear and concise instructions, and compiled a voluminous log. LANS supports the timely completion of notifications by assigning a dedicated staff member to each primary task in the radio room. However, EA noted issues that limited effective command, control, and communications for the radio room staff, such as not using available tools and briefings to ensure staff knew the status of the emergency, and omitting some critical information regarding injuries and missing personnel from the log. EA also noted issues with the radio room staff's use of the mass notification system, including not ensuring messages were received, not using alternate notification systems to ensure broader distribution of messages, and not including all organizations that needed to receive the PARs. As a result, LANS did not effectively provide emergency notifications to all appropriate personnel. Further, EA noted issues in the accuracy and completeness of the information provided in notifications sent to offsite organizations, which did not include critical information known at the time. Consequently, offsite organizations did not have an accurate picture of the emergency occurring at LANL.

5.3 Emergency Operations Center

The LANL EOC is separated by a glass wall into a primary room and a secondary room. The emergency management team, known as the emergency directorate, work in the primary room and the rest of the supporting EOC cadre work in the secondary room. The radio room, telephone operations room, ETSC (where the consequence assessment team performs consequence assessment functions), and police tactical room (where the IC established the incident command post) surround the primary and secondary rooms. LANS and NA-LA staff the emergency directorate. Personnel with communications, technical, liaison, and public affairs expertise, as required by DOE Order 151.1C, support the emergency directorate.

At the start of the exercise, the EOC primary and secondary rooms were vacant and LANS activated the EOC cadre, providing safe route information to the EOC. Delays in staffing the EOC ensued because the IC did not quickly establish safe route information. The limited number of passable roads and the time it took to determine the type and quantity of HAZMAT releases partly delayed the IC in determining the most applicable emergency action level (EAL) to use. Without knowing the HAZMAT release information, the IC appropriately used EALs for the worst-case releases from the damaged buildings. Use of worst-case assumption placed passable roads into a potential plume that exceeded protective action criteria. In an attempt to reduce the area presumed to be above protective action criteria and enable use of the roads, the IC requested an ETSC modeler provide him with plume projections and authorized deployment of a HAZMAT team to take field measurements for chemical and radioactive materials. The HAZMAT team provided the empirical data to support safe routing instructions before correct plume projections were available.

Once LANS and NA-LA staffed the EOC, the emergency director (ED) completed a briefing with the IC and declared the EOC operational. The ED and other members `of the emergency directorate proceeded to conduct their required actions as established within the emergency plan implementing procedures (EPIPs):

- Establishing strategic objectives
- Processing action item forms
- Reviewing press releases
- Supporting the IC
- Maintaining narrative logs
- Using checklists
- Authorizing offsite support requests for urban search and rescue, radiological assistance program, buses, and Red Cross

- Decision-making for continuity of operations and security conditions
- Conducting periodic briefings.

However, EA noted the following issues with the response: (See **OFI-LANS-6**.)

- The EOC was not operational within one hour after activation, as established by the *Emergency Operations Center Operations* procedure (ERO-EPIP-205) and included as an exercise objective.

- The emergency directorate identified strategic objectives, but the EOC cadre did not develop implementing action plans and operational periods for all three objectives, as required by the *Emergency Director* procedure (ERO-EPIP-105) and included as an exercise objective. The EOC cadre initiated an action plan only for an evacuation. The emergency directorate identified protection of personnel, protection of special nuclear material, and continuity of operations as the three objectives.

- The ERO underutilized available equipment. For example:

    o Once LANS and NA-LA staffed the EOC primary room, the use of the wall displays was limited to the EOC log, which displayed only approximately 30 minutes of information.

    o The ERO did not display maps, plume projections, weather conditions, and video from the site's unmanned aerial vehicle to improve situational awareness.

- The ERO did not use WebEOC as described by the *Severe Event EPIP* (SEO-EPIP-310) and included as an exercise objective.

- The first situation report sent to DOE Headquarters was incomplete (i.e., weather and response/protective actions were incorrectly marked as "unknown").

- The ERO initiated requests for logistical support in accordance with site procedures; however, the ERO did not track the completion status of requests or keep the IC and the ED informed of the status of the requested assets.

- An NA-LA Emergency Directorate-Representative declared himself the IC and was unaware during the first few hours that the LANS duty emergency manager was operating as the IC from the EOC police tactical room.

EA also noted several issues with the EPIPs. For example: (See **OFI-LANS-7**.)

- There is no EPIP that identifies an accountability officer in the EOC with a function to track personnel accountability and effectively manage reports from all site buildings.

- EPIPs did not assign responsibility to refuel standby generators in response to the loss of site-wide normal power.

- EPIPs did not identify a mechanism in the EOC to create awareness of the seriousness of some injuries and the large number of injured and missing people. The informational resource displayed was limited to an EOC log, and it did not fully characterize the injuries and number of injured, contaminated, or missing people (as discussed in Section 5.2.) so the ED could determine whether a mass casualty plan should be implemented.

- EPIPs did not identify a mechanism for the ERO to identify and track injured or missing personnel.

- The NA-LA Emergency Directorate-Representative approved four news releases before an ED was in the EOC, although the site procedures did not address alternate approval authority when the ED is not present.

- The Operations Section Chief information book did not contain a current phone roster of "critical" safeguards and security contacts.

Overall, the EOC is well equipped with informational systems and severe event response procedures, and the EOC cadre demonstrated good familiarity with their protocols. However, LANS did not effectively use these systems and processes to maintain situational awareness, and some ERO members did not complete initiated actions. The IC significantly delayed activation of the ERO because safe routing instructions were not immediately available. Before the EOC was operational, the radio room and the IC had a substantial amount of information about facility conditions, injuries, and personnel accountability, but the EOC cadre was not fully aware of these reports largely because informational systems were underutilized and procedure directions were not always provided. The ERO did not acknowledge the need for a mass casualty plan, did not acknowledge agreements with area hospitals for accepting contaminated personnel, and did not execute loss of power procedures, mostly because the ERO was not fully aware of these conditions.

5.4 Emergency Technical Support Center

At the start of the exercise, the ETSC coordinator was located at a workstation outside of the EOC. The ETSC coordinator conducted initial consequence assessment duties there, while the site was under SIP protective actions, until he could relocate using safe routing information. Once the IC provided safe routing information, all ETSC personnel reported to the EOC to perform consequence assessment tasks. Important assignments that the ETSC conducted included verifying event classification and protective actions issued, modeling HAZMAT releases, and keeping key EOC personnel informed of dispersion modeling results through emails, discussions, and briefings.

EA observed the ETSC coordinator conduct a timely, initial consequence assessment in accordance with written protocols, but as described below, he could not get the assessment results to the IC for immediate use. The coordinator reviewed key documentation (Catastrophic Event Information list, EALs, and EPHA) to verify that the IC had made appropriate event classification and protective action decisions. The coordinator performed initial analyses for plutonium (Pu), lithium trioxide, and chromic trioxide using the National Atmospheric Release Advisory Center (NARAC) and the Emergency Prediction Information code, or EPICode, dispersion modeling software, although the initial Pu model results were incorrect. The coordinator emailed the dispersion models and recommended protective action distances to the HAZMAT supervisor and IC an hour and a half after the earthquake occurred while the IC directed the response without access to email. Once the ETSC team reported to the EOC, the ETSC team performed ongoing analyses using field data that the HAZMAT team provided. The ETSC dispersion modeler refined the source-term using the field data and accurately performed an analysis of Pu-239, once previous errors were identified, for protective action and ingestion concerns using NARAC. The ETSC coordinator provided the IC and ED with the new information on the dispersion modeling dose projections and PARs as they became available.

However, EA observed inadequate communications between the HAZMAT personnel, ETSC coordinator, and the HAZMAT team and untimely, inaccurate initial analyses. For example:

- The ETSC coordinator received conflicting information on the damage, buildings affected, and HAZMAT involved and was unable to provide timely HAZMAT dispersion modeling and geographic information system capabilities to identify affected facilities and offsite areas during a HAZMAT release, which required the IC to implement worst case planning assumptions without the benefit of dose projection plume models.

- Although protocol requires the ETSC to provide dispersion modeling information to the IC and HAZMAT team, the HAZMAT team lead was unable to contact the ETSC coordinator because the coordinator was sheltered in his office and not equipped with a radio, and the HAZMAT team lead did not have the coordinators office or cell phone number. Further, the coordinator did not ensure that the HAZMAT team lead had received and reviewed the NARAC plume projection provided via the NARAC web.

Key ETSC personnel were recently moved from their offices within the EOC building to other offices onsite which contributed to the above inadequate communication issues. (See **OFI-LANS-8**.)

EA also observed issues with the accuracy of initial analyses. For example:

- The initial analysis performed for the Pu release was inaccurate. The coordinator had input the wrong source term into NARAC (i.e., he used 0.003 Curies (Ci) of Pu-239 rather than 0.3 Ci of Pu-239 as indicated in the relevant EPHA). (See **OFI-LANS-9**.)

- This inaccuracy was identified by the ETSC dispersion modeler after relocating to the EOC and the results were distributed. The errors resulted in information that was not conservative in identifying areas potentially above protective action criteria.

- Approximately 3-hours after the earthquake occurred, the ETSC provided an accurate NARAC model projection that indicated the protective action guide of 1 Rem was exceeded out to a distance of 251 meters, whereas the initial model indicated that 1 Rem was not exceeded. The coordinator quickly briefed the IC and ED on the error, provided appropriate protective actions, and discussed the protective action and ingestion concerns.

Overall, ETSC staff members demonstrated familiarity with their assigned tasks, including key activities, such as event classification verifications and producing HAZMAT dispersion modeling projections. However, LANS's prior decision to move key ETSC personnel from the EOC building contributed to degradation of critical communications. This deficiency, combined with modeling input errors, resulted in delayed and non-conservative initial analyses used to protect workers and responders.

5.5 Conduct of Exercise

This exercise was a functional exercise and was in addition to the required annual site-level exercise. Therefore, EA did not expect LANS to implement all attributes implemented for an annual exercise for this functional exercise. Specifically, the level of realism was reduced and controllers or a control cell provided most exercise conditions. No field play occurred. Nonetheless, LANS performed the planning and execution of the exercise via an exercise plan that included all of the essential elements. At the end of the exercise, the responders provided important feedback during a hotwash, followed by a critique meeting with the controller/evaluator organization. The evaluators used exercise evaluation guidelines to complete and document their conclusions for inclusion in an after action report. These activities are consistent with exercise requirements established by DOE Order 151.1C and the LANL emergency plan.

The exercise scenario was challenging and revealed a number of issues for LANS to correct and improve its program. This quarterly functional exercise also gave responders, evaluators, and controllers an extra opportunity to practice their roles and test new procedures and operating concepts for a severe event scenario.

Although the exercise was conducted in accordance with DOE requirements, EA identified the following issues in the areas of exercise planning and execution, control, and evaluations, some of which LANS evaluators also identified and included in the LANS after action report:

- For planning and execution: (See **OFI-LANS-10**.)

  o Incorrect controller injects changed the planned scenario as responders addressed an unknown chemical release rather than the planned cyanide release, and initially addressed a nitrogen release rather than a carbon monoxide release.

- For exercise control: (See **OFI-LANS-11**.)

  o A controller was not present in the radio room for most of the exercise, causing the radio room players to leave the area and find a controller who could answer their questions.

  o Controllers did not always provide player earned information, such as whether the CMR was involved in a fire.

  o A controller coached the radiological control player several times with unsolicited updates on the status of and recommended uses for the Radiological Assistance Program team.

- For exercise evaluations: (See **OFI-LANS-12**.)

  o All LANS evaluators also served as controllers; DOE's emergency management guidelines discourage these dual responsibilities because each role has specific responsibilities that require total concentration to be performed effectively.

  o The critique meeting did not establish the responders' timeline or determine whether all exercise objectives were met for initial formulation of findings.

  o Some EEGs did not adequately address the breadth and depth of the objective, i.e., for the LANL EOC, situational awareness objective (EOC.3), seven of the nine criteria were applicable only to the radio room with no criteria provided for the secondary or primary EOC rooms.

  o An evaluator recorded that the EOC was operational within an hour of activation when it was not.

  o LANS graded a criterion for using WebEOC as not applicable rather than not met because WebEOC was not used in the event response.

  o An evaluator incorrectly graded an objective for developing strategic objectives plans and tracking them to completion as met because the ERO discussed writing the plans, while another evaluator gave a grade of not met.

o   Evaluators graded some criteria as not observed because they were not performed, rather than not met, because the responder actions should have been performed as an appropriate response to the event.

Overall, LANS implemented an exercise in accordance with DOE requirements, but deviated from some DOE guidelines, and EA identified some areas where the further exercise program improvements can be made.

6.0   FINDINGS

As defined in DOE Order 227.1B, findings are 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 or Federal regulation. DOE line management and/or contractor organizations must develop and implement corrective action plans for EA appraisal findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 227.1B to manage these corrective action plans and track them to completion. EA identified several important conditions during this review and identified one finding. EA did not document an additional finding because LANS included it in its exercise after-action report. This finding is:

As per ERO-EPIP-205, R3.3, *EOC Operations*, the SEO-3 (LANS) did not provide continuous, effect, and accurate communications among the various response organizations.

EA's additional finding is:

Finding F-LANS-1: LANS did not effectively provide emergency notifications to workers, emergency response personnel/organizations, appropriate DOE/NNSA elements, and local organizations. (DOE Order 151.1C)

7.0   OPPORTUNITIES FOR IMPROVEMENT

This EA review identified 12 opportunities for improvement (OFIs). These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are suggestions offered by the EA review team that may assist site management in implementing best practices, or provide potential solutions to minor issues identified during the conduct of the review. In some cases, OFIs address areas where program or process improvements can be achieved through minimal effort. It is expected that the responsible line management organizations will evaluate these OFIs and accept, reject, or modify them as appropriate, in accordance with site-specific program objectives and priorities.

LANS

OFI-LANS-1: Consider improving communications among response facilities, field response elements, and offsite command centers to provide a common operating picture of the emergency response and shared situational awareness among all teams by:

- Installing and fully implementing an automated information management system

- Defining information flow processes within LANL's response facilities and field response elements

- Fostering interoperability with offsite response facilities (i.e., joint information center, local and state EOCs, and the DOE Headquarters EOC) and enabling access to unclassified emergency response information such as notification forms, emergency status updates, plume projections, significant events data, and field monitoring data

- Expanding the use of computerized information management systems, which are capable of rapidly interfacing with other systems that may be vital during an emergency response, to communicate a common operating picture and shared situational awareness by:

  ○ Providing a real-time perception of what is occurring at the incident scene(s)
  ○ Providing awareness of what the ERO is doing in relation to the incident(s)
  ○ Enabling the ERO to predict changes to the incident(s)
  ○ Supporting ERO objectives that forecast future actions

- Defining expected actions for achieving and maintaining situational awareness among all teams.

OFI-LANS-2: Consider revising ERO-EPIP-150 and EM-FORM-063 to include:

- Purpose of the event task tracker tool, person responsible for entering and updating information in the tool, and frequency of expected updates

- Expected frequency of periodic briefings by the radio room coordinator to the radio room staff.

OFI-LANS-3: Consider establishing an alternate method of recording and displaying information received in the radio room on injured and missing personnel to ensure that the ERO can easily access this critical information.

OFI-LANS-4: Consider revising ERO-EPIP-160 to include:

- Verification checks after a specific period of time that the mass notification system reached intended recipients

- Expected success rate for the mass notification system and when alternate notification systems need to be used

- Frequency of status checks for query messages and process for acting on the responses received

- A verification check that the distribution of the OE notification form includes all organizations that might need to implement PARs

- A confirmation check that OE notification form contains:

  ○ Explanation on why an emergency was classified as an Alert, Site Area Emergency, or General Emergency
  ○ Correct onsite protective actions and PARs
  ○ Isolation zone and downwind protective action distances
  ○ Level of media interest

  o Mitigation activities.

OFI-LANS-5: Consider revising EM-FORM-009, *LANL EOC OE Notification,* to include a sequential number or time stamp to distinguish between the different updates of the form.

OFI-LANS-6: Consider increasing the frequency of drills and evaluations to improve the response of the ERO in:

- Achieving an operational EOC within one hour of EOC activation

- Maximizing the use of EOC wall displays, such as maps, plume projections, weather conditions, video from the site's drone, and WebEOC to improve situational awareness

- Developing action plans to implement the emergency directorate's strategic objectives

- Preparing situation reports with all known information

- Tracking the status of action requests

- Ensuring a common understanding about who serves as the IC in a LANL emergency response.

OFI-LANS-7: Consider improving the EPIPs by:

- Establishing an accountability officer in the EOC to ensure accountability reports are received and effectively managed from all site buildings

- Establishing written protocols to address the loss of site-wide normal power and reliance on standby power systems at some buildings

- Developing a mechanism that clearly displays the status and number of known personnel injured and missing

- Developing a mass casualty plan

- Developing a mechanism to identify and track injured personnel as they are transported for treatment, including decontamination needs

- Revising the press release protocols to provide for an alternate approval authority in case the ED is not present

- Ensuring the Operations Section Chief information book contains a current phone roster of "critical" safeguards and security contacts.

OFI-LANS-8: Consider moving key ETSC personnel back to the EOC building to alleviate communication issues and support the development of timely initial assessments.

OFI-LANS-9: Consider improving the accuracy and quality of all consequence assessments by:

- Emphasizing in ETSC drills and refresher training:

- o The importance of using accurate source terms in dispersion modeling to provide better dispersion transport information for protective action decision-making

- o The importance of conducting an independent and thorough quality assurance check of all model inputs for accuracy

- Providing worst-case consequence assessment model files on the ETSC dispersion modeling computers default that correspond to each EPHA identified emergency event for use during drills, exercises, and actual emergency events.

OFI-LANS-10: Consider improving functional exercise plans by having quality control verifications to ensure message injects are consistent with the planned scenario.

OFI-LANS-11: Consider improving control of the exercise by:

- Staffing each responder venue with a controller to answer responder questions and provide information on the status of the exercises in case an exercise hold is needed and for termination of exercise play

- Emphasizing during controller training the prohibitions for coaching players, the importance of providing players earned information, and the availability of the controller network for controllers to obtain additional guidance when needed.

OFI-LANS-12: Consider improving exercise evaluations by:

- Recruiting and training a sufficient number of controllers and evaluators to minimize the need for assigning duel controller/evaluator responsibilities

- Emphasizing during evaluator sessions differences between "not met" and "not observed" grades for evaluation criteria

- Establishing a timeline of exercise injects and player responses during the exercise critique to formulate where time critical objectives are not met for formulating findings

- Increasing the depth and breadths of the evaluation criteria at all venues to reflect the actions required to implement measurable standards based on the emergency plan and EPIPs.

APPENDIX A
SUPPLEMENTAL INFORMATION

Dates of Review

Onsite Review: September 15-17, 2015

Office of Enterprise Assessments (EA) Management

Glenn S. Podonsky, Director, Office of Enterprise Assessments
William A. Eckroade, Deputy Director, Office of Enterprise Assessments
Thomas R. Staker, Director, Office of Environment, Safety and Health Assessments
William E. Miller, Director, Office of Nuclear Safety and Environmental Assessments
Patricia Williams, Director, Office of Worker Safety and Health Assessments
Gerald M. McAteer, Director, Office of Emergency Management Assessments

Quality Review Board

William A. Eckroade
Karen L. Boardman
John S. Boulden III
William E. Miller
Patricia Williams
Gerald M. McAteer
Michael A. Kilpatrick

EA Site Lead for LANL

Ronald Bostic

EA Reviewers

Randy Griffin – Team Lead
Kurt Runge
John Bolling
Deb Johnson
Teri Lachman
Thomas Rogers

APPENDIX B
KEY DOCUMENTS REVIEWED, INTERVIEWS, AND OBSERVATIONS

Documents Reviewed

- ER-610-010, *Deploying the Field Monitoring Team During an Emergency Event*, Rev. 2, 01/22/15
- ERO-EPIP-105 *Emergency Director*, Rev. 3, 1/26/15
- ERO-EPIP-205 *Emergency Operations Center Operations*, Rev. 4, 6/9/15
- EM-FORM-060, *ETSC Coordinator Checklist*, Rev. 0.3
- ERO-EPIP-125, *ETSC Staff*, Rev. 1.2, 03/29/15
- EM-FORM-061, *ETSC Staff Checklist*, Rev. 0.3
- EM-FORM-009, *LANL EOC OE Notification*, Rev. 6, 8/25/15
- EM-FORM-063, *Radio Room Coordinator Checklist*, Rev. 0.3, 4/15/13
- ERO-EPIP-150, *Radio Room Coordinator*, Rev. 2.1, 6/4/14
- ERO-EPIP-160, *Notifier Levels I, II, and III*, Rev. 4.3, 10/16/14
- ERO-EPIP-210, *Operational Emergency Categorization/Classification*, Rev. 5.1, 10/28/14
- SEO-EPIP-310, *Severe Event EPIP*, Rev. 1.1, 9/8/15
- SEO-DO-PLAN-100, *The Los Alamos National Laboratory and Los Alamos Field Office Hazardous Materials Emergency Management Plan*, Rev. 5.1, 11/19/14

Interviews

- LANS ETSC Leader
- LANS Emergency Management Department Director
- LANS Notifier Level II
- LANS Operations Section Chief
- LANS Radio Room Controller/Evaluator

Observations

- Consequence Assessment Response (From daily workstation and ETSC)
- EOC Emergency Directorate Response (Primary Room)
- EOC Support Team Response (Secondary Room)
- Incident Command Response (Police Tactical Room)
- Radio Room Response (Radio Room)