Office of Enterprise Assessments Review of the Savannah River Site 2014 Site-Level Exercise

January 2015

Office of Environment, Safety and Health Assessments
Office of Enterprise Assessments
U.S. Department of Energy

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Acronyms

AEC	Area Emergency Coordinator
AOP	Abnormal Operating Procedure
CAR	Consequence Assessment Room
Ci	Curie
CRAD	Criteria, Review, and Approach Document
DAC	Derived Air Concentration
DOE	U.S. Department of Energy
DOE-HQ	DOE Headquarters
DOE-SR	DOE Savannah River Operations Office
dpm	Disintegrations per Minute
EA	DOE Office of Enterprise Assessments
EA-33	Office of Emergency Management Assessments
EAL	Emergency Action Level
ECS	Emergency Communications Specialist
ED	Emergency Director
EDO	Emergency Duty Officer
EMG	Emergency Management Guide
EMS	Emergency Medical Services
EMT	Emergency Management Team
EOC	Emergency Operations Center
EPHA	Emergency Planning Hazards Assessment
EPIP	Emergency Plan Implementing Procedure
ERO	Emergency Response Organization
FMT	Field Monitoring Team
HAZMAT	Hazardous Material
IC	Incident Commander
ICP	Incident Command Post
ISC	Incident Scene Coordinator
MOX	Mixed Oxide Fuel Fabrication Facility
NARAC	National Atmospheric Release Advisory Center
NIMS	National Incident Management System
NNSA	National Nuclear Security Administration
OFI	Opportunity for Improvement
PA	Public Address
PAC	Protective Action Criteria
PPE	Personal Protective Equipment
Pu	Plutonium
RPD	Radiological Protection Department
SAE	Site Area Emergency
SOM	Shift Operations Manager
SRNS	Savannah River Nuclear Solutions, LLC
SRS	Savannah River Site
SRSFD	Savannah River Site Fire Department
SRSOC	Savannah River Site Operations Center
TSC	Technical Support Coordinator
TSR	Technical Support Room
WINDS	Weather Information and Display System
WSB	Waste Solidification Building
WSI-LE	Wackenhut Services, Incorporated Law Enforcement
WSI-SRS	Wackenhut Services, Incorporated-Savannah River Site

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EXECUTIVE SUMMARY

The Office of Emergency Management Assessments, within the U.S. Department of Energy (DOE), Office of Enterprise Assessments (EA), conducted a review at the Savannah River Site (SRS) to evaluate SRS's preparedness for responding to a hazardous material event and to assess SRS's compliance with DOE Order 151.1C, *Comprehensive Emergency Management System*. EA also evaluated the ability of various response organizations to recognize specific hazardous situations, notify appropriate onsite and offsite organizations and agencies, implement appropriate protective actions, establish command and control of the simulated emergency event, mitigate the event, and plan for recovery operations to comply with DOE site-level exercise requirements.

EA evaluated SRS's conduct of an exercise and response to a scenario that resulted in a radioactive material release from building 235-F in F-Area. The exercise involved a site-level response in which EA performed evaluations at the SRS operations center, command room, technical support room, consequence assessment room, F-Area control room, and incident command post. The initiating event for this exercise involved several severe thunderstorms moving through F-Area with high winds and numerous lightning strikes.

During the exercise, EA observed several strengths. The incident commander, area emergency coordinator, emergency duty officer, and Emergency Director executed their duties appropriately in response to the information available to them. Emergency response organization staffing was adequate at all venues, and an F-Area incident scene coordinator initially established command and control of the event scene until the formal turnover to the SRS Fire Department fire captain. The F-Area shift operations manager discussed the event with the SRS operations center emergency duty officer and determined that the emergency met the criteria for declaring a Site Area Emergency for 235-F and agreed upon a declaration time. The emergency duty officer appropriately participated in determining the categorization and classification of the emergency, and SRS operations center personnel transmitted the initial SRS Notification Form to offsite officials within 15 minutes of emergency classification. In addition, the consequence assessment room staff accurately modeled the default source term from the emergency action level for the event to determine onsite and offsite consequences in a timely manner. Efforts made to refine the worst-case source term and dose assessment (for plume and ingestion phases) were initially performed in a timely manner and continued throughout the exercise. Savannah River Nuclear Solutions, LLC provided appropriate medical treatment and planning for the emergency, provided adequate medical support for workers contaminated by hazardous materials, and demonstrated effective planning and appropriate arrangements with onsite and offsite medical facilities to accept and treat contaminated, injured personnel.

EA also observed a number of important weaknesses. The incident command post, emergency operations center, and area emergency coordinator did not share a common operating picture of the event, resulting in fundamentally different scenarios being reacted to at the incident scene and the emergency operations center. The SRS Fire Department was initially dispatched to a vehicle accident with an injury at a radiological facility. While in transit, a Site Area Emergency was declared at the facility because the accident resulted in a radioactive material release. Although potentially significant exposure levels at the incident scene were being briefed in the emergency operations center command room and protective actions were being implemented across the site to protect other workers, the incident commander was not informed of the radiological material release and subsequent Site Area Emergency at any time during the

exercise. This lack of communication resulted in personnel not being informed of the potential consequence (798 rem at 30 meters based on the Emergency Planning Hazards Assessment) and resultant exposures from plutonium 238, as well as the incident commander not implementing appropriate protective actions for nearby facilities (although protective actions were issued by the Area Emergency Coordinator). Several emergency response organization procedures task personnel to verify responder protective actions; however, some members of the emergency response organization were observed relying more on individual knowledge and experience rather than response procedures and checklists, which likely contributed to this oversight. While several strengths were observed during the exercise, these deficiencies are significant, and increased management attention is necessary to ensure protective actions for all site personnel are appropriately assessed and properly implemented.

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1.0 PURPOSE

The Office of Emergency Management Assessments (EA-33), within the U.S. Department of Energy (DOE), Office of Enterprise Assessments (EA), conducted a review at the Savannah River Site (SRS) from May 12 – June 5, 2014, to evaluate SRS's preparedness for responding to a hazardous material (HAZMAT) event and to assess SRS's compliance with DOE Order 151.1C, *Comprehensive Emergency Management System*. EA also reviewed the ability of various response organizations to recognize specific hazardous situations, notify appropriate onsite and offsite organizations and agencies, implement appropriate protective actions, establish command and control of the simulated emergency event, mitigate the event, and plan for recovery operations to comply with DOE site-level exercise requirements. The initiating event for this exercise involved several severe thunderstorms moving through F-Area with high winds and numerous lightning strikes. This report discusses the scope, exercise scenario and response summary, results, findings, and opportunities for improvement (OFIs). In conjunction with this report, EA will produce an independent review report of the SRS emergency management exercise program. That report will cover the planning and execution of the exercise, and the corrective actions taken to address issues identified during the exercise.

2.0 SCOPE

EA reviewed specific objectives for selected emergency response elements and the exercise program element of the emergency management program at SRS to assess whether the site has established an appropriate program for responding to a HAZMAT release. EA then evaluated SRS's conduct of the exercise and response to a scenario that resulted in a simulated radioactive material release from building 235-F in F-Area. The exercise involved a site-level response in which EA performed evaluations at the SRS operations center (SRSOC), command room, technical support room (TSR), consequence assessment room (CAR), F-Area control room, and incident command post (ICP). EA's conclusions were based on a review of key documents, as well as observations at SRS's exercise venues. Key documents reviewed included emergency planning hazards assessments (EPHAs), the site emergency plan, and plans and procedures that implement the site emergency plan. The EA team also conducted interviews of key personnel responsible for developing and executing the associated exercise, and walked down significant portions of selected SRS facilities involved in the simulated emergency. The exercise plan and supporting documentation provided a basis to evaluate the ability of the SRS emergency response organization (ERO) to recognize, respond, and mitigate a simulated radioactive release.

SRS is a 310 square mile (198,344 acres) site, located south of Aiken, South Carolina. SRS encompasses parts of Aiken, Barnwell, and Allendale counties and is bordered on the west by the Savannah River and Georgia. The current mission performed at SRS's F-Area is to provide long-term surveillance for the F Canyon, FB Line, and building 235-F facilities, which were once components of the site's chemical processing areas for the recovery of plutonium and uranium.

DOE's Savannah River Operations Office is responsible for oversight of DOE's Environmental Management operations at SRS, which includes F-Area. Two other DOE offices, the Savannah River Site Office and the Office of Site Engineering and Construction Management oversee the missions supporting the National Nuclear Security Administration (NNSA) projects at SRS, which includes the Mixed Oxide Fuel Fabrication Facility (MOX) and Waste Solidification Building (WSB) construction sites that are immediately adjacent to F-Area. Savannah River National Laboratory (SRNL) operates the waste tanks

in F-Area and Savannah River Nuclear Solutions, LLC (SRNS) operates the balance of F-Area. Wackenhut Services, Incorporated-Savannah River Site (WSI-SRS) provides protective force services for the SRS.

The members of the EA team responsible for this review are listed in Appendix A. A detailed list of the documents reviewed, personnel interviewed, and observations made during this review are provided in Appendix B. A timeline of key response actions during the exercise is provided in Appendix C. Consequence assessment plume projections developed during the exercise are provided in Appendix D, and a table of EA-33 focus areas and SRS exercise demonstrations is provided in Appendix E.

3.0 EXERCISE SCENARIO AND RESPONSE SUMMARY

The response personnel participating in this SRS exercise included the SRS F-Area ERO, SRSOC personnel, SRS Fire Department (SRSFD), protective force, site-level ERO, site infrastructure operations support center, field monitoring teams (FMTs), and personnel at the nearby NNSA MOX and WSB. State representatives from the South Carolina Emergency Management Division, South Carolina Department of Health and Environmental Control, and Georgia Emergency Management Agency also participated in the SRS emergency operations center (EOC). Further, Doctors Hospital in Augusta, Georgia, participated by receiving a simulated injured person who was contaminated with radioactive material.

The SRS exercise was designed to evaluate the following 14 SRS objectives:

1. Demonstrate facility and site ERO members performing response activities safely.
2. Demonstrate the ability to develop and implement appropriate protective actions in accordance with approved procedures.
3. Demonstrate the ability to properly mitigate, stabilize conditions, and gain control over the emergency situation in accordance with procedures.
4. Demonstrate the ability to minimize exposure and control chemical and radiological conditions as appropriate in accordance with approved procedures.
5. Accurately categorize/classify, upgrade, downgrade, and/or terminate the emergency in a timely manner and in accordance with approved procedures.
6. Activate emergency response facilities in an effective and timely manner based on the type and extent of the emergency in accordance with approved procedures.
7. Demonstrate the ability to provide appropriate medical care for injured personnel in accordance with approved procedures.
8. Perform all onsite and offsite notifications in accordance with approved procedures.
9. Effectively interface and coordinate with offsite agencies and organizations in accordance with approved procedures.
10. Assess the actual or potential onsite and offsite consequences and develop onsite protective actions and offsite protective action recommendations in accordance with approved procedures.
11. Develop and disseminate accurate and timely information to the news media and the public in accordance with approved procedures.
12. Perform recovery activities in accordance with approved procedures.

13. Demonstrate the adequacy and functionality of facilities and equipment for emergency operations.
14. Demonstrate the ability of the Controller/Evaluator organization to effectively conduct an exercise.

The exercise scenario presented a radiological release at the portion of SRS known as F-Area and included a contaminated, injured person. The initiating event involved a severe thunderstorm that caused downed trees (impacting F-Area access), a downed power pole (impacting F-Area Tank Farm operations), and a momentary voltage drop in the normal power supply to building 235-F (resulting in the start, but not loading of the building diesel generator). Building 235-F contains significant quantities of dispersible plutonium (Pu)-238 that is holdup material in process equipment. While operators investigated equipment conditions at building 235-F, a nitrogen delivery truck from an offsite vendor crashed into a set of doors to the building and nitrogen bottles rocketed off of the truck, causing further damage to equipment inside the building and the building ventilation system resulting in a momentary lapse in negative pressure. The building damage met the conditions for a Site Area Emergency (SAE) according to a building 235-F emergency action level (EAL), because the damage represented an unfiltered radioactive material release from the building. Noteworthy response actions included the rescue of a simulated contaminated, injured driver involved in the vehicle crash; transport of the driver to a nearby hospital; use of technical safety requirements and alarm response procedures for operational problems at building 235-F; and response of the site-level and F-Area EROs to the SAE. A timeline of key response actions is provided in Appendix C that identifies additional details on responder actions during the exercise.

4.0 RESULTS

The results of this review are organized according to the emergency response elements contained in DOE Guide 151.1-4, *Response Elements Emergency Management Guide* (EMG), for the elements that were observed by EA evaluators. The following italicized statement reflects the portion of the Criteria, Review, and Approach Document (CRAD) 45-61, *Exercises Program Review and Severe Event Response Evaluation*, criteria that is addressed by this report. Each subsection is introduced with the expected response from the ERO based on the exercise design and SRS procedures.

Review Criteria:

The site has adequately prepared for a severe event through planning and training as demonstrated by responders proficiently implementing emergency plans during a severe event exercise scenario (DOE Order 151.1C and CRAD 45-61).

DOE Order 151.1C requirements and associated guides, primarily DOE Guide 151.1-4, provide detailed instructions on assessing the performance of the ERO and the adequacy of equipment, facilities, and response documents used by responders. This assessment consisted of a comparison of responder performance against predetermined and documented facility/site evaluation criteria that are based on the site-specific plans and procedures for implementing DOE Order 151.1C requirements. EA monitored activities and functions performed by the exercise participants and evaluated performance based on the participants' familiarity with responder organizations, functions, procedures, and anticipated responder decisions and response activities.

EA reviewed the SRS emergency plan, emergency plan implementing procedures (EPIPs), SRS 2014 exercise plan, emergency response facility procedures, EPHA and EALs for building 235-F, and records generated during the exercise.

4.1 Emergency Response Organization

The design of the exercise expected the ERO to activate, staff facilities, and safely perform the following functions:

- Activated ERO members report to their duty locations and perform their assigned duties.
- Demonstrate effective use of procedures.
- Demonstrate command and control.

The ERO includes all participating ERO members in the SRSOC, EOC, SRSFD, F-Area Complex, and WSI-SRS.

EA observed that the F/H Laboratory control room received immediate notification of the event upon detection of an abnormality by an operator. The F-Area shift operations manager (SOM) made immediate use of EALs to classify the event and determine the required protective actions for area personnel, and directed personnel, as necessary. The SOM consulted with the emergency duty officer (EDO) and, with concurrence from the EDO, determined that event parameters met EAL entry conditions for an unfiltered release of radioactive material from building 235-F. Subsequently, the SOM declared an SAE and assumed the duties and responsibilities of the area emergency coordinator (AEC). At the time of the SAE declaration, the F-Area ERO positions required for minimum staffing were already in place, because the SOM activated them earlier for the storm conditions. The AEC also used technical safety requirements and abnormal operating procedures to assess and mitigate the emergency, notified the SRSOC, and formed and dispatched emergency response teams. Furthermore, the AEC requested that the EDO dispatch the SRSFD to the event scene.

The F-Area incident scene coordinator (ISC) established command and control of the event scene until the SRSFD captain arrived and the turnover occurred. SRSFD appropriately obtained current meteorological data and determined a safe route and upwind location for the ICP, given the SRSOC dispatch message of a vehicle accident at building 235-F. However, the SRSFD did not have adequate situational awareness of the declared SAE at the event scene and did not respond with knowledge of the potential radiological hazards involved. (See **Finding F-SRNS-2** in the Notifications and Communications section of this report, and Section 6.0, **OFI-SRNS-4**.) EA conducted follow-up discussions with the SRSFD captain and other SRSFD officers to validate their situational awareness during the exercise and to further understand their response tactics to the event. The SRSFD officers confirmed that SRSFD received no communications from the ISC, AEC, EDO, or SRSOC fire dispatch that informed them of the SAE declaration or the potential radiological consequences associated with the event. From the SRSFD's perspective, they were responding to a vehicle accident with injury outside a HAZMAT facility. SRSFD officers acknowledged that if they had been informed of the potential for a significant radiological event, they would have considerably altered their approach to and response at the event scene. Notwithstanding, the SRSFD and field ERO adequately demonstrated an appropriate understanding of authorities and responsibilities for the functional response areas assigned to the event scene. The fire captain quickly assessed the vehicle accident and established appropriate strategies and tactics, with lifesaving, safety, and incident stabilization receiving top priority. Additionally, the SRSFD command staff continually assessed the situation and developed revised mitigation strategies.

Savannah River Nuclear Solutions (SRNS) had primary responsibility for the SRS ERO, with the protective force contractor (WSI-SRS) and all other contractors providing assistance. During the

exercise, SRNS and WSI-SRS staff immediately transitioned to emergency response in the SRSOC, with the EDO exercising full authority as the Emergency Director (ED) and DOE Savannah River Operations Office (DOE-SR) emergency manager, as appropriate, until ERO members staffed these positions in the EOC. Likewise, EA observed that SRNS, WSI-SRS, and DOE-SR appropriately staffed and activated the EOC, which included the command room, TSR, and CAR. Additionally, DOE-SR oversaw the overall direction and management of response operations and post-incident activities. Coordination between DOE-SR and the NNSA Savannah River Site Office occurred for management of response operations involving NNSA facilities. Furthermore, the SRS ERO exercised overall management of response from the EOC, once activated, using concepts established in the National Response Framework and National Incident Management System (NIMS)/Incident Command System to establish the appropriate command and control.

The SRS ERO had numerous response procedures and checklists available for key emergency response functions, but mostly used an experience-based approach rather than a process/procedure-based approach to decision-making for many emergency tasks during the exercise. The experience-based approach relies more heavily on the ERO to implement the emergency plan and to make time-urgent decisions based on their expert knowledge of a given situation. Consequently, the ERO did not perform some expected response actions as called for in the emergency plan and EPIPs, and the experience-based approach likely contributed to the situational awareness issue. For example, the SRS Emergency Plan F-Area Annex requires the AEC to provide directions and safe entry routes, access control points, and toxicological concerns before SRSFD/WSI-SRS responds to an area/facility, which did not occur. Additionally, neither the EDO nor emergency communications specialists (ECSs) in the SRSOC kept a log of their actions. As a result, little documentation exists to support what actions were taken by SRSOC and when the actions were completed. Furthermore, the EDO did not use the EDO Emergency Worksheet for its intended purpose, which is to provide a structured method of recording all incident information. The EDO omitted several key pieces of information from the worksheet, such as the specific protective actions implemented, the locations of roadblocks, and the completion of required special notifications. In addition, EA observed numerous other examples of checklist and procedure non-compliance at the event scene and EOC/TSR. (See Section 6.0, **OFI-SRNS-1**.)

Overall, ERO staffing was adequate at all venues. Additionally, consistent with their respective responsibilities and authorities, the SRS ERO demonstrated adequate command and control of the event based on the NIMS concept of incident command (Environmental Management facilities) or unified command (NNSA facilities), as appropriate. However, the ERO did not perform some expected response actions, as discussed throughout the report, because of the experience-based rather than process/procedure-based approach to some decision-making that likely contributed to the observed situational awareness issues.

4.2 Offsite Response Interfaces

The design of the exercise expected the ERO to effectively interface and coordinate with offsite facilities as follows:

- Establish communications and coordinate with offsite agencies and organizations in accordance with SRS procedures.
- Provide offsite representatives timely and accurate technical and resource information about the SAE.
- Integrate the offsite liaisons with SRS EOC staff.

- Notify an offsite hospital of the transport of a potentially radiologically contaminated, injured patient.

EA observed that the SRS ERO established effective interfaces with the offsite medical facility and the liaisons from three state agencies who responded to the SRS EOC. An SRSOC ECS quickly notified the offsite hospital staff that a radiologically contaminated, injured patient was being transported to their location. In addition, the three state liaisons were included in the discussions held in the EOC command room and given access to all available information.

The EOC offsite interactions coordinator and EOC DOE Headquarters (DOE-HQ) communicator provided additional information to offsite agencies and DOE-HQ (simulated by the control cell), although this information was sometimes not timely or accurate. The EOC DOE-HQ communicator transmitted the first Situation Report to the DOE-HQ emergency management team (EMT) within one hour of EOC activation. Further, updated Situation Reports were transmitted approximately every hour to the DOE-HQ EMT for the duration of the exercise. Similarly, the offsite interactions coordinator sent periodic e-mails to offsite officials, providing additional information about the emergency for the duration of the exercise. The EOC DOE-HQ communicator also faxed the DOE-SR ERO Staffing Worksheet to the DOE-HQ EMT; however, the Staffing Worksheet was sent 30 minutes after the EOC was activated rather than immediately as required by EPIP 300, *Command Operations.* In addition, the Staffing Worksheet was handwritten and parts of the document were illegible. More significantly, several critical pieces of information were not accurately described in the documents sent to offsite agencies. The e-mails sent by the offsite interactions coordinator provided a description of the onsite protective actions (remain indoors for a two-mile radius downwind of the event) that was incorrect and significantly smaller than the implemented onsite protective actions (remain indoors for a two-mile radius around the event scene and downwind from the event scene to the site boundary). Although the first Situation Report contained correct information, the two subsequent Situation Reports were not updated, as required by EPIP 300, to include several critical pieces of information such as:

- Actual contamination measurements and dose estimates described as "to be determined" when these values were known.
- Anticipated duration of onsite protective actions listed as "to be determined" when all onsite protective actions had been terminated.
- Contamination status of the radiologically contaminated, injured patient stated as "not applicable" when the contamination levels were known.
- Media and public information contact numbers described as "not provided" when those numbers were known.

As a result, the DOE-HQ element receiving this information would not be able to satisfy the demands of Departmental senior management or provide information to other Federal agencies and officials. Similarly, local offsite organizations and elected officials would not have a complete picture regarding the emergency or the possible ramifications to their jurisdictions. (See **Finding F-SRNS-1** and Section 6.0, **OFI-SRNS-2**.)

Finding F-SRNS-1: Contrary to DOE Order 151.1C, SRNS did not provide accurate and timely follow-up notifications to offsite officials when exercise conditions changed.

Overall, SRNS has established effective interfaces to ensure an integrated and coordinated emergency response with Federal, state, and local agencies and organizations responsible for emergency response and protection of the workers, public, and environment. However, timely and accurate exercise

information was not consistently provided to offsite agencies and organizations as required by SRS procedures.

4.3 Emergency Facilities and Equipment

The design of the exercise expected the facilities and equipment to be adequate, functional, and safe to operate as follows:

- Each participating emergency response facility demonstrates the use of current approved procedures and support documents/plans, status boards, displays, communications equipment, protective gear, and other emergency response equipment, as applicable.
- Each facility and its equipment, including plans, procedures, maps, etc., are operable and safe to use, and adequate for the required emergency response.

EA observed SRNS demonstrate an acceptable response using the facilities and equipment available in command centers, as well as equipment deployed with on-scene responders. The F/H Laboratory control room, SRSOC, and EOC served as dedicated and viable command centers where emergency response functions were performed safely. Additionally, dedicated equipment was available for emergency response in the field, including the capability to notify employees of an emergency and facilitate the safe evacuation and sheltering of employees, although some announcements were unintelligible and timely repair of some area speakers is warranted. Furthermore, SRNS had adequate supplies of personal protective equipment (PPE), radiation detectors, and equipment to mitigate and control releases to the environment.

At the scene, EA observed that SRSFD responded with adequate fire fighting, rescue, and medical response vehicles and equipment needed to mitigate the event consequences. Each firefighter was equipped with PPE (i.e., specially designed boots, pants, coats, gloves, and helmets) designed to comply with the requirements of applicable National Fire Protection Association standards. In addition, all entry team personnel used self-contained breathing apparatus to safely perform emergency response activities. Radiological Protection Department (RPD) personnel arrived with respirators, radiation detection equipment, and anti-contamination clothing.

In the F/H Laboratory control room, the F-Area ERO used adequately equipped work stations, including the selective signaling terminal, telephones, and radios for two-way communications; a microphone for announcing area-wide protective actions; and fixed radiation detectors and alarms to alert control room inhabitants of unsafe atmospheres. The control room was also equipped with computers (used to monitor meteorological conditions), alarm response and emergency response procedures, EALs, logbooks, technical safety requirements, a site emergency response map, and flip charts for recording significant events that were used during the exercise.

Although the control room was equipped with a microphone to broadcast protective action messages via speakers throughout F-Area, some responders and controllers stated during hot-wash meetings that they did not hear or could not understand the announcements. Controller logs also reflected unclear or unavailable speaker coverage. SRNS personnel indicated, during the exercise critique, that speakers are tested weekly and improperly working speakers are fixed via the site maintenance request program. SRNS personnel verified that no speakers had outstanding maintenance requests and attributed the speaker deficiencies to an old system that frequently malfunctions.

In the SRSOC, the facility and equipment were adequate, functional, and safe to operate. Sufficient telephone circuits, radio channels, and facsimile machines were available and operable to allow for

effective communications with onsite personnel and offsite officials, as well as the issuance of site protective action messages. Emergency response maps were available for plotting wind direction and determining areas covered by protective actions.

The EOC facilities, which include the command room, TSR, and CAR, were adequately equipped to safely perform emergency response functions in accordance with the SRS emergency plan. The EOC facilities included work stations, facsimile machines, telephones, radios for communications, EALs, technical safety requirements, a site emergency response map, and flip charts for recording significant events. Emergency response maps were available for plotting wind direction and emergency access to the event area.

Overall, each facility and its equipment, including plans, procedures, maps, etc., were operable and safe to use, and adequate for the observed emergency response. Likewise, field personnel were adequately equipped with PPE, portable radiation detection equipment, and equipment to support the transport of a contaminated, injured person to an offsite hospital. However, EA observed that some speakers used to inform F-Area workers of protective actions were not working or the announcements were unintelligible.

4.4 Emergency Categorization and Classification

The design of the exercise expected the AEC, EDO, and EOC staff to determine, validate, and upgrade the event classification if necessary, as follows:

- The AEC, in coordination with the EDO, declares an SAE based on EAL SAE-1.1, *External Event Impacting 235-F, Unfiltered Release*, as indicated by "direct observation of structural damage and loss of the ventilation as indicated by activation of the Roof Tunnel 4 Low Vacuum alarm located on Panel Board 480-B8."
- The TSR staff and the assessment and planning coordinator in the EOC command room, once activated, review and validate the emergency classification.
- The TSR engineering advisor refines the source term and recommends changes, if appropriate, per Procedure 6Q15.1, Procedure 750, *Technical Support Operations*.
- The SAE classification remains unchanged for the duration of the exercise.

EA observed the F-Area SOM's transition to the AEC position and his classification of the exercise operational emergency within three minutes of receiving the vehicle crash report. Once the F/H Laboratory SOM received the report of the breach in building 235-F from the vehicle crash, he quickly recognized the potential for an unfiltered radioactive material release and started reviewing EALs. He then selected the appropriate EAL with entry conditions involving a loss of ventilation, as indicated by control room low vacuum alarms (a simulated display), that was caused by the passing storm and an unfiltered release path through the building's doors. The loss of ventilation and a breach in building 235-F met EAL entry conditions for an SAE.

The SOM telephonically consulted with the EDO regarding the EAL, discussed known conditions, and reached agreement on an SAE classification. Immediately thereafter, the SOM announced his role as the AEC and directed the implementation of pre-planned F-Area protective actions that are linked to the EAL, placing all non-essential personnel in "remain indoors" protective actions. The SAE classification remained throughout the exercise. At the time of the SAE declaration, the F/H Laboratory ERO was already in place because the SOM activated it nearly 25 minutes beforehand at his discretion due to post-storm conditions. Once the EOC became operational, the AEC transferred any further event classification responsibilities to the ED in the EOC.

Upon arrival into the EOC, the TSR staff and the assessment and planning coordinator reviewed and validated the SAE classification. The TSR staff refined the source term, but there was an insignificant reduction in the material-at-risk quantity (as discussed in Section 4.6).

Overall, the SOM, EDO, TSR staff, and the assessment and planning coordinator collectively determined and validated the correct event classification, which remained an SAE throughout the exercise. The TSR appropriately refined the source term, and decision-makers used the appropriate EAL for determining the event classification.

4.5 Notifications and Communications

The design of the exercise expected the ERO to perform all onsite and offsite notifications in accordance with SRS procedures as follows:

- The SRSOC EDO and F-Area AEC complete proper and timely emergency notifications.
- The EDO prepares the initial SRS Notification Form, based on the initial incident information provided by the F-Area AEC, and includes the worst case (default) source term and other information provided in L2-1-EPIP-001, *F-Area Complex Facilities Emergency Classification*.
- The SRS Notification Form is updated hourly or as significant changes occur.
- Communications are complete, clear, accurate, and effective.

EA observed that the SRS ERO completed all required emergency notifications, although several cases were noted where notifications were not timely or accurate. The F-Area AEC quickly contacted the SRSOC EDO and provided information on the emergency, which the EDO used to prepare the initial SRS Notification Form along with additional information provided in L2-1-EPIP-001. The F-Area AEC and SRSOC personnel promptly notified site personnel of the necessary protective actions (although the public address system in F-Area did not provide clear and complete coverage), and SRSOC personnel began the recall of remote workers. SRSOC personnel transmitted the initial SRS Notification Form to offsite officials within 15 minutes of emergency classification, and the SRSOC EDO or EOC ED appropriately approved all subsequent updates.

However, several weaknesses were noted in the offsite notification process. The narrative description of the event provided in the initial SRS Notification Form listed the facility name as an acronym that would be unfamiliar to offsite officials, contrary to the requirements of EPIP 120, *Savannah River Site Notifications*, which states that the narrative description should not contain acronyms. Additionally, SRS Notification Form #3 stated that a radiologically contaminated, injured patient was still being transported to the hospital, rather than stating that the patient had arrived at the hospital approximately 30 minutes before the form was approved. None of the subsequent notification forms stated that the patient had arrived at the hospital, although the EOC offsite interactions coordinator included updated information about the patient in e-mails sent to offsite officials. SRS Notification Form #3 and subsequent forms listed the projected site boundary dose as "to be determined," rather than being updated as required by EPIP 120 once the air dispersion modeling run had been completed and approved by the EOC assessment and planning coordinator. Further, SRSOC personnel did not fax SRS Notification Form #3 until almost an hour after it was approved and not within one hour of the previous form's transmittal, as required by EPIP 120. In addition, the technical support coordinator (TSC) changed the state of the material release from solid to solid and liquid on SRS Notification Form #4, but did not provide an explanation in the Description/Remarks section of the form explaining why the state of the material was changed. As a

result, offsite notifications were not consistently complete, accurate, and timely. (See **Finding F-SRNS-1** and Section 6.0, **OFI-SRNS-2**.)

The SRS ERO appropriately established communication channels between the various venues, but communications between the ERO venues were not consistently complete, clear, accurate, and effective. Upon learning of the emergency, the F-Area AEC immediately contacted the SRSOC EDO. Communication links were then quickly established with the SRSFD and, subsequently, with the command room, TSR, and CAR as those venues were activated. However, several weaknesses were noted regarding the quality and timeliness of the communications. Information regarding damage to a power pole in the F-Area Tank Farm, which occurred at the onset of the exercise, was not disseminated throughout the ERO until late in the exercise. The loss of the power pole affected two tanks in the F-Area Tank Farm that the ERO did not acknowledge. Additionally, the F/H Laboratory control room had to make multiple requests for the dispatch of an FMT to the event scene, which also included a direct discussion between the F-Area AEC and incident commander (IC) regarding who had the authority to request an FMT. Moreover, the CAR assessment specialist did not discuss the information provided during the EOC conference calls with the CAR staff. (See Section 6.0, **OFI-SRNS-3**.)

More significantly, the SRS ERO did not have a common understanding of the hazards posed by the emergency event scenario. At the event scene, the IC established an initial command post and staging area approximately 200 feet from the building where the ISC had moved to wait for SRSFD's arrival. The IC subsequently relocated the command post two additional times to make room for emergency medical services (EMS) and HAZMAT operations and to move away from a fire ant mound, with the end result of an ICP located approximately 400 feet from the building. Although the IC was in contact with the F/H Laboratory control room, SRSOC, and TSR personnel throughout the emergency, none of these groups informed the IC that an SAE had been declared based on the radiological hazard present in the facility that was impacted by the vehicle accident. The IC was also unaware of the potential radiological consequences associated with the facility, including the protective action distance of 3.85 miles that correlated with the SAE declaration or that the facility's EPHA calculated a worst-case 100-rem potential consequence out to a distance of 885 feet, clearly encompassing the location of the ICP. Furthermore, no one in the ERO advised the IC to relocate the ICP to a safe distance from the event scene. Consequently, the IC and other ERO responders at the event scene were unaware that they were located in an area where the potential existed for significant exposure to radiological material. (See **Finding F-SRNS-2** and Section 6.0, **OFI-SRNS-4**.)

Finding F-SRNS-2: Contrary to DOE Order 151.1C, SRNS did not provide effective exercise communications among onsite response organizations throughout the emergency.

Overall, SRNS promptly completed most emergency notifications to workers and emergency response personnel/organizations, DOE-HQ, and offsite organizations. Appropriate offsite Federal, state, and local officials were notified and provided periodic updates. However, notifications provided to offsite officials were often inaccurate and incomplete, and sometimes not timely. More importantly, the SRS ERO did not maintain effective communications and an adequate situational awareness of the incident scene, and did not take action to ensure the safety of the emergency responders at the scene.

4.6 Consequence Assessment

The design of the exercise expected the CAR staff to accurately assess the actual or potential onsite consequences and continually determine and/or modify onsite protective actions and offsite protective action recommendations (if any) as data was received, in accordance with approved procedures, as follows:

- The projected dose assessment data considers the expected release duration, evacuation time estimates, time of day, and heat/cold stress factors.
- The TSR staff revises the source term using additional inventory documentation and provides the revised source term to the CAR staff.
- The Dispersion Modeling System specialist re-runs the Weather Information and Display System (WINDS) using the revised source term.

EA observed the CAR staff accurately computing the default source term indicated in the EAL for the event to determine onsite and offsite consequences of potential HAZMAT releases in a timely manner. Efforts were made to refine the worst-case source term and dose assessment (for plume and ingestion phases) throughout the exercise. The CAR staff appropriately integrated the consequence assessment with emergency classification; however, the staff did not adequately evaluate the computed plume projections and did not integrate the consequence assessment plume projection results with the protective action decision-making.

The CAR staff demonstrated familiarity with their assigned tasks, including the need for other key activities, such as event classification, and most used their position-specific checklists. The assessment specialist and Dispersion Modeling System specialist properly determined the default source term (5.6 curie (Ci) Pu-238 equivalent) from the EAL for the event. The Dispersion Modeling System specialist appropriately produced a WINDS dispersion model based on the default worst-case source term using actual meteorology. In accordance with the EAL, the plume projections were modeled as a ground-level release with a default ten-minute release duration. (The EAL contains the default source term and default modeling parameters for ease of use during an emergency event.)

Notwithstanding, the projected dose assessment data did not result in confirmation that initial protective action decisions were accurate, appropriate, and conservative for the protection of workers and first responders. The results of the WINDS dispersion model projected one-hour doses of 791 rem at 30 meters, 46 rem at the F-Area facility boundary, and 0.069 rem at the site boundary. The Dispersion Modeling System specialist discussed the WINDS output with the assessment specialist, but did not adequately resolve the results of the dispersion model. For example, the Dispersion Modeling System specialist only considered the expected plume arrival time at the EOC and did not consider evacuation time estimates and heat/cold stress factors. Further, the Dispersion Modeling System specialist did not determine the dose consequences at critical receptor locations (i.e., F/H Laboratory control room, ICP, MOX, Central Training Facility, and EOC) or discuss the fact that the model indicated a 791 rem dose at 30 meters. (See **Finding F-SRNS-3** and Section 6.0, **OFI-SRNS-5**)

Finding F-SRNS-3: Contrary to DOE Order 151.1C, protective actions were not reassessed throughout the emergency exercise and modified accordingly.

Although the assessment specialist briefed the assessment and planning coordinator and ED on the WINDS dispersion model output, the plume projection was of little use in ensuring that on-scene and site personnel were adequately protected. The WINDS plume plot (see Appendix D, **Figure SRNS-1**) did not clearly indicate the high (>1 rem) dose areas of concern to aid in decision-making. Although the plume plot was displayed in the command room, TSR, and CAR, the EOC staff did not question the information displayed and did not discuss the resultant projected dose levels, expected plume arrival times, or evacuation time estimates at critical receptor locations, as mentioned above. Further, maps were not used to indicate the default 2-mile radius protective action distances used during the event (see Appendix D, **Figure SRNS-2**) or the 3.85 miles (6200 meter) protective action criteria (PAC) distance indicated by the EAL (see Appendix D, **Figure SRNS-3**). Additionally, a map was not used to indicate the high radiological dose area (30 meters) and the facility boundary (see Appendix D, **Figure SRNS-4**). The use

of maps is not required, but would have provided a better representation of the areas of concern on site. (See Section 6.0, **OFI-SRNS-6**.)

TSR staff appropriately revised the source term, and the Dispersion Modeling System specialist produced a dispersion model based on the revised source term. CAR staff discussed the small change in source terms (5.6 Ci to 5.4 Ci Pu-238) and decided not to rerun WINDS. However, the Dispersion Modeling System specialist did use the National Atmospheric Release Advisory Center (NARAC) for modeling the revised source term to compare the NARAC and WINDS plume projections. The assessment specialist and Dispersion Modeling System specialist briefed the assessment and planning coordinator, ED, and state personnel on the results of the NARAC plume plots. The Dispersion Modeling System specialist also produced worst-case four-day total dose equivalent and surface deposition WINDS plume plots; however, these plots were not shared with the entire ERO cadre. (See Section 6.0, **OFI-SRNS-6**.)

At the event scene, RPD technicians monitored radiological conditions and exposures at the incident facility consistent with the emergency response priorities, procedures, and guidelines. The preliminary monitoring strategy focused on the immediate deployment of RPD technicians, ensuring the collection of relevant monitoring data at the event scene to support timely emergency response. However, the strategy was also dependent on the initial assessment of the release and, in this case, should have considered the large area under protective actions specified by the EAL for an airborne release. As such, the monitoring strategy should have focused on the immediate collection of air and, to a lesser extent, surface contamination data because the potential release would result in the generation of an airborne plume. RPD technicians worked to locate a plume footprint using monitoring stations surrounding building 235-F and identifying the outer boundaries of airborne deposition and surface contamination. Nevertheless, it was not apparent that the RPD technicians were aware of the SAE declaration or the extent of potential radiological consequences associated with the operational event. Consequently, SRNS did not consider the emergency exposure guidelines or establish turn-back levels for the released contaminants, which must be approved by the IC during the development of the initial Fire Department entry plan and the RPD's preliminary monitoring strategy. (See Section 6.0, **OFI-SRNS-7**.)

Overall, CAR staff members coordinated their activities and communicated frequently with command room and TSR personnel. A default WINDS dispersion model was accurately computed in a timely manner. However, the results of the dispersion model were not adequately assessed, dose consequences at critical receptor locations were not computed or considered, and the WINDS plume projection did not indicate the high radiological dose areas of concern and was of little use in the protective action decision-making process. Therefore, the exercise consequence assessment products did not result in confirmation that initial decisions were accurate, appropriate, and conservative for the protection of workers and first responders. Further, RPD technicians were not aware of the SAE, did not consider emergency exposure guidelines, and did not establish turn-back levels for the potential radiological consequences.

4.7 Protective Actions and Reentry

The design of the exercise expected the ISC, AEC, EDO, security organization, and TSR/EOC personnel to implement protective action tasks as follows:

- ISC
  - Ensure personnel in proximity of the scene are upwind of its location and validate accountability of those personnel.
- AEC

  - Identify the potential and actual HAZMAT release consequences and determine facility protective actions.
  - Decide whether to relocate personnel in the immediate area based on wind direction, and issue a "remain indoors" protective action within F-Area based on a potential radioactive release.
  - Continually reassess and modify protective actions based on wind shifts.
- EDO
  - Implement a protective action of "remain indoors" for a two-mile radius around F-Area and downwind to the site boundary.
  - Continually reassess and modify protective actions, if necessary, based on current and forecasted meteorology.
  - Recall and account for all remote workers.
- Security
  - Establish roadblocks and initiate access control into F-Area in a timely manner.
- TSR/EOC
  - Continually reassess and modify protective actions, if necessary, based on current and forecasted meteorology.
  - Review the protective action determined by the facility to ensure that the appropriate protective action was implemented.
  - Review the initial protective actions implemented by the AEC and SRSOC to verify appropriate protective actions have been taken for the facility and site.

EA observed that one of the operators who was originally dispatched to investigate the loss of vacuum in building 235-F and the start of the building diesel generator, was subsequently directed to escort the vendor delivery truck to building 235-F. When doing so, the operator witnessed the truck crash into building 235-F and became the ISC upon declaration of an SAE. The ISC established initial control of the scene near the accident site and provided a briefing to arriving SRSFD personnel. Personnel near the scene were not informed of the potential consequence (791 rem at 30 meters) and resultant exposure from Pu-238 in building 235-F from this type of scenario (based on the analysis in the EPHA). Initially, the arriving responders and the ISC had no PPE or detection equipment to alert or protect them from a Pu-238 uptake, and were not made fully aware of all the risks involved with conducting response operations in an area of potentially greater than 25 rem as stated in Environmental Protection Agency 400-R-001, *Manual of Protective Actions Guide and Protective Actions for Nuclear Incidents*, and SRNS *Emergency Response Facility Procedures Manual 103, Attachment 8.6*.

The ISC promptly and effectively implemented protective actions at the event scene to protect the health and safety of responders and surrounding workers, based on what he knew at the time (a response to a vehicle accident). The ISC immediately determined that the facility was unoccupied and that only the vehicle driver was involved. The SRSFD captain used this information to plan and implement a time-urgent entry for lifesaving, safety, and incident stabilization. However, as previously discussed, initial responders were unaware of the event classification and the technical basis reasoning behind the default protective actions associated with the building 235-F EAL in use. Therefore, response to the vehicle accident and injury did not reflect the potential radiological release or initial protective actions associated with the SAE determination. (See Section 6.0, **OFI-SRNS-4**.)

Protective force personnel established roadblocks and initiated access control into F-Area in a timely manner. Furthermore, protective force personnel provided additional traffic controllers to ensure that the exercise was conducted safely when the ICP was relocated near an active road.

The AEC in the F/H Laboratory control room directed the implementation of the "remain indoors" protective action for F-Area, as stipulated by the EAL, with consideration of meteorological conditions throughout the scenario. Within two minutes of the SAE declaration, the AEC directed an ERO member to prepare a scripted protective action message, the message was prepared by completing an easy-to-use message template from the *F-Area Complex Emergency Response* procedure, and the message was announced area-wide from the control room. The protective actions guided affected personnel to go to the nearest building and remain indoors for a radioactive material release. The instructions included closure of doors and windows, and shutdown of building ventilation systems that are necessary for airborne HAZMAT releases. The AEC, as the SOM before the SAE declaration, had directed an evacuation of building 235-F beforehand because of the loss of the building's ventilation. Because the building was unoccupied, a rally point was not needed. The AEC did not view light and variable winds to be a concern for protecting personnel at the scene.

After reviewing the EAL and while awaiting RPD personnel equipped with radiation detectors to arrive at the event scene, the AEC did not appear (based on EA observation) to consider the potential release consequences in determining specific protective actions or relocation of personnel at the scene. The AEC did not recognize the significance of a 6200-meter protective action distance associated with the EAL and consider the magnitude of the potential dose in F-Area, or investigate potential exposures through a review of the EPHA. Further, the AEC is not provided with a table listing exposures at receptors of interest (based on the results of the EPHA analysis) for use in quickly determining potential exposures, as recommended by the EMG. (See Section 6.0, **OFI-SRNS-5**.) If tabulated exposures had been available, the AEC could have recognized the need to examine whether the control room and security traffic control points warranted relocation, area workers should be evacuated, and emergency exposure guidelines for responders should be implemented (as provided in *F-Area Complex Emergency Response* procedure) before airborne survey results were available.

The AEC implemented the "remain indoors" protective action, as stipulated by the EAL, rather than "sheltering" protective actions. The SRS emergency plan describes the use of "sheltering" protective actions as a better means to protect workers from even short duration radioactive material releases, rather than "remain indoors" protective actions stipulated by the EAL. The primary differences, as described by the SRS emergency plan, involve whether site workers should go to a designated HAZMAT shelter or seek protection in any building, including trailers. Specific F-Area buildings are labeled as HAZMAT shelters because they have been assessed for their robustness and low air infiltration rates. This information would have been important if the exercise scenario reflected the upper end of the event consequences from a building 235-F puff release. (See Section 6.0, **OFI-SRNS-8**.)

EA did not observe the AEC use his position response checklist during the exercise. The use of the checklist would have guided the AEC to consider a control room evacuation, due to projected exposures in the EPHA, and implementation of emergency exposure limits for on-scene responders. This knowledge would have been important if the design of the exercise reflected the upper end of the consequences from a radioactive material puff release from building 235-F. The EPHA reflects a 100-rem one-hour exposure at 885 feet from building 235-F for the default (worst-case) analysis; this distance extends beyond the F-Area boundary.

The SRSOC EDO promptly implemented protective actions for areas beyond the F-Area boundary, but did not recognize the differences between the EAL and EPIP 103, *Protective Actions*, regarding the extent

of protective actions. The EDO used EPIP 103 to immediately determine the protective actions required for the emergency and quickly issued an Onsite Protective Action Message; closed the site perimeter barricades and nearby highways; and initiated restrictions for air, rail, and river traffic. However, the EDO did not recognize the conflicting information about exceeding PAC at a greater distance, per the EAL, than what was implemented for the site, per EPIP 103. SRS Notification Form #1 states that the PAC of 1 rem is not expected to be exceeded at greater than 6200 meters (3.85 miles) from the point of release (obtained from the EAL), yet the EDO implemented onsite protective actions for a 2-mile radius around F-Area and downwind to the site boundary (obtained from EPIP 103). No discussion occurred in SRSOC regarding the difference in protective action distances between the EAL and EPIP 103. In addition, the EDO did not communicate with SRSOC protective force personnel about the distance where the PAC may be exceeded so that roadblocks could be adjusted as needed, as required by EPIP 103. Consequently, SRSOC protective force personnel were unaware that they may have personnel being exposed to greater than 1 rem. (See **Finding F-SRNS-4** and Section 6.0, **OFI-SRNS-9**.)

Finding F-SRNS-4: Contrary to DOE Order 151.1C, SRNS has not fully developed predetermined protective actions.

The TSR assessment specialist and Dispersion Modeling System specialist confirmed that the appropriate EAL and initial event classifications were implemented, but did not discuss or confirm implementation of the protective action information on the EAL (remain indoors, PAC out to 6200 meters). As previously mentioned, the predetermined protective actions are linked to the EAL and are meant to be conservative based on the EPHA calculations, but these predetermined actions do not fully encompass the area where protective actions are required as determined by the EPHA analysis. The consequence analysis data in the EPHA for building 235-F indicates that an unfiltered release from the facility could expose personnel within 30 meters to 3900 rem and personnel within 100 meters to 580 rem if they remain at their locations for only one hour. Instructing personnel to remain indoors without considering the potential indoor air concentration of nearby facilities did not adequately protect personnel for the worst-case scenario, as determined by the EPHA. Also, the ED and the assessment and planning coordinator did not review the need to relocate emergency workers at and near the event scene to an alternate location, as required by EPIP 103. (See **Finding F-SRNS-3** and Section 6.0, **OFI-SRNS-10**.)

Adequate communications occurred between the AEC and the IC on performing a facility reentry to verify equipment status and damage. The AEC provided adequate support to the IC to make building entries to ascertain whether the facility was in a safe configuration and to verify building vacuum readings and ventilation fan operation.

Overall during the exercise, the AEC implemented the default protective actions for F-Area, and the EDO implemented the default protective actions for the remainder of the site. Accountability of personnel was preformed quickly, and weather conditions were continually monitored to ensure on-scene responders remained upwind and to establish safe routes for ERO members to traverse the site. However, ERO members did not consider the potential exposures at key receptors of interest before detection equipment was available or recognize conflicts in the *Protective Action* procedure and the EPHA analysis. These issues included not verifying that on-scene responders and F/H Laboratory control room personnel were safe from potential building 235-F releases, not using HAZMAT shelters for a radioactive material release, and not recognizing that the protective action distance of the EAL in use extended beyond the two-mile default protective actions.

4.8 Emergency Medical Support

The design of the exercise expected appropriate medical care to be provided for injured personnel in accordance with approved procedures, as follows:

- First aid teams provide proper first aid care for injured personnel.
- ERO demonstrates command and control of the medical emergency.
- EMS personnel provide proper emergency medical care for injured personnel.
- EMS personnel coordinate the transport of contaminated/injured personnel with the local hospital, to include proper patient turnover and support to the hospital staff upon arrival.
- RPD personnel survey patients and provide PPE and decontamination advice to medical professionals.

Although the exercise scenario anticipated a response by an SRS F-Area first aid team, SRSFD personnel arrived on scene first, provided initial EMS, and negated the need for a first aid team. EA observed that SRSFD provided adequate EMS for the vehicle accident, discounting the communications and situational awareness issues previously discussed. The first priority was to retrieve the unconscious, injured victim from the cab of the truck. The SRSFD captain appropriately tasked EMS personnel to implement a "load and go" and immediately transport the victim to Doctors Hospital in Augusta, Georgia, where pre-planned arrangements existed to accept and treat contaminated, injured personnel. The RPD first line manager also designated an RPD inspector to travel with the victim to the offsite medical facility. Additionally, one of the firefighters exhibited symptoms of heat exhaustion and fainted (as part of the exercise scenario), which the SRSFD appropriately addressed by stabilizing the individual and providing transport to the Site Medical Facility for further evaluation and treatment.

SRSOC personnel also demonstrated effective coordination with offsite health care providers. The SRSOC ECS quickly notified Doctors Hospital staff that a contaminated, injured victim was being transported to their location. Furthermore, the EDO paged the Contaminated Patient Response group and informed them that a contaminated, injured patient was en route to Doctors Hospital. However, the fire specialist in the EOC did not properly track the status of the contaminated, injured victim. Unless the EOC recalls a medical department specialist, the Fire Department Specialist in the EOC is responsible for tracking all personnel taken to hospitals, but, in this case, the Fire Department Specialist did not record any data in the log or appropriate patient forms. (See Section 6.0, **OFI-SRNS-11**.)

Overall, SRNS provided appropriate medical treatment and planning for the emergency, and provided adequate medical support for injured workers contaminated by HAZMAT. SRNS also demonstrated effective coordination and planning for the sharing of patient information between onsite and offsite health care providers. Likewise, SRNS demonstrated effective planning and appropriate arrangements with onsite and offsite medical facilities to accept and treat contaminated, injured personnel. Nevertheless, SRNS staff members did not follow their procedure for tracking and documenting the status of the contaminated, injured victim.

4.9 Termination and Recovery

The design of the exercise expected recovery activities to be performed in accordance with approved procedures, as follows:

- Develop a recovery plan outline that identifies appropriate recovery strategies.
- Security personnel implement incident scene preservation.

When the EOC was notified that the damage at building 235-F appeared contained and the release terminated, EA observed the ED direct the TSC to prepare a recovery plan outline briefing. The TSC, in conjunction with the recovery team staff, reviewed the termination criteria from Procedure 113 and discussed each item listed to determine whether the criteria had been met. The TSC then briefed the ED and command staff on the termination criteria, with the ED agreeing to terminate the event (not the exercise) and enter into the recovery stage. The TSC and the recovery team staff proceeded to complete Attachment 8.5, *Typical Recovery Plan Outline*, and Attachment 8.6, *Typical Components of a Recovery Plan*, of Procedure 113. The TSC then briefed the ED and command room on the recovery plan. This brief included the names of the site and facility managers, and the need to further refine which chemicals were spilled, assess the condition of the truck, and plan for its removal. Also discussed was the need to assess glovebox conditions, determine the source term released, and determine the extent of exterior and interior cleanup needed. The ED orally approved the recovery plan.

Although the exercise included damage to a power pole and the failure of exhaust fans for two tanks in F-Area, EA did not hear either of these issues being discussed during the initial command room briefing. Later in the exercise, the emergency management coordinator requested that site utilities provide details on the damaged power pole, and the engineering advisor responded that the power pole did not affect the facility. The inoperable tank exhaust fans and the need for a work package to restore power were not discussed in the command room and were not addressed as part of a recovery plan.

Some issues were noted in the recovery planning process. Reentry assessment guidelines (Procedure 113, Attachment 8.4) were not discussed or completed. Furthermore, the ED and DOE-SR manager are required by Procedure 113 to approve the recovery plan, but the recovery plan does not contain signature blocks for the ED and DOE-SR manager to document their approval. The ED was only heard orally approving the recovery plan outline, and it was not observed or documented that the DOE-SR emergency manager approved the plan. Additionally, the recovery team staff discussed that this event was not a criminal or terrorist event, so incident scene preservation was not necessary. However, the recovery plan did not address whether a DOE accident investigation would be required for this event. (See Section 6.0, **OFI-SRNS-12**.)

Overall, the termination and recovery efforts that EA observed and documented mostly followed the event scenario and Procedure 113. The TSC was appropriately tasked with creating a recovery plan for building 235-F. However, repair to the damaged power pole that led to a loss of ventilation for the two F-Area tanks was not discussed, and the need for a work package to restore power was not addressed. In addition, reentry assessment guidelines were not discussed, and approval of the recovery plan was not documented.

5.0 FINDINGS

As defined in DOE Order 227.1, *Independent Oversight Program*, 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 the 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. Corrective action plans must be developed and implemented for EA appraisal findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 227.1 to manage these corrective action plans and track them to completion.

Finding F-SRNS-1: Contrary to DOE Order 151.1C, SRNS did not provide accurate and timely follow-up notifications to offsite officials when conditions changed.

DOE Order 151.1C states that continuous, effective, and accurate communication among response components and/or organizations (appropriate DOE/NNSA elements, local organizations, and authorities) must be reliably maintained throughout an Operational Emergency. The notification updates provided by SRNS to offsite organizations, including DOE-HQ, contained information that was inaccurate (e.g., protective actions implemented) or omitted critical pieces of information that were known (e.g., dose estimates). As a result, the DOE-HQ EMT would not be able to fully inform Departmental senior management about the ramifications of the emergency, or provide information to other Federal agencies and officials. Similarly, local offsite organizations and elected officials would not have a complete understanding of the emergency.

Finding F-SRNS-2: Contrary to DOE Order 151.1C, SRNS did not provide effective communications among onsite response organizations throughout the emergency.

DOE Order 151.1C states that the contractor must provide effective communications among response organizations throughout an emergency and establish effective communications methods between event scene responders, emergency managers, and response facilities. Additionally, effective implementation of NIMS requires communications among the ERO to provide a common operating picture of the emergency response and shared situational awareness among all teams. During the exercise, the IC, EOC, and AEC did not share a common operating picture of the event, resulting in fundamentally different understandings of the event being reacted to at the incident scene and the EOC. The lack of a common operating picture resulted in personnel not being fully aware of all the risks involved with conducting response functions at the incident scene and appropriate protective actions for nearby facilities not being implemented.

Finding F-SRNS-3: Contrary to DOE Order 151.1C, protective actions were not reassessed throughout the emergency and modified accordingly.

DOE Order 151.1C states that protective actions must be promptly and effectively implemented to minimize the consequences of emergencies to protect the health and safety of workers. Protective actions must be reassessed throughout an emergency and modified as conditions change. The EMG further states that a continuous ongoing assessment of event-specific data, consisting of correlations between monitoring instrument readings and concentrations, cumulative exposure/dose, and/or exposure/dose rate at specific receptors, be incorporated into the analysis as it becomes available. The Dispersion Modeling System specialist did not determine the dose consequences at critical receptor locations (i.e., the ICP and nearby facilities) or consider the fact that the dispersion model indicated 791 rem at 30 meters from the incident scene. As a result, the potential existed for workers and first responders within the F-Area facility and the adjacent MOX facility to be exposed to doses associated with these consequences without being fully aware of the risks involved.

Finding F-SRNS-4: Contrary to DOE Order 151.1C, SRNS has not fully developed predetermined protective actions.

DOE Order 151.1C states that protective actions must be predetermined for onsite personnel, to include methods for controlling access to contaminated areas. The protective actions specified in the EPHA and EAL for an unfiltered release from building 235-F only require personnel to remain indoors to a distance of 3.85 miles (6200 meters). By simple extrapolation from the EPHA, the potential exists for personnel within 30 meters of the incident for one hour to be exposed to 3900 rem, and personnel within 100 meters

to 580 rem because the predetermined protective actions do not consider the potential indoor air concentration of nearby facilities. As a result, the potential exists for workers instructed to remain indoors and first responders within the F-Area facility to be exposed to doses associated with these consequences.

6.0 OPPORTUNITIES FOR IMPROVEMENT

As discussed above in the results, this EA review identified 12 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 anticipated that these OFIs will be evaluated by the responsible line management organizations and either accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

OFI-SRNS-1: Consider improving ERO decision-making for a broad range of emergency response events by:

- Establishing and documenting, in EPIPs, the expected actions of the IC and SRS ERO to ensure that they can act decisively and avoid off-script actions (i.e., providing a criteria-based decision rationale that minimizes experience-based decision-making).
- Revising procedures and forms that serve as response records to require the time of occurrence and person creating the record.
- Revising existing EPIPs to ensure that the immediate and subsequent expected response actions are clearly defined and that each procedure has clear direction for branching to other emergency response procedures.
- Defining expected actions for achieving and maintaining situational awareness among all teams.
- Conducting drills with the IC and ERO to ensure that procedurally required actions are demonstrated for a variety of response scenarios.

OFI-SRNS-2: Consider improving the usability, timeliness, and accuracy of information provided to offsite officials by:

- Using an electronic version of the DOE-SR ERO Staffing Worksheet rather than a hand-written version to provide DOE-HQ with the requested information.
- Sending the DOE-SR ERO Staffing Worksheet, Situation Reports, and SRS Notification Forms via e-mail rather than facsimile.
- Contacting the EDO directly to verify the protective actions that were implemented on site before providing that information to offsite officials.
- Ensuring that each Situation Report, SRS Notification Form, and e-mail to offsite officials contains the latest data by conferring with EOC personnel or referring to the following sources of information:
    - WebEOC significant events board
    - News releases

- SRS Notification Forms
- Plume projections.

- Providing an explanation when information is changed in a subsequent update, such as a change in the state of the material released from a solid to a solid and a liquid.

OFI-SRNS-3: Consider enhancing the completeness, clarity, accuracy, and timeliness of communications within the ERO by implementing the following:

- Establishing written protocols and training on the differences between an FMT and responding RPD inspectors, including who has the authority to dispatch the two groups.
- Ensuring that assessment specialists are adequately trained to ensure that CAR staff members are appropriately briefed.

OFI-SRNS-4: Consider improving communications among the ERO to provide a common operating picture of the emergency response and shared situational awareness among all teams by:

- Defining information flow processes within SRS's response facilities and field response elements.
- Achieving interoperability among specialized response facilities (area/facility control rooms, SRSOC, EOC, TSR, CAR, joint information center, and DOE-HQ EOC) to capture, distribute, and assess emergency information that expedites rapid and accurate decision-making.
- Expanding the use of computerized information management systems, 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.
  - Providing awareness of what the ERO is doing in relation to the incident.
  - Enabling the ERO to predict changes to the incident.
  - Supporting ERO objectives that forecast future actions.
- Establishing tools and operator aids that enable decision-makers to remain in their assigned positions to focus on analysis, use shared information, and consult with their specialized staffs, without needing to leave their positions to seek information, maps, or displays.

OFI-SRNS-5: Consider confirming accuracy and appropriateness of the projected dose assessment data by:

- Developing a table listing exposures at receptors of interest based on EPHA results.
- Ensuring evacuation time estimates for all affected buildings, facilities, and areas, as well as heat/cold stress factors, are discussed with decision-makers in a timely manner.
- Ensuring that the dispersion model outputs indicate consequences at all critical receptor locations, ICP, and PAC-2 distances.
- Discussing critical assessment data (e.g., exposure of workers to greater than 25 rem and PAC-2 distances) with decision-makers in a timely manner.

OFI-SRNS-6: Consider enhancing the timeliness and accuracy of protective actions taken to protect workers and first responders by:

- Ensuring plume plots clearly indicate the high (>PAC-2) dose areas of concern and doses at the facility boundary to aid in protective action decision-making for workers and first responders.
- Displaying a map that indicates the default 2-mile radius protective action distance and the PAC distance indicated in the EPHA and/or EAL.
- Displaying a map that indicates the high radiological dose area (30 meters) and the facility boundary.
- Sharing all radiological plume projection outputs (e.g., four-day total dose equivalent and surface deposition) with the ERO.

OFI-SRNS-7: Consider improving the RPD preliminary monitoring strategy by:

- Ensuring that the RPD-relevant EAL information is factored into the field monitoring plan for a radiological release.
- Ensuring that turn-back levels for the released contaminants are appropriately and adequately established.

OFI-SRNS-8: Consider updating the protective action statements for radioactive material releases to shelter in place for puff releases and evacuation for other radioactive plumes to make them consistent with the SRS HAZMAT shelter plan.

OFI-SRNS-9: Consider improving the protective action decision-making process by:

- Using the same unit of measurement (e.g., miles versus meters) for all protective action distances.
- Providing a process for the EDO to use when the EPHA indicates a different protective action distance than the standard protective action distance prescribed in EPIP 103.

OFI-SRNS-10: Consider improving the implementation of protective actions by:

- Revising existing EPIPs to ensure consistency between the EPIPs and EAL dictated protective action distances (i.e., miles versus meters).
- Revising existing EPIPs to implement appropriate protective actions involving shelter in place and/or evacuation.

OFI-SRNS-11: Consider improving the process for maintaining awareness of injured personnel status during an event by ensuring clear responsibility for tracking, documenting, and communicating information throughout an emergency.

OFI-SRNS-12: Consider modifying the recovery plan outline by:

- Including signature blocks for the ED and DOE-SR emergency manager to document their approval of the plan.
- Including consideration of whether a DOE accident investigation (with incident scene preservation) will be required.

Appendix A
Supplemental Information

Dates of Review

Onsite Review: May 12 – June 5, 2014

Office of Enterprise Assessments

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

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William A. Eckroade
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Phil Aiken

EA Reviewers

Randy Griffin – Lead
John Bolling
Deborah Johnson
Teri Lachman
Tom Rogers

Appendix B
Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

- CAR Assessment Specialist Checklist, F-Area Exercise, 5/14/14
- CAR Dispersion Modeling System Specialist Checklist, F-Area Exercise, 5/14/14
- CAR FMT Coordinator Checklist, F-Area Exercise, 5/14/14
- CAR Lead Controller log, F-Area Exercise, 5/14/14
- DOE-HQ EMT Situation Reports #1-3, F-Area Exercise, 5/14/14
- DOE-SR ERO Staffing Worksheet (Figure 1, Attachment 8.13 of EPIP 300), F-Area Exercise, 5/14/14
- EDO Emergency Worksheet, F-Area Exercise, 5/14/14
- EOC DOE-HQ Communicator Checklist (Attachment 8.13 of EPIP 300), F-Area Exercise, 5/14/14
- EOC DOE-HQ Communicator ERO Message Forms, F-Area Exercise, 5/14/14
- EOC Offsite Interactions Coordinator E-Mails, F-Area Exercise, 5/14/14
- EOC Offsite Interactions Coordinator ERO Message Forms, F-Area Exercise, 5/14/14
- EOC Offsite Interactions Coordinator Checklist (Attachment 8.15 of EPIP 300), F-Area Exercise, 5/14/14
- EOC Offsite Interactions Coordinator Log, F-Area Exercise, 5/14/14
- EPIP 103, *Protective Actions*, Rev. 15, 9/10/12
- EPIP 114, *Emergency Categorization and Classification*, Rev. 17, 11/29/12
- EPIP 300, *Command Operations*, Rev. 24, 3/20/13
- EPIP 750, *Technical Support Staff Operations*, Rev. 12, 2/19/13
- EPIP 825, *Consequence Assessment Operations*, Rev. 7, 11/29/12
- EPIP 120, *SRS Notifications*, Rev. 15, 9/10/12
- EPIP 123, *Graded ERO Response*, Rev. 10, 4/19/13
- L2-1-EPIP-001, *F-Area Complex Facilities Emergency Classification*, Rev. 17, 11/29/12
- L2-1-EPIP-002, *F-Area Complex Emergency Response*, Rev. 15, 1/15/14
- F/H Laboratory Control Room Log, 5/14/14
- Procedure 317-1, *Operations Center Response to Emergencies*, Rev. 15, 4/10/14
- SRS Notification Forms #1-6, F-Area Exercise, 5/14/14
- SRS Onsite Protective Action Message, F-Area Exercise, 5/14/14
- SRSOC Control Net log, F-Area Exercise, 5/14/14
- SRSOC Controller log, F-Area Exercise, 5/14/14
- SRSOC Lead Controller log, F-Area Exercise, 5/14/14
- SRSOC Notification Verification Sheet, Rev. 11, 9/16/09
- SRSOC Site Messages, F-Area Exercise, 5/14/14
- S-EHA-F-00004, EPHA for 235-F, Rev. 5, 9/2010
- TSC Checklist, F-Area Exercise, 5/14/14
- TSR Lead Controller log, F-Area Exercise, 5/14/14
- WebEOC Significant Events Board Report, F-Area Exercise, 5/14/14
- WebEOC Task Assignments Board Report, F-Area Exercise, 5/14/14

Interviews

- SRNS CAR Assessment Specialist
- SRNS CAR Dispersion Modeling System Specialist
- SRNS CAR Lead Controller
- SRNS Database Developer (Emergency Management Department)
- SRNS EOC Assessment and Planning Coordinator
- SRNS EOC Emergency Management Assistant
- SRNS Event Scene Lead Controller
- SRNS SRSFD Officers
- SRNS SRSOC EDO
- SRNS SRSOC Lead Controller/SRSOC Manager
- SRNS TSR Lead Controller

Observations

- Response to the exercise scenario at the F/H Laboratory control room, incident scene, SRSOC, EOC, TSC, and CAR.
- Exercise hot-washes for the venues observed by EA.
- Exercise critique meeting.

Appendix C
Timeline of Key Response Actions

Time	Action
0750	Exercise starts in the control room.
0751	Control room communicator calls SRSOC to gather information on sitewide power outages. SOM checks alarm conditions and equipment status changes; none noted. SOM requests field operators to verify that building 235-F ventilation fans are running.
0752	SRSOC reports to control room that no power outages are reported on site.
0800	Generator running inject provided. SOM pulls Abnormal Operating Procedure (AOP) for generator.
0800	Exercise starts at incident scene.
0802	SOM activates F/H Laboratory ERO because the passing storm caused the 235-F standby generator start and low vacuum alarms to annunciate.
0803	SOM gets report that building 772-1F containment is not occupied.
0806	Operator arrives at building 235-F to check diesel generator start.
0808	Operator notifies the control room that diesel generator had started with no load (zero amps).
0811	WSI Law Enforcement (WSI-LE) reports that their units in the area did not hear the public address (PA) announcement in F-Area.
0811	EDO confirms with F/H Laboratory control room that PA announcement was not heard.
0812	WSI-LE confirms that EDO would like F-Area blocked off.
0812	SOM dispatches operator to escort an Airgas delivery truck and notes deviation from an actual response (deliveries would be suspended due to existing problems at building 235-F). SOM requests operators at building 235-F to escort the delivery truck and obtain name and phone number of Airgas driver.
0813	Control room habitability checks commence.
0815	SOM monitors wind direction and updates area map.
0816	Control room asks SRSOC whether downed trees create a full or partial roadblock to F-Area. The answer was full.
0816	Second operator arrives at building 235-F.
0817	Control room receives a call from an operator to report that no one is inside building 235-F.
0819	Operators use AOP to check ventilation status – Normal.
0822	Lead controller provides message that Airgas truck accident has occurred.
0824	Operator reports accident to the control room.
0826	Operator assumes the role of ISC.
0828	ISC requests control room to call in emergency medical technicians.
0828	Building 235-F accountability completed. All persons accounted for.
0830	SOM and SRSOC consult on EAL. The SOM declares SAE 1.1 and issues the “remain indoors” protective action. Wind is from the east at 87 degrees.
0832	EDO reports that a release is in progress at building 235-F.
0832	Outdoor PA announcement made (unintelligible).
0834	ISC moves outside the east entrance gate to wait for arriving ERO.
0835	AEC briefs control room staff on all current conditions.
0836	SRSOC ECS #2 activate FMT #1.
0837	EDO receives 911 call about vehicle accident NE of building 235-F, 100 yards from 9013-F.
0837	SRSOC provides ICP location to AEC.
0837	SRSFD arrives on scene.

0839	RPD arrives on scene.
0840	ISC provides turnover brief to SRSFD captain. SRSFD captain becomes IC. SRSFD captain requests habitability survey of ICP. ICP is located outside of east entrance gate where operator was waiting. Note: No discussion of high radioactivity potential in turnover briefing.
0842	SRSOC ECS #2 broadcasts an onsite protective action message over Selective Signaling Terminal and faxes message.
0842	RPD begins segregating operators for survey.
0842	Control room receives report that surveys confirm a radiological release has occurred.
0843	Fire captain asks for "survey pad" and makes plan for initial entry team. SRSFD entry team in bunker/self-contained breathing apparatus.
0843	Control room informed that the SRSFD captain has command of the scene.
0844	SRSFD entry team (3 firefighters) enter event scene.
0845	SRSFD captain makes the decision to "load and go" based on the reported condition of victim (unconscious and laceration on head).
0847	SRSFD captain requests ISC to "figure out what's on the truck."
0848	Victim is at the step off pad on a stretcher.
0850	RPD first line manager receives ant bites at ICP.
0853	ICP moved further east to the next road.
0854	Entry team debriefs at ICP. - Cylinders are nitrogen. - Entry team closed the building doors. - No discussion of breach inside the building. - IC questions what liquid is leaking since nitrogen would typically not puddle – entry team reports that liquid is in the drain and trench. - IC requests a manifest of what was on the truck – ISC working on this.
0856	Ambulance pulls out with victim heading for Doctors Hospital in Augusta. - No discussion at ICP that this is an Airgas employee.
0856	AEC enters limiting condition for operation 3.3.1 for building 235-F ventilation system.
0857	ISC reports that ICP is "clear" of radiological contamination.
0857	Control room receives report that building 235-F doors are closed.
0859	IC discusses installing a tarp over the drain to contain liquid on ground.
0900	IC confirms victim identity and that RPD is on the ambulance.
0901	SRSFD captain holds first ICP briefing. - One victim en route with RPD. - No one else in facility, and accountability is confirmed. - Closed doors to minimize any release. - RPD first line manager reports area is ready to enter.
0905	WSI officer arrives at ICP – SRSFD battalion chief requests WSI to block the road on either side of the ICP.
0907	Second group of SRSFD units arrive at the event scene.
0908	Exercise on hold to address RPD first line manager ant bites.
0934	Exercise resumed at ICP.
0935	ICP briefing: - Drain is covered with tarp. - Cylinder info is reviewed. - Exterior doors closed.
0936	Exercise resumes at other venues.
0937	AEC advised of driver's ID and supervisor contact information.
0937	Controller provides inject that the liquid on the ground is diesel and antifreeze.
0938	RPD reported no beta/gamma detected.

0939	Firefighter down due to heat exhaustion – as part of the exercise.
0940	ICP note taker arrives at ICP and appears to have monitored the radio traffic since the event started.
0942	RPD first line manager reports only alpha contamination now – confirmed no airborne contamination.
0942	IC strategy for 2nd entry team: - Need to verify building at negative pressure. - Read pressure gauge and confirm fan is running. - Plan for reentry needed for HAZMAT team. - Verify that WSI has blocked the ICP area road. - Alpha contamination only – non-airborne. - RPD first line manager asks entry team to carry a portable air sampler with them. Note: SAE declaration never mentioned at the ICP.
0954	AEC briefs control room personnel and relays that firefighter is at Aiken Regional Hospital; a second firefighter is reported to have 10,000 disintegrations per minute (dpm) on boot.
0956	MOX notified of the event. Wind is east by south east at 144 degrees.
1001	SRSFD dealing with mitigating strategies for the building doors, drain, and ditch.
1008	ISC discusses how to get a status of the facility with the SRSFD fire captain.
1009	Lead event scene controller injects that cylinder did breach the inside wall and that cylinder is embedded in the wall.
1012	IC strategizes how to seal the breach in the wall and comes up with a plan to use a tarp and duct tape.
1022	Contamination reports arrive regarding nurse and hallways at Doctors Hospital.
1027	CAR assessment specialist reports that an assessment of damage to building 235-F is ongoing. No one can confirm whether the release is ongoing, so will assume it is ongoing. Most of the building's damage is in the area of the largest source term, 5.43 Ci Pu-238 equivalent. Refined source term is not yet determined.
1028	Second SRSFD entry team (2 firefighters) enters event scene with portable air sampler, tarp and tape, and instructions on how to read the building ventilation air pressure gauge.
1030	Entry team reports gauge is reading "2.6," which is normal.
1031	Entry team reports liquid spill is contained.
1034	Entry team reports cylinder is embedded in the wall and they will reclose doors and seal with tarp and tape.
1035	Entry team reports one nitrogen and one oxygen cylinder are still on the truck.
1036	Entry team is at the step off pad. - One firefighter has 10,000 dpm on boots. - Air sampler shows 15 derived air concentration (DAC)/hour.
1045	AEC briefs control room on 15 DAC hours at building 292-F.
1051	Control room notified that building 235-F doors are sealed and negative pressure indicated. IC and AEC concur that building 235-F is in a safe configuration.
1055	AEC briefs control room on current conditions.
1055	ICP briefing: - Airborne contamination is localized. - No issues outside the building for SRSFD.
1100	AEC receives a report that the firefighter is at Aiken Regional Hospital, not site medical.
1102	Control room staffer asks AEC about MOX, WSB, and F-Area Tank Farm. Assumed F-Area Tank Farm personnel are not in danger because it is upwind.
1104	Confusion about whether authority to dispatch FMT resides with AEC or IC. Spill estimate at 40 gallons of fuel provided to the AEC.
1106	SRSOC informs AEC of isolation of downed electrical pole. Control room personnel are

	confused as they were unaware of impact from downed electrical pole at F-Area Tank Farm.
1107	Exercise terminated at the ICP.
1114	RPD relief arrives; no contamination reported at fence line.
1205	Exercise terminated at the control room.
1258	Modeler briefs the state representatives on the NARAC and WINDS plume modeling runs. The state representatives told the modeler that they did not ask for the NARAC runs or the briefing.
1258	No one asked to see the plume plots and they were never posted. Further, the original plume projection file was the only one displayed throughout the entire exercise.
1353	Exercise terminated.

Appendix D
Consequence Assessment Plume Projections

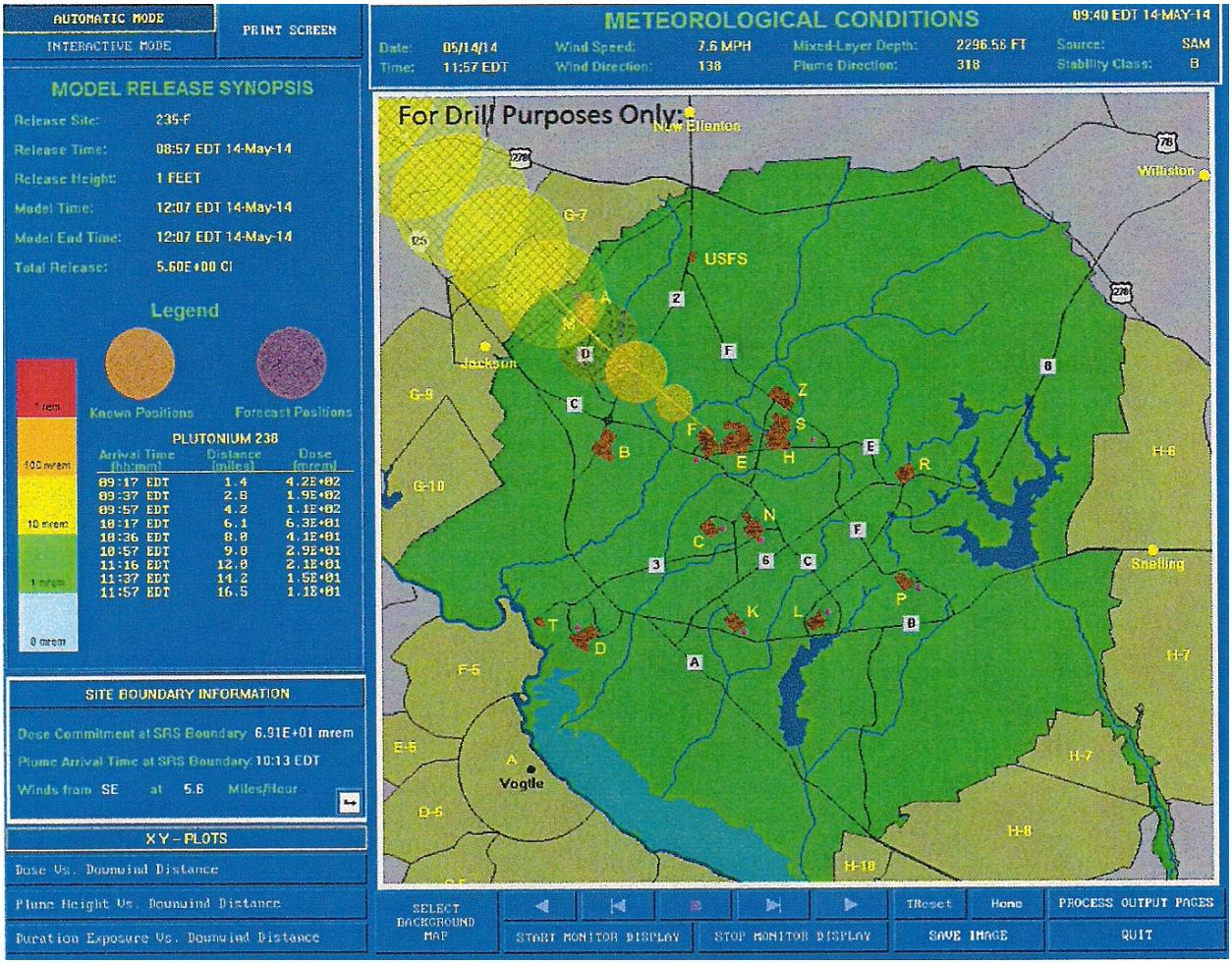

Figure SRNS-1

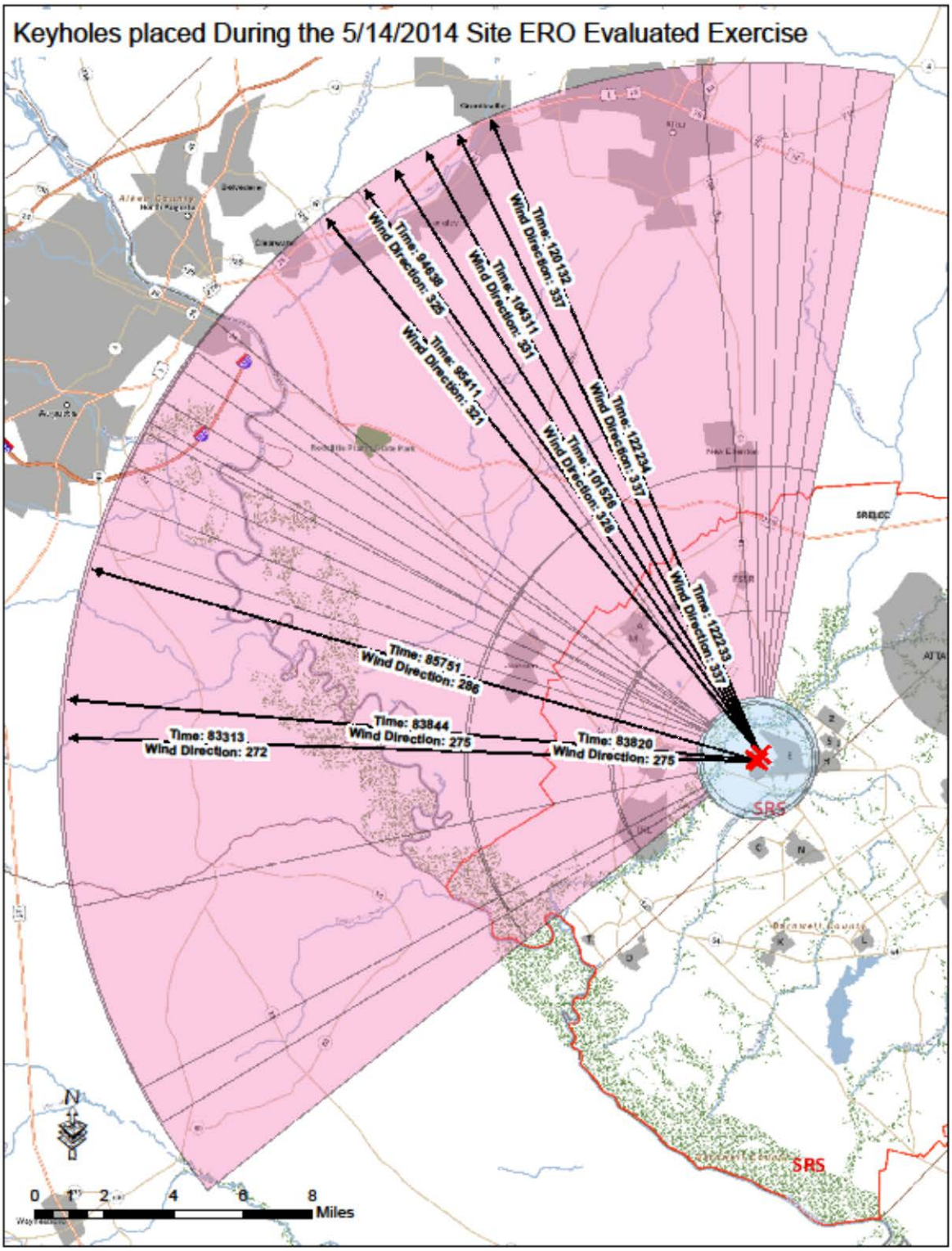

Figure SRNS-2

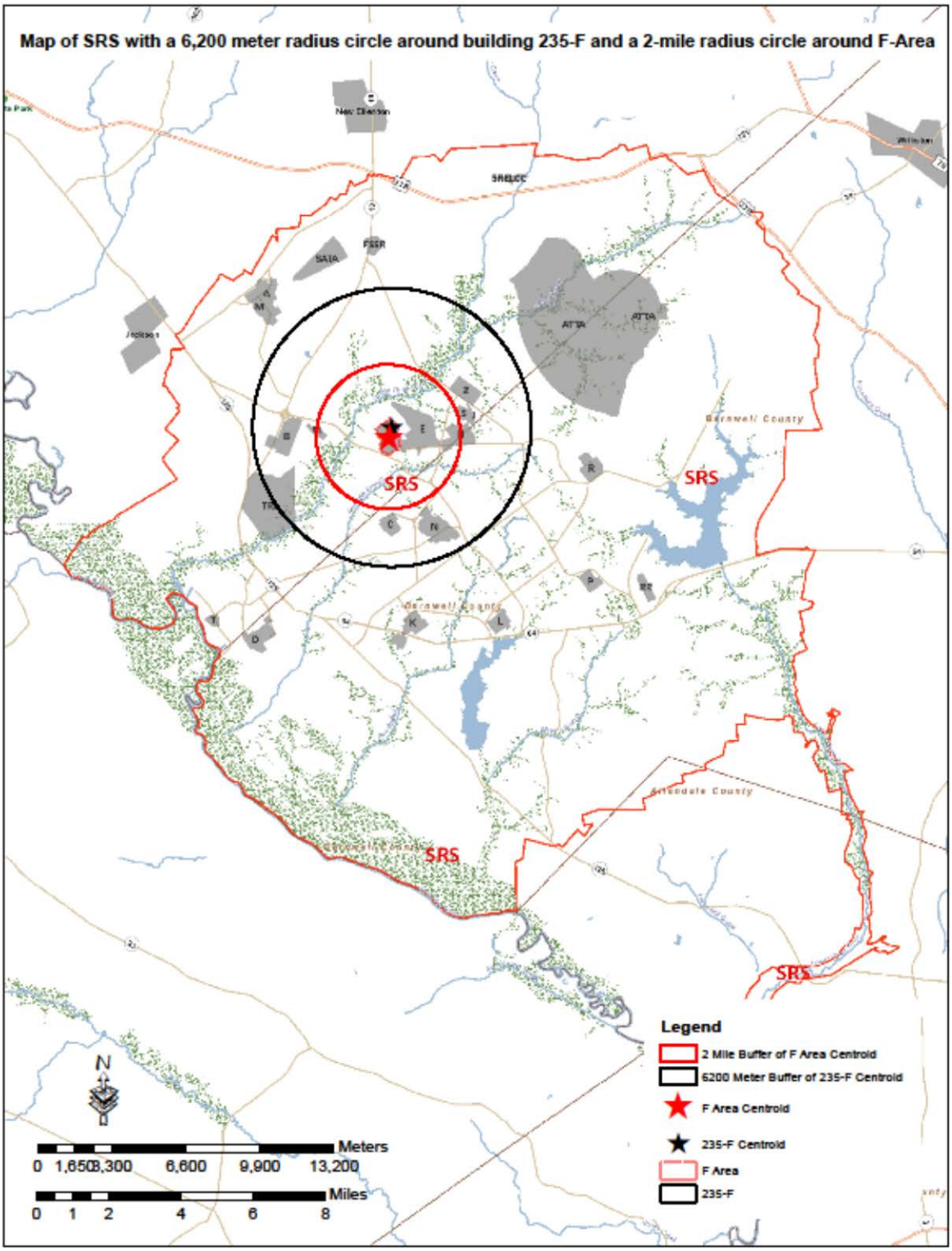

Figure SRNS-3

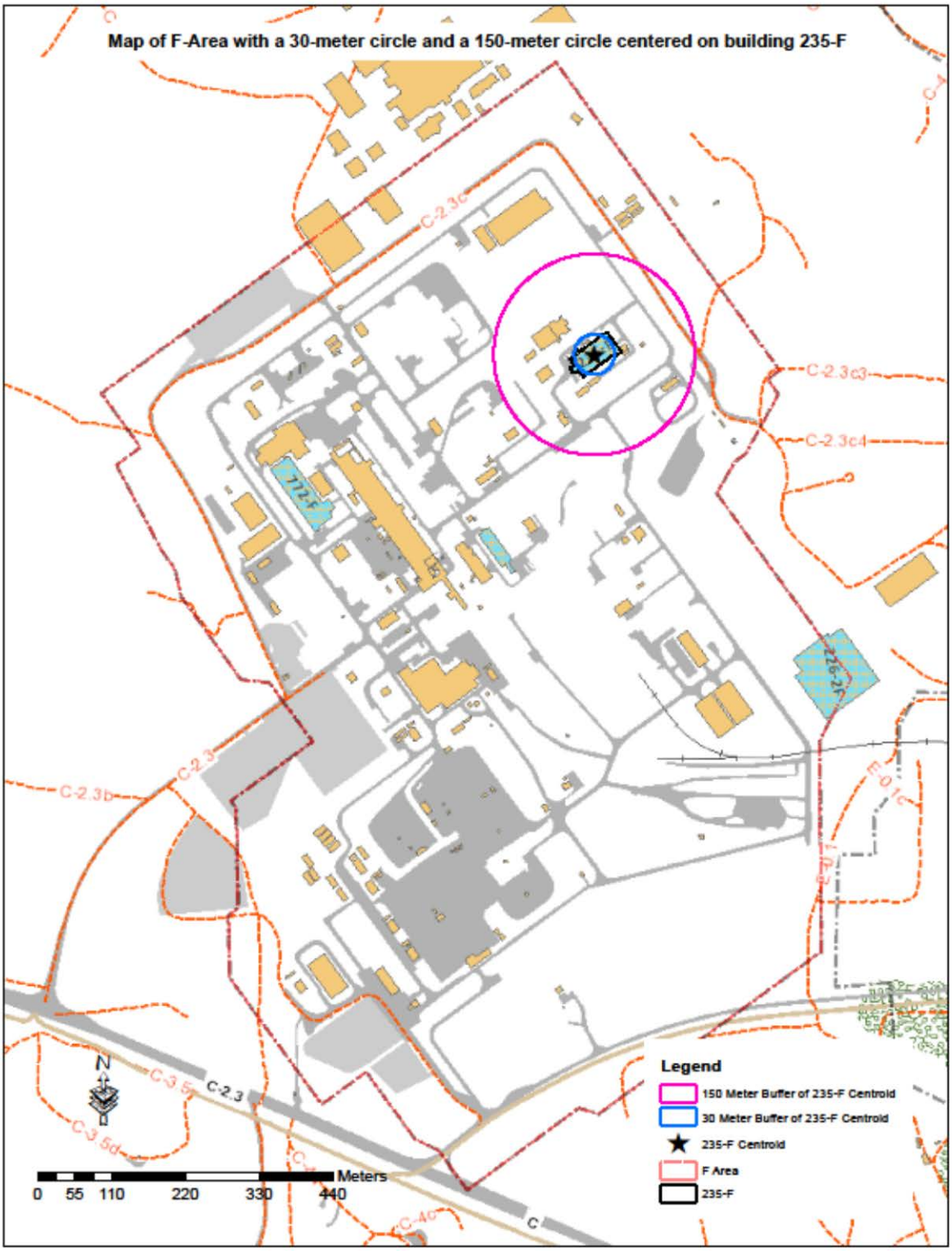

Figure SRNS-4

Appendix E
EA-33 Focus Areas

EA-33 2014 Focus Areas	Focus Areas Demonstrated During the Exercise
Assess the impacts of severe events by considering damage to multiple HAZMAT facilities, command centers, and facilities used to implement protective actions.	No
Implement emergency action levels (EALs) using real-time meteorological conditions in determining initial protective actions.	Yes
Confirm habitability of the primary or alternate EOC following a severe event involving the airborne release of HAZMATs.	Yes
Establish alternate command centers as operational, if necessary.	No
Power essential response equipment from backup power sources.	No
Communicate using backup communication systems.	Yes
Analyze consequences using more sophisticated modeling programs during ongoing continuous assessment activities.	Yes
Validate offsite monitoring and integration with national radiological response assets.	No
Implement severe event planning with state and local governments.	No
Plan for events beyond the site's response capabilities and consider a timeframe to be self-sufficient.	No
Perform short-term initial recovery and reconstitution activities.	Yes