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Response Elements

Emergency Management Guide

[This Guide describes suggested nonmandatory approaches for meeting requirements. Guides are not requirements documents and are not to be construed as requirements in any audit or appraisal for compliance with the parent Policy, Order, Notice, or Manual.]

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DOE G 151.1-4 - Response Elements
Table of Contents

List of Figures

List of Tables

1. EMERGENCY RESPONSE ORGANIZATION

1.1 Introduction

The purpose of this chapter is to assist Department of Energy (DOE) and National Nuclear Security Administration (NNSA) field elements in complying with the DOE O 151.1C requirement to establish and maintain an Emergency Response Organization (ERO) for each facility/site or activity and to ensure that DOE/NNSA EROs are compliant with the National Incident Management System (NIMS). The ERO is a structured organization with overall responsibility for initial and ongoing emergency response to an Operational Emergency (OE) and for mitigation of the consequences. The ERO establishes effective control of response capabilities at the scene of an event/incident and integrates ERO activities with those of local agencies and organizations that provide onsite response services. An adequate number of experienced and trained personnel, including designated alternates, should be available on demand for timely and effective performance of ERO functions.

This chapter is designed primarily for facilities/sites and activities that are required to implement an Operational Emergency Hazardous Materials Program and is directed at operations and emergency management staff at Field Elements and operating contractor organizations responsible for DOE and NNSA facilities/sites and activities.

This guide cancels and supersedes the following

- DOE G 151.1-1, V-1, *Emergency Response Organization*, dated 8-21-97
- DOE G 151.1-1, V-2, *Offsite Response Interfaces*, dated 8-21-97
- DOE G 151.1-1, V-3, *Categorization and Classifications of Operational Emergencies*, dated 8-21-97
- DOE G 151.1-1, V-4, *Notifications and Communications*, dated 8-21-97
- DOE G 151.1-1, V-1, *Consequence Assessment*, dated 8-21-97
- DOE G 151.1-1, V-2, *Protective Actions and Reentry*, dated 8-21-97
- DOE G 151.1-1, V-3, *Emergency Medical Support*, dated 8-21-97
- ·DOE G 151.1-1, V-4, *Emergency Public Information*, dated 8-21-97
- DOE G 151.1-1, V-5, *Emergency Facilities and Equipment*, dated 8-21-97
- DOE G 151.1-1, V-6, *Termination and Recovery*, dated 8-21-97

1.2 General Approach

Emergency response in the DOE/NNSA Comprehensive Emergency Management System consists of a three-tiered organizational structure. The primary capability for responding to an OE resides with site prime Management and Operating (M&O) contractors because of their responsibility for directing appropriate emergency response actions within the area under their control and at the scene of the emergency. Facility/site and activity emergency response capability is based on comprehensive and integrated plans and procedures. DOE/NNSA field elements, the second tier, oversee and support emergency management activities for responding to an OE at facilities/sites or activities under their cognizance. DOE/NNSA headquarters organizations, the third tier, oversee and support the emergency management activities of the field element by monitoring the field and contractor response, providing support as needed, assisting with issue resolution, and coordinating interagency, congressional, and public information activities at the national level. Headquarters provides strategic direction to the DOE/NNSA field response and evaluates the impact of the emergency on DOE/NNSA operations, missions, and functions.

At each tier the DOE/NNSA Comprehensive Emergency Management System requires a structured organization, an ERO, to ensure a prompt, effective, and efficient response to a wide variety of emergency events and conditions so that appropriate response measures are taken to protect workers, the public, the environment, and national security. The guidance in this chapter addresses the establishment and maintenance of an ERO at the facility-level, site-level or activity-level on an ongoing basis during normal operations and the on-demand staffing of the ERO in response to an OE. *Each* facility on a multi-facility site should have a facility-level ERO that may interface with and join the site-level ERO in emergency events. However, the functional response needs and results of the Hazards Survey and Emergency Planning Hazards Assessment (EPHA) will be the predominant factors affecting the ERO organizational structure; the availability and location of individual emergency response facilities may also affect the configuration and allocation of ERO personnel and response capabilities.

The guidance focuses on the structure and functions to be implemented by facilities/sites and activities and will assist in defining an ERO that is capable of responding to the spectrum of potential emergencies affecting a site, including definition of authorities, responsibilities, and duties of individuals assigned to the organization. A description of a typical onsite emergency organization, including a method for determining functions to be performed and its interfaces with offsite services and agencies, is provided. The ongoing activities that are required to maintain the readiness of the ERO during normal operations are addressed. Finally, the activation of the ERO organization and subsequent operational aspects during a response are discussed.

The Incident Command System (ICS), which manages response operations at the event scene, should be developed and implemented according to the ICS consistent with the National Response Plan (NRP) and required by the NIMS.

1.3 ERO Structure

The organizational structure of the ERO should be based on the results of the facility/site or activity Hazards Surveys and EPHA, the relationships between the site and facility response capabilities, and the relationships between the onsite and offsite emergency response organizations. Characteristics of the spectrum of scenarios that constitute the technical planning basis for a facility determine the functions that will be required to respond to emergency events. Specific functions activated in a response will depend on the requirements of the particular emergency. The distribution of the emergency functions among facility- and site-levels will be determined primarily by the locations of response facilities and organizations that provide response assets. For a specific site or facility, some emergency response functions can best be organized and performed at the facility-level while others may be better served by a site-wide organization. Facility-level functions may include control of process operations and implementation of local protective actions (e.g., building evacuations or sheltering, ventilation manipulation). Functions that are more likely to be common for a site include firefighting, medical response, and environmental monitoring. In contrast, some response functions, such as firefighting or Hazardous Materials (HAZMAT) response, may be performed utilizing offsite support services.

The terms “Emergency Response Organization” and “Emergency Management Team” are not synonymous. ***ALL*** personnel who may be needed to perform duties, beyond those specified by 29 CFR 1910.120 for the first responder awareness level, during a response to any of a broad range of emergencies defined in the Hazards Survey or EPHA are members of the ERO. In general, the ERO component formed to manage the response actions during emergencies is the Emergency Management Team (EMT). At each response tier (e.g., facility, Field element, Headquarters), the EMT provides for overall management, direction, and control of the emergency response and normally operates from a command center or Emergency Operations Center (EOC).

1.3.1 Emergency Director (ED)

One position in the facility/site M&O contractor ERO, the Emergency Director (ED) or similar title, should have unilateral authority and responsibility to implement the facility/site emergency plan and employ overall emergency management responsibility during response to an OE. Full authority and responsibility implies that this individual should either initially perform, or oversee, the following minimum functions: detect or assess, categorize and classify (as necessary) the emergency event or conditions; carry out initial notifications; implement protective actions onsite; issue offsite protective action recommendations; and initiate response by appropriate emergency resources (such as fire, medical, security and HAZMAT personnel). The position may be transferred to more senior officials once the ERO is fully staffed.

1.3.2 ERO Functions

This section provides guidance on determining basic/core and support functions necessary for the facility/site to fulfill its responsibilities and respond to the needs of outside agencies during an emergency. The ERO configuration should be contingent on the severity of the emergency (emergency category and classification) and the required functions determined by analysis. The Hazards Survey and EPHA should be used as the basis document for determining required functions. Identified emergency conditions from the Hazards Survey and analyzed scenarios of the EPHA are particularly useful in determining what response functions should be fulfilled and, ultimately, what response tasks need to be performed. The ERO staffing should be documented based upon an analysis performed of potential emergency conditions.

Although the functional response needs and results of the Hazards Survey and EPHA should be the predominant factors affecting the ERO structure, the availability and location of existing emergency response facilities may affect the allocation of ERO personnel. The structure of the facility/site ERO should take into account locations of emergency facilities and how these locations may influence the effectiveness of emergency response functions. For example, damage control and repair teams are best dispatched from an area close to maintenance shops, tool cribs, and storage areas for personnel protection equipment. Additional information is presented in DOE G 151.1-4, Chapter 3.

The emergency plan should address the scope and responsibility of the support functions and the equipment and facilities required for performance of the function. Implementing procedures should assign personnel to the various functions required and provide directives and checklists for the performance of those duties. The extent to which support functions are implemented is dependent upon the nature and severity of potential emergencies at a facility/site. Some support functions may not be required at all, while some may be required dependent on the type or classification of emergency. While most generally conform to the NIMS management structure, several functions are unique to DOE/NNSA emergency management programs and are not explicitly encompassed within the NIMS functions.

The following representative support functions should be considered during analysis to ensure the ERO is capable of successfully responding to an emergency:

- **Operations Support.** Operational support in the form of a coordinated work force and equipment for performance of assessment or damage control, maintenance/ repair, or implementation of mitigative actions should be considered for most operational events.

- **Technical Support.** Technical personnel are available to advise emergency and operations management on the present status of the facility/site and to forecast future operational impacts. Technical personnel should advise management on actions to bring the facility to a stable condition or safe shutdown.

- **Notifications.** Notification methods should be established to support emergency management. Equipment, personnel, and procedures should be made available to ensure the facility/site fulfills all responsibilities of notifying workers, response organizations, and other agencies. Facility/site personnel and organizations and offsite authorities and response organizations should be notified in a timely manner of changes in event status or emergency condition.

- **Consequence Assessment.** This support function should assist emergency assessment teams and protective actions personnel in estimating and measuring onsite and offsite consequences. This function may include directing environmental sampling and analysis teams, meteorological data monitors, etc.

- **Communications.** Communications support should be provided to all functions to maintain control of the emergency organization and provide effective communications among key ERO members. Support may be required to maintain continuous communications within elements of the ERO (e.g., technical support for communication equipment/systems, and maintenance of status boards and logs).

- **Health and Safety Support.** Radiological, chemical, biological, and occupational safety support may be required for exposure and dose control, or environmental contamination assessments.

- **Administration and Logistics, Data Distribution, Documentation.** Emergency management should be provided with sufficient resources required to mitigate the emergency, including unexpected additional resource and asset requirements. Facility/site data and status should be promptly distributed to all functional groups to permit overall management of the response effort. Documentation of key events, including actions taken, decisions made, etc., necessary to reconstruct the event should be maintained.

- **Public and Media Information.** Public and media information support should be available to perform such tasks as interfacing with the media; updating the public, including facility/site personnel not directly involved with the response; providing rumor control, etc.

- **Medical.** Medical support should be provided for all injured and/or potentially contaminated or infected personnel, including emergency responders. Medical advice should also be provided to emergency management when there is a potential for significant injuries or casualties from an event. Interfaces with offsite medical support organizations are within the responsibilities of the site medical staff.

- **Hazardous Material Survey, Sampling and Sample Analysis Support.** Hazardous Material Survey, Sampling and Sample Analysis Teams should be designated to evaluate the occupational, radiological, and environmental health hazard at or near an accident scene. These teams should be equipped with adequate monitoring equipment and personnel. Teams should possess knowledge on the use of protective gear, monitoring equipment, and communication equipment and should be equipped and trained to accomplish field monitoring and plume tracking, *when appropriate*, within and beyond the Emergency Planning Zone (EPZ).

- **<u>Security</u>.** Security support will be required to interface with emergency management personnel in several different response activities (e.g., control of an incident scene, direction of evacuation efforts, control of classified material, protection of nuclear, biological, toxicological, or other sensitive assets, and preservation of the accident/incident scene). Organizational and operational interfaces between these traditional emergency response functions and security organizations should be clearly defined in emergency plans and procedures to ensure timely decision-making, coordination of actions, field communications, Headquarters communications, and recovery. Expected interfaces with offsite security and law enforcement organizations should be defined and covered in emergency plans.

- **<u>Fire and Rescue</u>.** Fire and rescue support should be capable responding to the scene of the emergency safely. Response units should possess the proper amount and type of specialized equipment. Search and rescue operations should be capable of being conducted in an efficient and effective manner. Depending on the situation, Fire and Rescue operations should include monitoring for Personnel Protective Equipment (PPE) acceptability by industrial hygiene and Health Physics personnel. Fire and Rescue support is determined by the baseline needs assessment performed in accordance with DOE O 420.1B, using the Hazards Survey and EPHA.

- **<u>Repair and Maintenance</u>.** Repair and maintenance support should be available for carrying out repair and maintenance activities during an emergency in a timely and efficient manner. Repair and maintenance teams should possess the proper tools and the capabilities to procure replacement parts if needed. Repair and maintenance activities should include personnel protection and monitoring as well as coordination with other support groups, such as Health Physics and Chemistry personnel.

The above functions are not intended to represent an all-inclusive list. A “needs” analysis can be used to identify ERO functions to be performed in implementing an effective emergency response based on the results of the Hazards Survey and EPHA, ultimately developing a list of functions similar to those indicated above. Organizations and personnel who are not part of the normal site operations, but are a part of the ERO, may perform some facility/site ERO functions. It may be more cost effective to rely on offsite providers of specialized services, such as medical support or explosive disposal, than to develop those capabilities onsite. These offsite capabilities should be clearly defined in current Memoranda of Agreement (MOAs), Memoranda of Understanding (MOUs), or Mutual Aid Agreements (MAAs).

Several of the functional areas mentioned above (e.g., consequence assessment) may include several individual tasks. For example, in the case of a high hazard facility, a review and/or analysis of the EPHA and applicable guidance documents will be required to identify all tasks that could be necessary in response to the spectrum of emergencies analyzed. When tasks have been identified and the ongoing or intermittent characteristics of their performance during the response determined, performance-time requirements can be estimated and the process of determining positions and staffing may proceed. Once this is completed, the assignment of specific staff members may be accomplished by aligning the normal operating organization to the ERO. Personnel whose day-to-day duties most closely align with required emergency functions and tasks should be assigned to the equivalent ERO position in order to maximize organizational effectiveness and minimize training and additional qualification requirements.

Once functional areas have been determined and individual tasks within each area are identified, it will be apparent that many functions have direct counterparts in offsite organizations. One task not uniformly described in each of the above functions is related to working level interfaces with offsite organizations. An example is the liaison function necessary between the consequence assessment team and a State's Department of Hygiene for events with offsite consequences. Several example tasks were also mentioned above in the Public and Media function.

The needs analysis concept described above is also applicable to determining where elements of the ERO are located and what equipment is required to support staff efforts. Utilization of the Hazards Survey and EPHA for deriving required facilities and equipment is presented in DOE G 151.1-4, Chapter 3, as well as chapters devoted to specific response functions, such as consequence assessment.

1.3.3 ERO Positions

A one-for-one correspondence between ERO positions and emergency response functions is not always necessary. For example, small, low-hazard facilities might have one position serve several functions, whereas other facilities might need several persons to carry out a single function (such as a high hazard facility consequence assessment function for several different potential emergency scenarios).

The following is a list of positions of specific responsibilities and/or authorities for a generic ERO structure:

- **Duty officer** is the individual assigned initial decision-making responsibility with the requisite authority to categorize the OE, make initial classification and protective action determination, and activate the ERO. A separate *Duty Officer* position is not necessary; for example, the Duty Officer may be the Fire or Security Officer who becomes the Incident Commander (IC) in event of emergency.

- **Incident Commander (IC)** maintains operational control of the response at the incident scene and transmits information to the command center or EOC.

- **Emergency Director (ED)** maintains overall command and control of the emergency response.

- **Environmental, Safety, and Health (ES&H) manager** oversees and monitors the operations of the occupational safety organization, the medical, and consequence assessment (including hazardous materials monitoring, modeling, and meteorological) response teams, and the activities of health physicists and industrials hygienists.

- **EOC manager** oversees, monitors, and directs the EOC response operations, offsite communications, notification process and administrative operations of the EOC.

- **Operations manager** ensures communications with incident command; manages overall impact of the event on operations; supplies needed information about facilities and processes, and monitors personnel status and accountability.

- **Logistics manager** ensures logistical requests are met for response support equipment, supplies, and communications.

- **Public affairs manager** ensures emergency public information is communicated effectively and accurately.

- **Security manager** ensures safeguards and security response efforts and needed liaison. The security manager coordinates security operations with offsite security liaisons [Federal Bureau of Investigation (FBI), local law agencies, etc.]

Provisions should exist for interface between other agency response personnel and the facility/site and Cognizant Field Element EROs, with clearly defined positions or points-of-contact. Interfaces that require coordination, liaison exchange, or integration, that will also influence the structure of the ERO during an emergency, may include but are not limited to:

- Tenant and visiting national laboratories (for special projects)

- Potential Department of Defense, Defense Threat Reduction Agency (DTRA), Department of State (DOS), Environmental Protection Agency (EPA), Department of Homeland Security (DHS), and Department of Justice (DOJ)/FBI presence

- Offsite organizations including local law enforcement; fire, medical, American Red Cross, local, state, Tribal, and regional Federal agencies; and joint public information groups

- Radiological emergency response assets, such as the Accident Response Group (ARG), Nuclear Emergency Support Team (NEST), Federal Radiological Monitoring and Assessment Center (FRMAC), Aerial Measuring System (AMS), National Atmospheric Release Advisory Center (NARAC), Radiation Emergency Assistance Center/Training Site (REAC/TS), and Radiological Assistance Program (RAP)

- Organizations under the NRP, such as the Joint Field Office (JFO) or the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) organizations

- Organizations under National Interagency Fire Center for wild land fires

These interfaces should be preplanned and described in the emergency plan where applicable. Additional information concerning the interface with offsite emergency response organizations is provided in DOE G 151.1-4, Chapter 2.

1.4 Staffing the ERO

1.4.1 Initial Staffing

Upon declaration of an OE, on-shift personnel should initially fill key ERO positions and perform time-urgent emergency functions until designated ERO personnel arrive and assume their assigned positions. Wherever possible, functions of the ERO should be performed by shift personnel until full staffing has been achieved.

Assigned ERO personnel will eventually staff the ERO positions associated with the specific OE conditions. If normal site operations are managed by a site prime M&O contractor, then that contractor should staff the primary positions in the ERO. The ERO may consist of personnel from several different contractors or subcontractors that provide specific services or expertise to the site (such as fire protection or security). Personnel needed to perform emergency-related duties and activities during a response to any of a broad range of OEs are considered members of the ERO. Authorities, responsibilities, and duties should be developed for each position in the ERO, documented in the emergency plan, and implemented by Emergency Plan Implementing Procedures (EPIPs). Minimum qualifications for each position should be well defined. Control of operations, monitoring, and repair teams should be clearly defined and associated with a single ERO position or the teams should each be associated with a separate position.

The system used for performing the initial call-out of the ERO should ensure that the ERO positions are functionally staffed and activated in a timely manner. The following aspects of an initial activation should be considered in developing the call-out system:

- Response time objectives for primary and alternate responders and the minimum staffing levels necessary to achieve different levels of emergency response capability
- Authentication of responder notification, such as use of code words, call-backs, or restricted access communication networks
- Effects of seasonal weather, concurrent emergencies at more than one facility on a site, and local equipment/phone exchange limitations
- Security clearances and credentials that may be needed for site as well as offsite responders to gain entry to facilities and participate in response, especially in response to security driven events.

A person trained and qualified to fill the ED position should be onsite at all times. For facilities where there is no operating shift outside of the normal work day, there should be either an individual qualified to fill the ED position on the back-shift or arrangements should be made to fill the position with a qualified person from an adjacent facility, the site organization, or with an Incident Commander (IC) from an organization such as the fire department. When an individual from outside the specific facility fills the position of ED, a qualified person from the facility staff should be on-call to assume the ED position as soon as possible.

Fully trained and qualified personnel should be available at all times to perform each of the emergency response functions. Primary and backup personnel may be assigned (by name, title, or position in the operating organization) to each position in the ERO (both facility- and site-level) to enhance planning and response. Availability of staff to perform these ERO functions may be achieved by having three or more persons qualified to fill each position, with at least three of them being on call at all times. An adequate number of experienced and trained personnel should be assigned to each functional area for initial and ongoing response. For some operations or processes and locations, offsite personnel may also staff ERO positions. All persons assigned to ERO positions should demonstrate their proficiency in their assigned position through periodic participation in an exercise, an evaluated drill, or an actual response; all primary and alternate personnel can accomplish this participation on a rotating basis.

1.4.2 Staff Augmentation

The emergency plan should provide for a modular organization, which enables the ERO to expand or contract to meet the needs of the incident. The ERO evolves as a top-down organizational structure for any incident. As the incident warrants, the ED activates other functional areas, as needed. Thus, the ERO can consist of several layers with additional resources (personnel and equipment) to ensure performance of required basic and support functions. Procedures should include specific methods and information (e.g., rosters of qualified ERO personnel, telephone numbers, and paging procedures) necessary for timely recall of response personnel. The following additional items should be considered during development and review of the ERO activation procedures to facilitate staff augmentation:

- Rapid recall of alternates if primary (on-call) responders cannot be contacted
- Recall procedures should be easily implemented by on-shift personnel and not adversely affected by an event occurring during normal working hours, off-hours, or holidays
- Round-the-clock staffing of the ERO for long-duration emergencies
- Site and facility access by responders during augmentation of the ERO and the potential for interference between non-essential personnel being evacuated and the augmentation staff being recalled

The lines of succession for key emergency response positions should be established and documented. For example, positions authorized to assume ED duties should be specified, including positions in the normal operating organization (normally the senior on-shift position at a facility) and the non-shift management positions in the corporate structure. Basic qualifications of senior on-shift personnel should include those for ED, while non-shift management personnel in the line of succession will require individual (by name) qualifications for the ED position. This approach should be applied to other key ERO positions. If an individual is unavailable to assume the duties of the key position, a qualified alternate should be readily available for that position.

Procedures and checklists should be available to provide for orderly assumption and transfer of emergency management and coordination functions during the time when augmentation staff is assuming their ERO duties at the facility/site, Field Cognizant Element, and DOE Headquarters (HQ) levels.

1.5 Operational Aspects of the ERO

ERO operations, both activation and ongoing response activities, will depend on the actual or potential emergency conditions. Procedures and the management structure of the ERO should provide for the efficient collection and dissemination of accurate data, setting priorities, assigning work to functional groups, and keeping key emergency response staff abreast of emergency conditions and response status. In this section, the activation of the ERO is discussed and features of the operation of an ERO during a response are presented.

1.5.1 Activation

The normal operating organization should transition to an ERO immediately after an OE is declared. The defined authorities, responsibilities, tasks, and lines of communication of the ERO should supersede those of the normal operating organization for the duration of the emergency. On-shift operations staff should perform initial response functions [e.g., categorization/classification of the event or condition, notifications and activation of the ERO, initial phase of consequence assessment (i.e., Timely Initial Assessment)]. The ERO should incorporate the capabilities of the normal operating organization, augmenting them as needed to meet the functional and operational requirements of the emergency response facilities, defined for the specific OE, <u>normally within an hour</u> after the declaration of the emergency. Once activated, the facility/site or activity ERO should remain operational until a formal decision is made to terminate the emergency and enter recovery.

The staffing of ERO positions in emergency response facilities (e.g., EOC) should be orderly, controlled, and verifiable. Personnel who are assigned to ERO positions should gain access to the facility and their respective stations without impediment. In contrast, non-ERO personnel should be deliberately excluded from emergency response work areas. Sign-in procedures at access points will accomplish both. In addition, ERO staff should readily identify personnel who assume key response positions/functions (e.g., using status boards or badges).

1.5.2 Operations

The ED has the authority and lead responsibility for all aspects of the emergency response at the facility/site or activity. As such, the ED should have practical knowledge of the effected facility and its operations, the emergency response team and its mission, and the available tools and resources necessary to affect an appropriate response and mitigate the emergency. The ED has the authority and responsibility to perform the required functions, including initial activation of onsite response assets, notification of offsite authorities, and requests for offsite assistance. The DOE system requires that an

IC have responsibility for the tactical response to the event at the incident scene. When the ED functions are initially performed by the IC, a clearly defined transfer of ED responsibilities should occur that allows the IC to focus on tactical aspects of the response. It is imperative that the division of authority and responsibility between the IC and the ED position be clearly established and maintained.

In general, all members of the ERO should: perform in their roles, functions, and interfaces and in their use of emergency equipment, facilities, and resources in an timely, effective and efficient manner; clearly acknowledge and understand authorities and responsibilities in functional areas; and identify and access available response resources (e.g., personnel, equipment, consumables, and replacement parts), and, as appropriate, take account of both specific capabilities and resource limitations. The following represent specific activities that should characterize the efficient and effective operation of the ERO staff within an emergency facility (e.g., EOC):

- Transfer of a command and control function to another emergency facility, within an emergency facility, or to a command external to the ERO or ICS (e.g., another Federal agency, such as DOJ/FBI) is completed in an orderly and formal manner and ERO personnel are informed of the transfer.

- A fully staffed ERO will establish effective internal and external interfaces with other agencies and organizations; such external interfaces may include: Federal, Tribal, State, and local agencies and non-governmental groups such as concerned citizens and the media.

- Responsible ERO operations and technical support staff will determine and implement a reasonable, well-planned course of action based on their current knowledge of the situation.

- Specialty groups (e.g., consequence assessment, maintenance, operations, technical staff) provide timely information to the decision-making process.

- When priority actions are identified, tasking is clearly made to emergency response staff, and the actions are followed through to completion.

- Adequate data on the emergency situation are obtained and analyzed by the ERO to support the operations staff in assessing and mitigating the emergency events.

- Information is accurately and efficiently transmitted in an orderly and documented manner throughout the chain of command and between/within emergency facilities.

- In order to ensure that the ERO staff is kept up to date on the emergency situation, periodic briefings should be provided on the status of the emergency and significant current response priorities and activities.

- Communications between the site ERO and the DOE HQ EMT are maintained, and information about the emergency situation is provided to the EMT on a regular basis.

- ERO management effectively coordinates State and DOE site requests for use of assets, such as the RAP.

An essential aspect of effective communication is the requirement that the use of acronyms, code words, convention and/or technical terminology causes no misunderstandings related to the response and associated data. Security and ERO teams/ groups may use differing terminology during an emergency response. This could impact the effectiveness of communications and decision-making in an emergency. It is important that these response groups have an advance understanding of terminology differences or if possible, resolve these differences in advance. This is just one example of the need for integrated emergency response exercises involving these varied organizations.

Several ERO activities require specific attention and assigned responsibilities:

- Liaison responsibilities for coordinating with offsite agencies to ensure that effective communications are initiated and maintained during an emergency

- Liaison responsibilities with personnel representing DOE or NNSA assets (e.g., NARAC, FRMAC, AMS, RAP, REAC/TS, ARG, and/or NEST) involved in the response, to coordinate logistics, ensure that effective communications are initiated and maintained, and ensure that data is exchanged using consistent units of measure

- An individual trained to recognize, categorize, and classify events and to conduct appropriate notifications should be available 24 hours a day, 7 days a week. This individual's authority is unambiguous and clearly communicated throughout the ERO.

The activities of reentry and rescue teams should follow specific protocols:

- ERO teams should be provided with adequate briefings concerning safety, operations, communications, and hazards before being deployed.

- ERO teams should be debriefed upon return from their assigned missions.

- The accomplishments, failures, exposures, and status information of ERO teams should be recorded and made available to other teams and emergency facilities.

- If necessary, the responsible ERO individual authorizes ERO personnel to receive exposures in excess of site administrative limits (or other Federal criteria) for carrying out lifesaving or other emergency activities.

1.6 Maintenance of the ERO

To ensure that ERO personnel are available on demand for timely and effective performance of ERO functions, the ongoing, maintenance or standby staffing of ERO emergency facility positions and response teams is effectively accomplished by:

- Using a technique, such as duty-cycle or static roster, to ensure that qualified personnel are available on-demand and properly assigned.
- Ensuring that sufficient trained personnel for initial and ongoing response, including designated alternates, are candidates for call-up in each functional area.
- Periodically reviewing ERO rosters to verify individual qualifications for specified positions, current qualification dates, required numbers of primary and alternate personnel for all positions, correct work and home phone numbers, pager numbers, addresses, commute time from home to assigned response facility, and other contact information.
- Periodically reviewing and updating ERO personnel qualifications.

In addition to maintaining ERO staffing, the communication systems used to activate both on shift and off shift emergency response personnel should be periodically tested to ensure their adequacy and reliability.

1.7 Special Response Function/Positions

Several special response functions or positions are addressed in this section in the context of both their interactions within the ERO structure and the specific accommodations that are required of each function because of the potential hazardous environment within which they need to perform.

1.7.1 Incident Command

An IC should be designated to manage and control all response activity at the event scene. The IC typically coordinates the activities of multiple response elements at the scene (e.g., fire, rescue, medical, spill containment, mutual aid) and makes on-the-spot decisions. The IC will utilize the ICS to manage response operations at the event scene, in accordance with the NRP and the NIMS/ICS. The NIMS/ICS is ideally tailored to deal with command, control, and coordination issues in advance. Some of these issues are: command on-scene, transfer of command, authority to request offsite mutual aid, authority to declare the situation under control, integration of field response functions, and assignment of response activities. The facility/site ICS should be compatible and integrated with offsite agency ICS systems. This is important to the inter-relationship of the site ERO and offsite agencies when utilizing the NIMS/ICS structure.

The basic attributes of a NIMS/ICS are:

- Common terminology
- Modular organization
- Management by objectives
- Reliance on Incident Action Plan (IAP)
- Manageable span-of-control
- Pre-designated incident locations and facilities
- Comprehensive resource management
- Integrated communications
- Establishment and transfer of command
- Chain of command and unity of command
- Single command IC and/or Unified Command (UC)
- Accountability
- Deployment
- Information and intelligence management

When both the EMT and ICS are used, close cooperation and coordination between the facility/site EMT and the ICS are required, along with pre-arranged division of responsibility and authority. This division should be specified in the emergency plan and associated implementing procedures. The emergency plan and implementing procedures should clearly state whether the IC or EMT is able to invoke any or all-mutual aid agreements with state, Tribal, and local emergency response agencies or the conditions for shifting such responsibilities. An IC may lead the EMT until an on-call senior manager is available to assume that role. When an IC is employed in the site ERO, the EMT in the EOC should focus on broader issues such as: offsite notifications, communications with offsite entities, broad-spectrum protective action issues, and marshaling additional resources (e.g., personnel and equipment).

When an incident involves more than one agency with incident jurisdiction or when incidents crossover political jurisdictions, an application of the ICS, known as Unified Command (UC), should be used. UC provides guidelines to enable agencies with different legal, geographic, and functional responsibilities to coordinate, plan, and interact effectively. Agencies work as a team to establish a common set of objectives and strategies, as well as a single IAP.

An Area Command is established to oversee management of multiple incidents that are each being handled by a separate ICS organization or to oversee the management of a very large or complex incident that engages multiple incident management teams. Area Command is generally used when there are a number of incidents in the same area and of the same type, which tend to compete for the same resources, such as public health emergencies. If the incidents under the authority of the Area Command span multiple jurisdictions, a Unified Area Command should be established.

Additional guidance on the ICS, UC, and Area Command can be found in the NIMS, available electronically on the website http://www.nimsonline.com/. This website also contains additional guidance on the ICS.

For DOE/NNSA facilities/sites or activities, there should be a predictable, coordinated, effective and acceptable response to OEs of all types. UC allows the varied response organizations to join in a seamless response effort. However, the concept can be complicated during security events, especially if there are competing priorities between security, rescue, medical and operations teams. It is critical that there be ongoing discussions between all response organizations, to achieve agreement on the concepts and procedures for UC. Additionally, this needs to be studied and exercised repeatedly until all concerns are addressed and resolved by all organizations involved. Procedures for UC should be in place to support transition from security command to traditional emergency response (i.e., fire department) command. Additionally, the ICS and procedures used for security emergencies should mirror the system and procedures used for other OEs.

ICS response to an OE on a DOE/NNSA site is characterized by the basic generic attributes of an ICS, which are generally reflected in specific response activities, including:

- The incident is assessed and response priorities are established; in the order of highest to lowest, the priorities are: lifesaving, safety, incident stabilization, and property conservation.

- Incident command sets clear strategic goals and tactical objectives and a flexible IAP is implemented.

- Incident command staff continually assesses the situation, develops a mitigation strategy, and requests additional assets, as needed.

- Incident command coordinates internal and external response assets in an efficient and effective manner.

- An ICS command post is established in a safe area away from the event scene, in order for the command and control functions to be performed safely and effectively.

- The habitability of the command post is periodically assessed, and the command post is moved, as necessary, when a hazardous environment challenges the safety of the staff.

- Incident command staff ensures that the response personnel take necessary precautions for personal safety and contamination control, as follows:

  – Incident command staff establishes a staging area where arriving asset personnel are briefed, communications are checked, special equipment is issued, and the assets are deployed upon request.

– Asset personnel being released are debriefed, personnel are accounted for, personnel and equipment are surveyed for contamination and decontaminated as necessary, and issued equipment is returned.

1.7.2 Hazardous Material Survey, Sampling, and Sample Analysis Teams

Teams implement survey and sampling procedures in a timely manner. Adequate monitoring equipment and personnel protective equipment should be available to the field teams in order to accomplish field monitoring and plume tracking within and beyond the EPZ. The teams should receive sufficient training to correctly use protective equipment, such as protective clothing and respirators, filter masks, and dosimetry. Required equipment for their tasks should be adequate, accessible, functional, and calibrated. In carrying out the required surveys or sampling activities, the teams should be capable of making effective use of maps or general arrangement drawings showing pre-determined and potential monitoring points.

Emergency response management is expected to control field teams effectively. This can be accomplished by establishing a position of survey team coordinator. Prior to deployment, the survey team coordinator develops a Survey Plan and obtains management approval of the plan. The survey team coordinator ensures that the teams are briefed on facility and meteorological conditions, and exposure control procedures; teams should be notified when changes occur. During survey operations, the survey team coordinator:

- Provides directions to survey specific areas.

- Provides directions to minimize hazardous material exposure by exiting high airborne and whole body dose areas (i.e., for radiological materials), or high concentration areas (i.e., for toxic non-radiological materials), when not actively engaged in sample and survey activities.

- Sets exposure limits for survey and tracking teams, and solicits and records survey results.

- Allows the teams the time necessary to complete the surveys.

Effective communications with their coordinator should be established to ensure that transmissions of readings and results are accurate and received in a timely manner. The survey teams should utilize proper survey equipment and keep accurate logs of results.

Responsibilities of sampling teams include:

- Collecting samples, bagging and marking them, and logging the results accurately and efficiently.

- Receiving and properly packaging and labeling with information such as sample time and date, sample location, volumetric data, sample media, and sample or survey collection person's name.

- Using analysis procedures and equipment to support processing of samples received, and either analyzing the samples in the field or transporting them to a laboratory.

- Communicating analysis results promptly and accurately to emergency response facilities, in particular, the consequence assessment team.

1.7.3 Security Staff

The security staff and other components of the ERO should develop a mutual understanding of authorities and responsibilities, response plans, utilization of command and control facilities, and terminology that enables site security to effectively coordinate and correlate response activities during an OE. The responsibilities and procedures of the site security forces should be efficiently and effectively implemented during response and be characterized by effective command and control. Many of the responsibilities of the protective forces involve the protection of onsite personnel, which requires that they be performed promptly and safely, to include:

- Timely and proper maintenance of access and egress control for the facility/site, facility/site areas, impacted areas (i.e., safe perimeters), and emergency response facilities.

- Implementation of effective security practices that facilitate timely movement and access of facility/site operating and response personnel (including offsite personnel) to required areas during emergencies.

The security forces implement the NIMS/ICS for security emergencies. Under emergency conditions, material accountability and protection for Special Nuclear Material (SNM) and other critical DOE assets are handled in a timely and effective manner.

When local law enforcement provides backup to the onsite security force common, pre-planned protocols are used (e.g., use of deadly force, weapons employment, tactics, code words, radio frequencies, etc.)

1.7.4 Fire and Rescue

Fire/rescue personnel and equipment are assembled and deployed to the scene of the emergency in a safe and timely manner. Personnel take necessary precautions for contamination, exposure, heat, and personal safety. Both onsite and offsite fire personnel are outfitted with the appropriate specialized equipment and supplies specific to the onsite hazards. When fire/rescue teams carry out search and rescue operations, their efforts are coordinated with medical, industrial hygiene, and health physics personnel.

Injured personnel are properly extricated, immobilized, and moved during search and rescue operations.

1.7.5 Repair and Maintenance

When facility and field repair and maintenance teams are dispatched, it is essential that their activities be carried out in a timely and efficient manner. They should have access to the proper tools for repair and maintenance activities and the procurement of replacement parts is expedited. Their activities include personnel protection equipment and monitoring as well as coordination with support groups, such as health physics, industrial hygiene, and chemistry personnel. Emergency work order procedures are used and emergency tagging (e.g., lockout/tag out or clearance) is implemented.

2. OFFSITE RESPONSE INTERFACES

2.1 Introduction

The purpose of this chapter is to assist DOE and NNSA field elements in complying with the DOE O 151.1C requirement that effective interfaces be established and maintained to ensure that emergency response activities are integrated and coordinated with the Federal, Tribal, State, and local agencies and organizations responsible for emergency response and protection of the workers, public, and environment. Interfaces with offsite response entities should be in accordance with the requirements of the National Response Plan (NRP) and National Incident Management System (NIMS).

This chapter is designed primarily for facilities/sites and activities that are required to implement an Operational Emergency Hazardous Materials Program and is directed at operations and emergency management staff at Field Elements and operating contractor organizations responsible for DOE and NNSA facilities/sites and activities.

2.2 General Approach

Interfaces with offsite response authorities and organizations are an integral part of the DOE and NNSA Comprehensive Emergency Management Program. In the context of the DOE/NNSA emergency management system, interfaces represent interactions with offsite response authorities and organizations both during an emergency in supporting onsite response and on a continuing basis by engaging in frequent dialog and interactions to establish and discuss emergency response roles, responsibilities, capabilities, notification procedures, and information needs. Interfaces can be effectively maintained through a designated point-of-contact within organizations.

DOE and NNSA have committed to comply with Federal, Tribal, State and local regulations that focus on protecting workers and the public in the event of an emergency. Many of these regulations have provisions that require the establishment of interfaces between organizations having responsibility for emergency response. Results of the Hazards Surveys and Emergency Planning Hazards Assessments (EPHAs) are used to help identify agencies and organizations necessary to support a comprehensive and integrated response. Appropriate interfaces should be established, documented, and tested with each agency and organization.

Under Federal environmental regulations, each state is required to establish a State Emergency Response Commission (SERC). The SERC is charged with designating emergency planning districts, appointing Local Emergency Planning Committees (LEPCs) for each district, and coordinating their activities. The LEPCs are charged specifically with integrating and coordinating community emergency planning. These requirements are further defined in 40 CFR 300, Subparts B and C. Superfund Amendments and Reauthorization Act (SARA) of 1986 Title III, Emergency Planning and Community-Right-to-Know Act (EPCRA), provides regulations on offsite interface regarding hazardous materials.

To establish and maintain offsite interfaces, regular facility/site meetings with offsite officials should be held to discuss areas of concern and changes to emergency response plans and procedures. These meetings can also be used to develop emergency public information and outreach programs. SERC/LEPC meetings could be used as a forum for these discussions.

The guidance in this chapter focuses on the establishment of interfaces through documented arrangements with offsite response agencies and organizations that may augment site resources in response to an onsite emergency, and also Tribal, State and local agencies and organizations responsible for protecting the public and environment within the vicinity of the facility/site; these arrangements are discussed in terms of the types of agreements and their generic content. The second part of the guidance addresses information and issues that should be addressed by DOE/NNSA sites and offsite agencies and support organizations in order to ensure that notifications, communications, information exchange, and operational integration necessary to establish effective response interfaces during an emergency onsite are accomplished. Activities and functions necessary for activating and maintaining effective interfaces during an emergency are presented in the last section.

2.3 Offsite Agencies and Organizations

Hazards Survey and EPHA results should be used to develop a list of emergency services, which may be needed to respond to potential accident conditions. Examples of required services include hospitals, fire departments, law enforcement, accident investigation, analytical laboratory services, ambulance services, coroners, materials suppliers, contractors, specialists and others. Offsite response agencies and organizations responsible for augmenting site response resources and State, local, and Tribal agencies responsible for protecting the public and environment within the vicinity of the facility/site should be identified. These agencies and organizations should be contacted to determine and/or establish authorities, responsibilities, resources, notification procedures, and information necessary in the event of an emergency at a DOE/NNSA facility/site.

Candidate offsite organizations can include:

- **Local Emergency Responders.** Local municipal and county fire departments, law enforcement personnel, hazardous material (HAZMAT) teams, and emergency medical and ambulance services will be among the first to respond to a request for support. For incidents involving public transportation (e.g., airlines, mass transit, railroads,) near or on a facility/site, workers and officials from these transportation organizations may be among the first responders. In the event of fatalities, the county coroner could also be a responder.

- **State Emergency Responders.** State Emergency Management Organizations (SEMOs) are responsible for coordinating activities necessary to protect communities from natural and technological disasters and other emergencies. SEMOs coordinate the response of state agencies ensuring the most appropriate resources are dispatched to the impacted area. SEMOs work with local governments, volunteer organizations and the private sector. In many states, State Police play a key leadership role in response and may have a significant planning role as well.

- **State and Local Public Health Authorities.** State laws grant state and local public health authorities emergency powers to combat communicable diseases. Emergency powers available and the procedures for enforcement vary from state to state. Typical powers include the isolation or quarantine of persons and places and obligatory vaccinations and other preventive measures, such as wearing of masks. In some states, these measures may be taken whenever there is a threat of communicable disease; in other states, the powers apply only to one or more specific, named diseases. State health departments often have the responsibility for decision-making associated with public protection in the event of emergencies involving radiological material release.

- **Medical Service Providers.** Hospitals generally perform emergency planning both to protect their own facilities and patients and to respond to disasters in the community. State licensing and accreditation standards require hospitals to meet certain criteria for emergency preparedness, which often includes participation in local or regional medical planning for disasters. Hospitals accredited by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) should be prepared for a variety of disaster scenarios, including facilities for biological, radioactive, or chemical isolation and decontamination where appropriate.

- **LEPCs, SERCs, and Tribal Emergency Response Commissions (TERCs).** These entities are established under SARA Title III, and the implementing regulations of the Environmental Protection Agency (EPA). LEPCs develop and maintain local hazardous material emergency plans and receive notifications of releases of hazardous substances. SERCs and TERCs supervise the operation of the LEPCs and administer the community right-to-know provisions of SARA Title III, including collection and distribution of information about facility inventories of hazardous substances, chemicals and toxins. LEPCs will have detailed information about industrial chemicals and emergency response capabilities within the community.

- **Federal Emergency Responders.** Depending on the emergency scenario, the Federal Government may respond to provide assistance. These departments and agencies may include the following but are not limited to: Department of Homeland Security (DHS), Department of Justice (DOJ), Federal Bureau of Investigation (FBI), Department of Defense (DOD), EPA, Department of Agriculture (USDA), Nuclear Regulatory Commission (NRC), Department of Veterans Affairs, and the Department of Health and Human Services (HHS), which includes the Centers for Disease Control and Prevention (CDC).

DOE/NNSA radiological emergency response assets are available to support offsite officials in the event of a radiological incident. Facilities/sites should coordinate with offsite officials to provide information on the availability and capabilities of DOE/NNSA radiological emergency response assets and how to access and utilize these Federal Assets.

One or more of the following organizations not usually included in emergency planning should be considered and liaison established, as appropriate, depending on the particular emergency scenario:

- **Local Business Community.** Local business might have resources to help support recovery from an emergency.

- **Colleges and Universities.** Colleges and Universities may provide temporary large facilities such as field houses, gyms, etc. Faculty members may have expertise (e.g., civil engineering, health physics, public health, agriculture, chemical weapons, infectious diseases) that can be used to assist with the emergency response or even as an independent expert to support public understanding of hazards.

- **American Red Cross.** This service organization provides disaster relief services for emergency workers and victims.

- **Federal Executive Board.** Federal Executive Board (FEB) is a network of councils located in 28 cities across the country. The boards are comprised of top managers from agencies having offices in those cities. The FEB plays a role in notifying agencies in the field when there is a major attack or threat of attack anywhere in the country. Local Boards have developed emergency plans for their respective areas and are sometimes the first point of contact for emergencies that impact large municipalities.

2.4 Support Agreements

An interface should be established with each entity from which support will be needed and appropriate agreements prepared. For multiple-facility sites, the contractor and Cognizant Field Element with site-wide responsibility should provide centralized point of coordination. Arrangements with State and local governments should be documented. All agreements [e.g., Memoranda of Understanding (MOUs), Memoranda of Agreement (MOAs), Mutual Aid Agreements (MAAs), Agreements in Principle, and State Oversight Agreements] with emergency management/response provisions should be consistent and contain provisions for periodic review to ensure continued applicability. These agreements should be accessible in the facility/site emergency plans.

Generally, an agreement should contain, at a minimum, the following information:

- The specific service and/or resources to be provided

- The agency, organization, or jurisdiction to which it applies

- Onsite individuals authorized to request aid from the offsite agency, organization, or jurisdiction

- Offsite individuals authorized to implement the arrangement, points-of-contact, and information required for implementation, such as names and telephone numbers
- Specific responsibilities, authorities, and command structure
- Any constraints/conditions that might preclude the agency, organization, or jurisdiction from meeting its obligation or support its refusal
- Public information release protocols
- Financial arrangements, including commitments by the facility or site to provide training, equipment, and facilities to the entity providing the service, and indemnification for injury to persons for loss and damage to property
- Specified periodic re-examination of the provisions and a renewal or termination date
- Signature of authorized individuals representing the site organizations and the offsite agency, organization, or jurisdiction

If a facility/site is to provide support to an offsite agency under the "good neighbor" policy or through MAAs, those support interfaces should be documented.

Facility/site plans should describe integrated support from offsite response organizations responding to emergencies. The organizations may include groups from outside the facility/site Emergency Planning Zone (EPZ) that respond under provisions of the NRP, *Nuclear/Radiological Incident* annex, for nuclear/radiological emergencies; the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), for oil and non-radiological hazardous material emergencies; or the NRP, if the situation is declared an emergency or major disaster by the President.

2.5 Interface Information and Issues to Address

Individuals with the appropriate authority, knowledge, and training should be responsible for establishing and maintaining ongoing and effective interfaces with offsite political, technical, law enforcement, and emergency services officials. Such interfaces will ensure that necessary information and issues are addressed prior to an emergency, to facilitate the activation and establishment of effective interfaces during an emergency. Areas that should be addressed and resolved include:

- Identification and responsibilities of all parties and participants, including the method for coordination and control of an emergency, in accordance with the requirements of the NIMS/Incident Command System (ICS) procedures. Clarify details of incident command including communication points and methods, facilities designated for command post and terminology.

- Identification of emergency points of contact, a description of information in notifications and follow-on activities, and a method to validate emergency notification messages [cf. DOE G 151.1-4, Chapter 5].

- Descriptions of actions by the parties for each type of Operational Emergency (OE), both classified (i.e., Alert, Site Area Emergency, and General Emergency) and not classified. EPZs and Emergency Action Levels (EALs) for Operational Emergency Hazardous Materials Programs should be described and include criteria for protective action recommendations to permit a clear and full understanding among parties.

- Agreement for liaisons and corresponding allocation of space in the Emergency Operations Centers (EOCs) of site and offsite parties.

- Communication interfaces/protocols for notification points and ongoing communications between EOCs, responders, monitoring teams, and other entities involved in the emergency response. Personnel to resolve offsite agency inquiries and concerns should also be designated.

- Methods of communication between the site and offsite responders and agencies should be described, along with agreed-upon procedures for periodic testing of the communication system. These methods of communication may include commercial telephone, Internet, radios, and/or dedicated lines. Details should address assurances of compatibility between systems used by different agencies and organizations.

- Public warning methods (e.g., sirens, tone alert radios) should be described.

- Descriptions of public information activities, including facility/site press release protocols and the name or position of personnel authorized to speak for each organization during an emergency. Agreement should be reached with offsite agencies on the location and management of the Joint Information Center (JIC). Also, the information on emergency plans and protective actions to be provided to the public prior to an emergency should be addressed with key offsite agencies.

- Description of operational interfaces between EOCs, including an organization chart depicting points-of-interface among parties.

- Descriptions of training activities, including beyond-the-basic emergency response training required for response to site-specific layout, conditions, and hazards. Additional training needs should be identified and arranged. For example, training for hospital emergency room personnel in handling radiological contaminated and injured individuals [cf. DOE G 151.1-4, Chapter 8] and training in Joint Information Center operations.

- Each DOE/NNSA facility/site is required to offer offsite response organizations the opportunity to participate in an exercise every three years. This section of the site emergency plan or procedures should discuss formulation of exercise objectives and exercise scenarios to accommodate these objectives. Agreed-upon schedules for development of exercise milestones should also be addressed.

- Details of separate MOUs, MOAs, MAAs, or agreements with fire services, hospitals, ambulance services, life flight helicopter service and other organizations supporting the facility and the public.

- Monitoring and consequence assessment plans and methods of the site and offsite response agencies should be clearly identified. This may include description of methods to coordinate activities and data of onsite and offsite monitoring teams, and coordination with regard to understanding differences in modeling methods and engineering units used in consequence assessment.

- Assumptions made by the facility as a basis for public protection planning should be clearly identified. Actions anticipated by each interface agency should be stated and information required to respond effectively should be identified. Potential protective action recommendations (sheltering, evacuation, relocation, food control, etc.) should be described, as should evacuation routes for site personnel and offsite public. Geographic areas for protective action, special needs populations and other locations of significance with regard to hazardous material releases should be clearly identified.

In some cases, primary responsibility for establishing and maintaining emergency management interfaces for the site may reside in other organizations, such as site security, who may facilitate coordination of emergency management activities with local, State, Tribal, and Federal law enforcement organizations (e.g., Sheriff, State Police, FBI). Onsite fire department representatives may provide interfaces with the local fire response assets.

2.6 Interfaces during Response

The identification of offsite response assets, the documentation of agreements, and the resolution of issues prior to an emergency are intended to ensure that facility/site response activities are integrated and coordinated with offsite supporting capabilities during an emergency. In addition, the following are essential for ensuring effective interfaces during an emergency:

- Organizations which may be needed in a supporting role and/or for long-term support have been identified and pre-designated offsite points-of-contact, including organization, names, and telephone numbers are readily available to the Emergency Response Organization (ERO)

- Methods of communications and communication protocols are in place, identified, and operable

- Offsite officials are briefed upon activation of their facilities

- Offsite agencies and organizations are provided initial and ongoing information sufficient to perform their respective functions

- Timely, clear, accurate, and effective information exchange occurs between the ERO and offsite personnel

- Incoming offsite agency/organization inquiries and concerns are directed to the appropriate site personnel for resolution

- Effective working relationships exist between the offsite officials and their ERO counterparts

- Coordination and integration of response activities with offsite agencies and organizations follow established, pre-arranged and documented plans and protocols, including responsibilities and authorities, coordination of response, notifications, facility activations, communications, EOC interfaces, public information activities, and logistic protocols (e.g., working space and site access).

3. EMERGENCY FACILITIES AND EQUIPMENT

3.1 Introduction

The purpose of this chapter is to assist DOE and NNSA field elements in complying with the DOE O 151.1C requirement that emergency facilities and equipment, adequate to support emergency response, are available, operable, and maintained. At a minimum, facilities should include an adequate and viable command center. Emergency equipment includes, but is not limited to, Personnel Protective Equipment (PPE), detectors, and decontamination equipment.

Responsible administrators of emergency management programs should use this guidance and that of other chapters in this Emergency Management Guide (EMG), DOE G 151.1-series, to identify the emergency facilities and equipment necessary to support emergency response at the facility/site or activity, in order to ensure that emergency response activities are commensurate with facility hazards and provide a timely and effective emergency response. However, it is ***not*** the intent of this chapter to support the purchase of new equipment, the construction of new emergency facilities, or the designation of additional emergency facilities, if the current situation adequately supports the activities of the Emergency Response Organization (ERO), commensurate with the hazards.

This chapter is designed primarily for facilities/sites and activities that are required to implement an Operational Emergency Hazardous Materials Program and is directed at operations and emergency management staff at Field Elements and operating contractor organizations responsible for DOE and NNSA facilities/sites and activities.

3.2 General Approach

The nature of the hazardous material releases analyzed in the Emergency Planning Hazards Assessment (EPHA) should dictate many of the specifications for facilities and equipment. Overall diversity, complexity, and magnitude of the hazardous material situation at the facility/site will help define general response needs, such as communications equipment and command center capability, while the specific hazards will indicate the need for specialized equipment, such as protective clothing, portable monitoring instruments, decontamination supplies, consequence assessment models, response vehicles and supplies, and facility data acquisition systems.

For all DOE/NNSA facilities/sites, DOE O 151.1C requires that emergency facilities and equipment, including supplies, be available and maintained for use in an emergency response. These requirements mandate the ability of a facility/site to properly notify (both onsite and offsite), implement protective actions (e.g., evacuate or shelter), and perform accountability for affected onsite personnel in the event of an emergency. Specific equipment that may be needed during a response to an Operational Emergency (OE) includes: current reference materials (e.g., maps, facility drawings); decisional aids (including computers); area and process monitors; public address system; PPE; portable monitoring instruments and personnel monitoring devices; siren and alarm systems; decontamination equipment; and communication equipment. The actual functions and operating characteristics of the specific equipment should function as intended to provide adequate support during a response.

Additional DOE O 151.1C requirements for Hazardous Materials Programs include: an onsite facility to serve as a command center; a facility to serve as an alternate command center in the event the primary is not available; and, the availability of adequate emergency equipment and supplies to meet the needs determined by the results of the EPHA. Depending upon these results, additional emergency facilities and capabilities may be necessary, such as technical support, security, personnel assembly/control, decontamination, medical services, process control, and chemical/biological/radiological analytic laboratories.

Emergency equipment and response facilities located throughout each site may be under different administrative or programmatic organizations but should be integrated to provide an overall, site-wide response capability.

This chapter provides guidance in determining emergency facility and equipment needs based on the Hazards Survey and EPHA results. General design and siting considerations are provided for each type of response facility and suggestions are given for identifying equipment to support response functions.

3.3 Role of the EPHA

The results of the EPHA are used to identify emergency facilities and equipment that may be needed during the response to a hazardous material release from a DOE/NNSA facility/site or activity. The specific technical information useful in making this determination includes the following:

- Hazardous material types, forms, quantities, and locations
- Release modes and analyzed events/scenarios
- Severity of consequences at various receptors (e.g., concentration, dose)
- Emergency classifications (i.e., Alert, Site Area Emergency, and General Emergency) of analyzed events
- Time to consequence at receptors
- Persistence of released material in the environment
- Initial protective actions and protective action recommendations
- Emergency Planning Zones (EPZs)

- Demographics of potentially affected areas

- Onsite and offsite entities and environments potentially affected by materials released

- Impact of hazardous material releases on positions in facilities or associated with activities that require occupancy for safe operation, security, or monitoring

Additional EPHA results that may influence the acquisition and tailoring of emergency facility and equipment needs include the following:

- **Estimated duration of hazardous material releases.** Determine emergency facility and equipment features such as: automated and sophisticated notification systems; command center/Emergency Operations Center (EOC) Heating, Ventilation, and Air Conditioning (HVAC) system filtration capability; equipment for field monitoring teams; and plans for extended occupancy of emergency facilities.

- **Potential for successful mitigation.** Determine the emergency facility and equipment features such as: facilities, equipment, and staffing plans for mitigation-oriented functions involving technical support and operations support; coordination capabilities of onsite and offsite firefighting and medical assets; and the degree to which emergency facilities are equipped with analytical tools (e.g., drawings, computers, and work-space for problem-solving teams).

- **Field measurement or consequence assessment methods that are applicable for the material and release types.** Determine emergency facility and equipment features such as: use of manual-versus-computerized consequence assessment methods; adequacy of installed monitoring and detection instrumentation; specific field team instruments; and the level of sophistication of meteorological instruments and ability to access forecast information.

- **Hazardous material events involving security considerations.** Determine emergency facility and equipment features such as: secure communications between emergency facilities; processing, storing, and discussing classified information within emergency facilities, thus establishing the level of physical security to be provided at these emergency facilities; respiratory protection equipment for security personnel; and hazardous materials monitoring equipment for security personnel and vehicles.

The EPHA results can be used to help identify potential locations and habitability requirements for both primary and alternate emergency facilities. Consequence estimates will identify areas potentially affected by hazardous materials releases. The analysis of EPHA consequence calculations determines the habitability requirements for a command center/EOC located within a potentially affected area for a new or existing structure and also determines a suitable location for the alternate. Staging facilities/areas could also be identified for such diverse emergency needs as personnel evacuation and accountability, decontamination sites, and casualty management locations through this process.

Comparison of emergency facility and equipment needs identified using the results of the EPHA with existing facilities and equipment can help eliminate duplication and redundancy. Selected equipment, such as radiation or hazardous material detection instruments, Self-Contained Breathing Apparatus (SCBA), and emergency repair materials may be used for emergencies, as necessary. Existing facilities and equipment should be used to meet these needs whenever possible.

The need for additional types of emergency facilities and equipment should be determined based on the extent they can help to lessen the onsite and offsite consequences of an incident or accident. For example, establishing sophisticated emergency facilities and equipment (e.g., technical support center, operations support center) to support mitigation activities may not be appropriate, if the likely duration of hazardous material releases is shorter than the time needed to activate and bring emergency response resources on line. Mitigation-oriented facilities may not be necessary if the majority of the more severe analyzed accidents are massive puff releases. In contrast, if some portions of the severe accidents involve prolonged releases, complex process systems, or conditions that deteriorate over time (e.g., a fire spreading throughout a facility containing multiple hazard sources), then mitigation-oriented facilities and equipment may be warranted.

Examples of enhanced mitigation activities include augmenting firefighting capabilities; improving the ability to rapidly modify or create impromptu operations and maintenance procedures; increasing the pre-designation of staging areas for tools, supplies, and personnel; and arranging for the equipping of command and control infrastructures necessary to carry out mitigation activities.

Assessment of the potential magnitude and duration of consequences will help develop logistical contingencies to support all response activities through emergency termination and into recovery. These include adequate housing, vehicles, food services, and general services and consumables (e.g., office supplies and equipment, construction materials, and minor repairs to computer equipment).

3.4 Emergency Facilities

In this section, characteristics of emergency facilities will be discussed. Specifically, attributes of an emergency command center and its alternate are described in terms of general functional requirements and those imposed by the facility-/site-specific hazards. The special case of a ***habitable*** command center, the EOC, is also introduced. Finally, the Joint Information Center (JIC) and other possible emergency facilities are discussed.

3.4.1 Command Center

During emergency response, a dedicated facility should be available for use as a command center by the Emergency Director (ED), the Emergency Management Team (EMT) component of the ERO, and other supporting members of the ERO. The command center is the primary onsite emergency facility designed to allow the EMT to fulfill its emergency response functions and responsibilities, based on an analysis of emergency response needs. Characteristics of this command center should reliably support the designated response functions and assignments. Facility systems and installed equipment (e.g., HVAC, sanitation, lighting, radiation monitors, computer systems, communications, and visual displays) should be adequate to support the functions and expected level of staffing. The command center should have the capability to access alternate power supplies in the event of a loss of power. If the primary command center becomes unavailable, then provisions should be in place to use an alternative location considering habitability, accessibility, and security, as well as access to power and communications.

Controlled access procedures should maintain security and accountability within the command center. Sufficient space and equipment should be provided to permit the EMT to perform its functions effectively and efficiently using its operations procedures, especially round-the-clock command, control, and communications. The command center should promote the active support of on-scene responders versus simply providing an incident-tracking capability.

A resource area with current electronic and hard-copy reference materials, such as operating procedures, technical safety requirements, emergency plans and procedures, safety analyses, offsite demographic data, evacuation plans, and environmental monitoring records, should be designated and maintained to allow for ready accessibility and use by the EMT.

If the command center is a dual-use facility, then plans and procedures should be in place and tested regularly to ensure that the facility can be rapidly converted into a command center, staff are knowledgeable in carrying out this transition, and facility resources and equipment are adequately maintained to ensure timely conversion, activation, and availability to support an emergency response.

At a minimum, a command center should have the capability to effectively integrate the following five functional elements:

- Command
- Operations
- Planning
- Logistics
- Finance/Administration

This configuration meets the intent of the National Incident Management System (NIMS) and describes the basic functional make-up of a NIMS Incident Command System (ICS). However, depending upon the actual emergency, these elements and their sub-elements should be tailored to needs dictated by the event, not by an automatic, one-size-fits-all configuration. A command center needs to flexibly support management of the facility/site emergency response while coordinating and meeting its Federal, Tribal, State, and local obligations.

The EOC is a primary onsite emergency response command center designed to allow the EMT component of the ERO to fulfill its emergency response functions and responsibilities with consideration given to habitability and human interface requirements.

To be considered habitable, the EOC should be capable of remaining operational and life-supporting for an extended period of time under accident conditions and maintaining its structural integrity under various design basis events, including natural phenomena (Cf. DOE G 420.1-2, *Guide for the Mitigation of Natural Phenomena Hazards for Nuclear Facilities and Non Nuclear Facilities*). A habitable EOC should satisfy the following criteria:

- **Breathable atmosphere.** The HVAC system should be designed to maintain safe oxygen levels, provide for air contaminant removal and filtration to prevent intake of contaminated outside air (including smoke), and establish a positive pressure to prevent the infiltration of radiologically, chemically, and/or biologically contaminated air. Equipment should be available to confirm that the atmosphere in the EOC remains uncontaminated.

- **Shielding/Protection.** Sufficient shielding and protection from radioactive and other hazardous materials should be provided to permit continued occupancy of the EOC by the EMT for its maximum expected activation time without exceeding recommended exposure levels.

- **Back-up emergency power.** Loss of normal electrical power should not preclude the EOC from performing its functions.

The design of the EOC should also follow human-factor principles for sleeping, food preparation comfort, noise reduction, lighting, and work-group interfaces.

3.4.2 Alternate Command Center

An alternate command center needs to be available if the primary command center becomes uninhabitable. The alternate does not have to duplicate every design feature and piece of equipment found in the primary command center, as long as it allows the EMT to perform its necessary functions effectively. The following points should be considered in the design of new or the designation of an existing facility to operate as an alternate command center:

- The alternate command center should be located where the likelihood of both the primary command center and the alternate being rendered uninhabitable by the same event is minimized. Consideration should be given to placing the alternate outside the EPZ or 180 degrees opposite (i.e., upwind from the prevailing wind direction) the primary command center. Monitoring equipment should be available to confirm the habitability of the alternate.

- Accessibility, security, and the ability to provide controlled access and secure communications should be considered in selecting the alternate location.

- Communications and information processing systems for the alternate command center should meet the same capability and interoperability specifications as for the primary. Back-up communications, such as cellular and/or satellite phones and radios, should be made available to maintain command and control.

- Reference material, including up-to-date plans, procedures, and maps, should be available in the alternate command center or provisions made to obtain them from other emergency facilities as needed.

- Transfer and activation procedures should be prepared, training conducted, and the process validated during exercises and drills for shifting responsibilities from the primary command center to the alternate during an emergency.

3.4.3 Joint Information Center (JIC)

DOE O 151.1C requires that each facility/site provide accurate, candid, and timely information about emergencies to workers and the public. The Hazardous Materials Program facility/site is expected to "ensure that an adequate public information program is established and maintained, commensurate with site hazards," where an "adequate emergency public information program includes a JIC to provide resources to comply with the integrated, comprehensive Emergency Management System, commensurate with hazards, during an emergency." This program should "provide support in media services, public inquiry, media inquiry, JIC management and administrative activities, and media monitoring." To accomplish this, a facility should be designated as a JIC and located where controlled access by the media and public is facilitated. A consolidated JIC, with local, State, Tribal, and other Federal officials, is encouraged to present a coordinated response to the public. DOE G 151.1-4, Chapter 9, details further considerations for JIC facilities and equipment requirements.

3.4.4 Other Emergency Facilities

In addition to the primary command center (or EOC), alternate command center, and the JIC, a variety of other emergency facilities may be necessary to accommodate the response activities as determined by the Hazards Survey and EPHA. Variations in the physical arrangement of other augmenting emergency facilities depend on size, nature, and organization of the facility/site ERO. These other facilities may include the following:

- **Manned operations area.** Facility operations and processes are controlled or monitored. An emergency could possibly be detected and reported, and initial mitigative actions implemented from this area.

- **Technical support center.** Detailed technical support and assistance is provided to the ERO. Activities such as technical assessments and engineering support could be coordinated from this center.

- **Operations support center.** Activities involving maintenance, health physics, industrial hygiene, and operations resource personnel could be coordinated and directed from this location. This center is typically the dispatching point for field monitoring teams, search and rescue teams, damage control and equipment repair teams, and emergency equipment operators.

Other facilities, used on a routine basis to support facility/site response activities during an OE, should also be considered emergency facilities during an emergency event. Examples include security patrol headquarters, notification centers, medical stations, decontamination stations, assembly points, and central alarm stations.

An analysis of the functional requirements of the command center may suggest that similar functions be combined in a single emergency facility. Examples of potential emergency facility arrangements include the following:

- Combining all emergency response control and coordination functions in a command center, with separate specialty functions in rooms or partitioned areas

- Combining the technical support center and command center

- Combining the technical support center and operations support center

- Establishing individual facility technical support centers and operational support centers, along with a common command center for the entire site

- Dividing operations support center functions among multiple emergency facilities (e.g., repair, monitoring, and operations staff staged in separate locations)

3.5 Emergency Equipment

The purpose of this section is to introduce emergency equipment by first discussing how specific equipment supports essential aspects of the emergency response. This is followed by a more detailed characterization of several categories of emergency equipment, such as communication, consequence assessment, protective action, medical, public information, and miscellaneous equipment.

3.5.1 Equipment Support for Response Functions

Response functions that are supported by specific, specialized emergency equipment include the following:

- **<u>Notifications and Communications</u>.** The facility/site should have the ability to notify all affected onsite individuals of an emergency condition in a timely manner and to provide directions to them. This notification/communication capability is usually made by a public address system and/or through alarm sirens, horn blasts, etc. Notifications to emergency responders (e.g. fire, medical, police departments) are usually made over a radio/telephone, hard line/battery-type redundant system to reasonably ensure that communication is maintained regardless of the nature of the emergency and its impacts on facility/site systems. This same system can also serve to notify other appropriate Federal, Tribal, State, and local organizations, as well as additional offsite Departmental entities. Many Departmental facilities and sites have designated radio frequencies and dedicated telephone lines to be used only for emergency notification and communication purposes. Provisions are also established to ensure operational compatibility between facility response capabilities and DOE or NNSA assets.

If the resources of offsite response organizations are to be integrated into the overall facility/site response, their communications capabilities need to be compatible and procedures/terminology consistent with onsite communications. MOUs with appropriate agencies should provide communication protocols and a workable integration process. Individual facilities or the site may need to provide mobile, compatible links to these organizations or establish other means of communications, such as exchanging liaisons.

- **Protective Actions.** Depending on type and duration of emergencies that could occur at or impact a facility/site, effective sheltering or transporting of onsite personnel for evacuation purposes may be desirable or even necessary. Pre-designation of the locations for these potential shelters and rally points for evacuation is critical in order to support onsite direction and coordination actions (e.g. temporary billeting, transportation) and for obtaining accurate accountability of all potentially affected personnel. Understanding the peak, onsite number of personnel which could potentially be affected by the emergency will help determine the size/type of sheltering facility, numbers/types of vehicles needed to support their evacuation, and the optimum personnel accountability system to be used. Selected shelters should include a communications capability to and from the command center. [Cf. DOE G 151.1-4, Chapter 7 for other protective actions that might be taken.]

- **Accountability Processing.** The capability to determine the whereabouts and status of onsite personnel, including visitors and subcontractors, during an emergency requires that the facility/site maintain a personnel accountability system. Some method of communication (except radio) is necessary to communicate the names of personnel unaccounted for or missing to the command center. The complexity of the system might be no more than a "roll call," if it serves to determine accountability after evacuation. Whatever system is used, from simple "roll calls" to fully automated badge-reader systems, consideration needs to be given to the variety of personnel that may be on the facility/site, optimum placement of accountability systems, system usage capabilities/ limitations/needs, and mobility requirements. For emergencies that could force the evacuation of most of a site and even the surrounding populations, some method for recalling onsite personnel who may not be accessible at their normal/permanent residences should be identified. The capability to determine the whereabouts and status of onsite personnel, including visitors and subcontractors, is essential.

3.5.2 Command, Control, and Communications Equipment

Command, control, and communications are the most important functions of the ERO. Primary and back-up emergency equipment, supplies, and alternative emergency response functions (to include redundant manual systems) need to be considered to ensure the continuous functioning of command, control, and communication capabilities. Recording capability of all radio and phone line communications is highly desirable.

Decision aids and information displays to support the command and control functions of the ERO in their emergency facility should be provided and regularly tested during drills and exercises. Equipment to be considered includes the following:

- Status boards/displays should provide a synopsis of the emergency and the response. Key information should be presented on the status boards/displays, including facility and system parameters; effluent releases; environmental monitoring and measurements; consequence assessments; protective actions; initial and follow-up notifications; accountability; and search and rescue. Status boards/displays offer information to the ERO at a glance, confirming reports that response actions have been made and that future actions have been identified.

- Data from installed instrumentation (e.g., meteorological and source term) critical to command and control (i.e., protective actions, classification, etc.,) should be available to appropriate ERO personnel.

- Primary and back-up communications systems should be provided to ensure effective communications critical to command and control of emergency response activities.

- Consideration should also be given to compatible communications systems to pass notification and activation reports to both on-shift and off-shift emergency response personnel, and to communicate such reports and other information to Departmental entities offsite and to other Federal, Tribal, State, and local government agencies. The systems designed to perform these functions should be tested and maintained regularly. Standard procedures and forms also should be developed to ensure that information could be passed quickly and accurately during an emergency.

- Secure communications equipment necessary for transmitting classified and sensitive information should be considered and be available during an emergency response if needed.

Additional guidance impacting the design and employment of communications systems used for notifications and reports can be found in DOE G 151.1-4, Chapter 2 and Section 5.

Primary and back-up communication links for mobile personnel, such as field teams and Incident Commanders (ICs), should be provided, tested, and maintained. If offsite response forces will be integrated into the overall facility or site response, communications should be compatible. The facility and/or site may be required to provide mobile, compatible communications links to these offsite organizations.

Communications networks used to support daily operations at a facility or site should be compatible with the networks established to exercise command and control of emergency response. For example, fire departments and brigades, security patrols, and craft departments often have established radio networks to communicate with central dispatch facilities. Equipment within the command center may be needed to ensure that the direction provided by the ED or the IC is accurately and quickly transmitted to all emergency response elements.

3.5.3 Consequence Assessment Equipment

The level of sophistication required for consequence assessment capabilities, such as meteorological data acquisition, calculation models, accident range instrumentation, data entry, and field monitoring capabilities, should be determined based on the results of the EPHA. DOE G 151.1-4, Chapter 6 provides recommended methods based on maximum event classification at the facility.

Adequate equipment should be staged and readily available to provide hazard characterizations to site personnel and the public and to permit prompt protective action implementation or recommendations. This equipment should be inventoried regularly and their locations identified. In accordance with manufacturer's instructions or industry standards, all such equipment and supplies should also be periodically inspected, calibrated, operationally checked, tested, and maintained. Installed monitoring systems needed for accident characterization should have back-up power to ensure continued operability in an accident.

Field monitoring equipment should be capable of measuring concentrations or exposures of interest during the emergency response. If plans include provisions for the deployment of joint DOE/State/local monitoring teams, then standardized or compatible monitoring and communication equipment should be used. Instruments suitable for determining occupational exposures during normal operations may not be capable of recording accident event concentrations. (Regardless of the choice of instrument types, consequence assessment data/results should be compatible in terms of engineering units, conversion factors, and the severity thresholds.)

3.5.4 Protective Equipment

EPHA results concerning the nature of potential hazards and affected areas, the types of consequences, and the population affected are useful for determining requirements for emergency equipment, materials, and facilities needed for protective action implementation. Detailed guidance is provided in DOE G 151.1-4, Chapter 7.

Respiratory protection and protective clothing may be necessary to protect workers in a contaminated environment, to allow for their escape, and to protect emergency workers during reentry to a contaminated facility. The type of respiratory protection and protective clothing should be based on the EPHA and consequence calculations. The possibility of inhalation and absorption through the skin should be considered in determining the type and quantity of protective clothing available. Additional discussion of requirements for maintaining PPE can be found in Hazardous Waste Operations and Emergency Responses (HAZWOPER) standards; Appendix B, 29 CFR 1910.120; 29 CFR 1910.132 through 1910.140; and National Fire Protection Association (NFPA) Standards 1991, 1992, and 1999. Some type of decontamination facility, either mobile or fixed, is suggested to provide decontamination for emergency responders and possibly victims. Specific locations within the facility, such as security posts or operations control rooms, are critical and may have to be continuously manned. The EPHA should be used to determine requirements for protective equipment that should be available at these locations.

Consideration should be given to standardization and interoperability of emergency equipment needed for implementing protective actions across a facility/site. This would enable routine operating supplies maintained by organizations, such as the fire department and the hazardous materials response group, to be pooled with any dedicated emergency equipment inventory and periodic inspections/calibrations/operational checks/testing conducted. Standardization of equipment allows for increased interoperability by response organizations, ease of maintenance, and greater flexibility during response.

Transportation equipment should be provided, or identified as readily available by means of a Memorandum of Agreement (MOA), for use in evacuating nonessential personnel onsite to a safe location following an evacuation order. Determination of suitable modes of transportation should consider disabled workers. Transportation equipment could include automobiles, buses, vans, ambulances, and cargo vehicles. This equipment can be either owned and maintained by the facility/site or available from Tribal, State, local, or private organizations via a contract or MOAs.

3.5.5 Medical Equipment

Sufficient medical equipment should be available to treat both workers and responders who may be injured during an emergency. Emergency planners should coordinate closely with medical professionals to ensure that appropriate treatment is available for analyzed accident scenarios, the types and nature of injuries that need to be treated, the kinds of contamination that can be expected, the number of personnel that could become casualties, and the time-frames during which treatment needs to be provided to be effective. Planning and evaluation should include types and amounts of medical equipment needed to respond to a mass casualty event. This should include medical supplies to treat exposure to toxic chemicals and/or biological agents.

10 CFR 851 and DOE O 440.1A and its supporting guidance document provide further information on requirements for onsite and offsite medical equipment. In addition, DOE G 151.1-4, Chapter 8 should be consulted.

3.5.6 Public Information Equipment

Audio-visual and data processing equipment dedicated to communications with the media and the public should be available. While some equipment may be dedicated to public information activities as part of normal operations, these assets may need to be upgraded to accommodate the substantially greater demands for public information dissemination during an emergency. TV monitors are necessary for monitoring local news broadcasts regarding the event. While members of the media will have some equipment needed to execute assignments, greater demand for onsite support interfaces (e.g., phone lines, power supplies) should be anticipated. Detailed guidance is provided in DOE G 151.1-4, Chapter 9.

3.5.7 Additional Support Equipment

Access control equipment and procedures for the command center and any other emergency facility are essential to ensure that the ERO functions without interruption or disruption. Equipment may be necessary to ensure that access to temporarily sensitive security areas or potentially contaminated areas is restricted. If an atmospheric release may affect areas beyond facility and site boundaries, coordination should occur with offsite authorities regarding the equipment and procedures necessary to extend a perimeter beyond the traditional facility or site boundary for access control purposes. The security force is usually tasked to carry out access control activities.

Fire departments normally make up a substantial portion of the emergency response force at a facility/site. DOE O 420.1B requires that a “Baseline Needs Assessment” establish the minimum required capabilities of site fire fighting forces. Once determined, these capabilities are to be reflected in the site emergency plan. Emergency planners should coordinate with counterparts in the fire protection organization to ensure that all hazards noted in the EPHA are incorporated.

Spill containment equipment and supplies should be available for immediate use following declaration of an emergency, if necessary. This includes containment equipment (e.g., booms and berm-making equipment) to minimize the environmental impacts of runoff (such as from a tank failure or firefighting efforts). Other equipment needs might include heavy construction equipment, portable power supplies, temporary sanitation equipment, specialized tools, and replacement parts. Additional supplies that might be required include PPE, dosimeters, medical supplies, office supplies, fire fighting expendables, and construction supplies. As with fire, medical, and hazardous material equipment, consideration should be given to arranging for the availability and compatibility of these resources with offsite organizations. The availability of such offsite resources, including names of equipment operators, should be documented in MOAs.

Emergency response personnel should have at their disposal the necessary equipment for reentry and recovery activities. Although maintaining onsite inventory of all equipment possibly required for reentry and recovery efforts is not practical, a resource list for short-notice procurement should be available.

Logistic support can be arranged through elements of the ERO or from other Federal, state, tribal, local, or private sources. Commitments to have these resources available immediately as necessary can be ensured through MOAs. Examples of facilities and services that could be needed include hazardous materials response, bomb removal, hostage negotiations, medical/morgue services, critical incident stress teams, analytical laboratory services, aerial survey support, personnel transportation, food services, contaminated laundry service, and dosimetry support. Planners should consider the potential impact of resources from offsite organizations not being available in the event of a disaster that affects a large area. Additional information on establishing interfaces with offsite response groups is provided in DOE G 151.1-4, Chapter 2.

Administrative support, such as document and clerical services, may be required during emergencies. Facility maintenance and upkeep records and management of information from an incident require personnel and a record keeping system.

3.6 Maintenance of Facilities and Equipment

Emergency facilities and equipment should be periodically inspected and checked during normal conditions to ensure availability and reliability during an emergency. Designated response facilities, especially multi-use facilities, should be adequately maintained to ensure timely activation and availability to support an emergency response. Inventories of all emergency equipment and supplies should be maintained and the location of equipment identified. Periodic inspections, facility walk-downs, operational checks, calibration, preventive maintenance and testing of equipment and supplies should be carried out in accordance with the manufacturer’s instructions or industry standards. Of particular importance are the communications systems and equipment. Communication systems with DOE Headquarters, DOE field elements and offsite organizations should be periodically tested. Also, communication systems used onsite to activate both on-shift and off-shift emergency response personnel should be tested and maintained regularly.

4. EMERGENCY CATEGORIZATION AND CLASSIFICATION

4.1 Introduction

The purpose of this chapter is to assist Department of Energy (DOE) and National Nuclear Security Administration (NNSA) field elements in complying with the DOE O 151.1C requirement that major unplanned or non-routine abnormal events or conditions involving or affecting DOE or NNSA facilities/sites or activities be recognized promptly and categorized as Operational Emergencies (OEs). The requirement applies to events or conditions that cause or have the potential to cause:

- Serious health and safety impacts onsite or offsite to workers or the public;
- Serious detrimental effects on the environment;
- Direct harm to people or the environment as a result of degradation of safeguards or security conditions; and
- Release of (or loss of control over) hazardous materials.

In addition to being categorized as OEs, events involving the actual or potential airborne release of (or loss of control over) hazardous materials from an onsite facility or activity also require prompt and accurate classification as an Alert, Site Area Emergency, or General Emergency, based on the measured or predicted radiation dose or hazardous material concentration at specific locations (e.g., facility and site boundaries). Conservative preplanned initial onsite protective actions and offsite protective action recommendations should be associated with the classification of these OEs.

This chapter describes the basic principles of event categorization and classification of OEs. First, event categorization is discussed with special emphasis on OEs that do not require classification and the development of criteria for determining quickly if an event is an OE. Next OEs that require classification and the relative severity (i.e., the consequences and the extent of the area impacted) associated with each emergency class are discussed. The use of Protective Action Criteria (PAC) for radiological and non-radiological releases to establish hazardous material emergency classification is also addressed. Guidance is provided for developing Emergency Action Levels (EALs), the criteria used to detect and recognize onsite hazardous material release events and assign the appropriate emergency class. Appendix A provides guidance for integrating event categorization and classification with normal operating procedures; Appendix B provides examples for the implementation of event categorization and classification.

This chapter is designed primarily for facilities/sites and activities that are required to implement an Operational Emergency Hazardous Materials Program and is directed at operations and emergency management staff at Field Elements and operating contractor organizations responsible for DOE and NNSA facilities/sites and activities.

4.2 General Approach

Effective emergency response depends upon early recognition of emergency events and conditions, coupled with rapid implementation of emergency actions. C***ategorizing*** events as OEs was created to ensure this rapid recognition and timely response. Response to OEs requires notification of offsite authorities and may require the commitment of significant resources. Categorization of events or conditions as OEs is intended to: ensure the rapid dissemination of event facts outward and upward; activate response activities beyond the local event scene; and meet the time-sensitive information needs of strategic decision-making in areas of national security. The DOE O 151.1C requires that an OE event or condition must be categorized as promptly as possible, but no later than 15 minutes after event recognition/identification/discovery.

In addition to ensuring rapid communications, the process of classifying selected OEs that involve hazardous materials was created to initiate preplanned local response and to protect the local site and offsite populations. For OEs that do not require classification, local emergency response activities may be unaffected by the categorization process with the exception of more timely recognition and notifications. Classified emergencies (i.e., Alert, Site Area Emergency, and General Emergency) are a subset of the OE category. Therefore, when an event is classified, it is (by definition) also categorized as an OE at the same time. As a result, an OE event or condition requiring classification needs to be ***categorized AND classified***, as promptly as possible, but no later than 15 minutes after event recognition/identification/discovery.

The emergency categorization/classification system includes a set of pre-approved decisions, agreed to by senior management and Tribal, State, and local officials, which allow onsite supervisory personnel to make rapid decisions affecting personnel, facilities, and resources in response to an emergency. Authority to initiate emergency communications and commit resources often rests with upper management. During the onset of an emergency, adherence to the normal management approval processes may delay the initiation of response actions and mobilization of resources. For the system to be effective, responsibility and authority for initial event categorization and classification should be vested in on-duty supervisory personnel who are close to the problem and who are familiar with the facility.

Every DOE/NNSA facility/site and activity is required to produce a Hazards Survey to identify the types of emergency events and conditions to be addressed by the DOE Comprehensive Emergency Management System. This survey can be used to define events and conditions that should be categorized as OEs. Facilities/sites and activities are required to identify these OEs and develop criteria for categorizing them quickly, as specified in the Order. OEs involving the release of (or loss of control over) hazardous materials on or from DOE sites or facilities are classified according to their severity for the purpose of rapidly implementing planned response activities and notifications that are commensurate with the degree of hazard presented by the event.

4.3 Operational Emergency Definition

DOE O 151.1C provides the following definition for an Operational Emergency:

> ***"Operational Emergencies*** **are major unplanned or nonroutine abnormal events or conditions that: involve or affect DOE/NNSA facilities and activities by causing or having the potential to cause serious health and safety or environmental impacts; require resources from outside the immediate/affected area or local event scene to supplement the initial response; and, require time-urgent notifications to initiate response activities at locations beyond the local event scene."**

The Order provides a number of examples of abnormal events and conditions that are to be categorized as OEs. The examples alone, however, may not fully convey the qualities (i.e., the seriousness and the required response efforts) that distinguish them as OEs in the DOE emergency management system. The basic characteristics of an OE, as spelled out in the Order definition, need to be considered along with the specific examples to determine whether a particular abnormal event is an OE. The following discussion provides guidance for interpreting the OE definition given in the Order.

- Operational Emergencies are " ***. . . major unplanned or nonroutine abnormal events or conditions . . .*** " They are ***major*** events or conditions that are expected to require the attention of senior level DOE management, possibly attract inquiries from the Executive and Legislative branches of the Federal Government, State and local governments, and Tribal authorities, and/or possibly attract highly visible media coverage and public attention. OEs do not include planned events (e.g., releases of hazardous materials in quantities below statutory limits) or routine and expected anomalies.

- Operational Emergencies " ***. . . involve or affect DOE or NNSA facilities and activities . .*** " The events can involve (originate from) DOE or NNSA facilities/sites and activities. Likewise, events can originate from an external (non-DOE) location/source, but affect DOE or NNSA facilities/sites and activities.

- Operational Emergencies " ***. . . cause or have the potential to cause serious health and safety or environmental impacts . . .*** " The events or conditions may cause, or have the potential to cause:

  – Serious health and safety impacts to workers or the public

  – Serious detrimental effects on the environment

  – Direct harm to people or the environment as a result of degradation of safeguards or security conditions

  – Release of a hazardous material from an offsite DOE shipment

  – Release of onsite hazardous materials to the environment (i.e., outside of a structure or enclosure); or, damage to or loss of control of nuclear weapons, components, or test devices

  Events or conditions that cause economic loss or result in a degradation of safeguards or security conditions, but have no actual or potential health and safety or environmental impacts, are **NOT** OEs.

- Operational Emergencies " ***. . . require resources from outside the immediate/ affected area or local event scene to supplement the initial response . . .*** " In an OE, the initial response efforts by personnel normally assigned to the immediate vicinity of the incident are not expected to be sufficient to mitigate all the health, safety or environmental impacts. As a minimum, emergency management assets [Emergency Operations Center (EOC) staff, information resources and communications capabilities] will be needed to control and coordinate the response activities. In addition, supplemental emergency response functional elements (e.g., firefighters, spill containment teams, security officers) may be needed to mitigate the event and its impacts effectively. The recognized need for different capabilities or resources than are deployed as part of the standard, planned response to events of a certain nature and magnitude (e.g., basic spill response capability) may also indicate that a specific occurrence is extraordinary in some way and should therefore be placed in the OE category. The fact that the <u>normal, planned initial response</u> for a particular kind of event comes from outside the "immediate/affected area or local event scene" (e.g., a site asset versus a facility asset) does not put the event into the category of OE, nor does precautionary repositioning of supplementary response resources closer to the event scene.

- Operational Emergencies " ***. . . require time-urgent notifications to initiate response activities at locations beyond the local event scene.*** " In an OE, time-urgent notifications to entities beyond the local event scene (and typically, beyond the site) are needed. External organizations notified may include: DOE/NNSA Headquarters, DOE/NNSA Cognizant Field Offices; Tribal, State, and local response organizations; and/or, other Federal regulatory authorities. These notifications are not simply informational, but are necessary to initiate and/or promote response actions beyond the local event scene that will have the effect of mitigating impacts to health, safety or environment. The notifications may activate interfaces with local planning partners, recommend protective actions and/or initiate planned response activities to mitigate impacts in areas beyond the immediate event scene. These notifications can also initiate *strategic* attention and decision-making at national levels particularly when the OE impacts areas of national security.

4.4 Categorization of Operational Emergencies

Although it is not intended that facilities develop detailed and quantitative categorization criteria for each type of OE described in the Order, some planning and preparation will be needed to ensure that events meeting the Order descriptions are promptly recognized and categorized. For some types of OEs, facilities and sites may choose to develop facility-

/site-specific criteria to aid in decision-making. For others, the guidance presented in this chapter may be useful in interpreting observed conditions directly against the Order descriptions. In either case, the decision to categorize a given occurrence as an OE should be based on the extent of the required response and the potential health, safety and/or environmental impacts discussed in the previous chapter, as well as and the nature of the event as conveyed in the Order examples.

In addition to satisfying criteria based on the Order descriptions, the event or condition should also exhibit the more subjective characteristics that define the OE, as discussed in Section 4.3. The process of OE categorization involves judgments on a number of subjective issues, including:

- Perceptions of the magnitude of the event
- Unique circumstances of the specific event
- General need for emergency “management” (i.e., multiple skills, additional resources, etc.)
- A sense of what DOE/NNSA Headquarters needs to be informed of promptly in order to interface with other Federal agencies at the highest levels
- The site’s political situation and its relationship with its neighbors

These considerations together with the interpretation of observed event conditions against criteria based on the Order descriptions of OEs describe the process of categorization.

In summary, there are few absolutes in categorizing emergency events or conditions. The categorization process involves a qualitative and quantitative assessment of unique events or conditions. The categorization decision needs to consider the OE definition in its entirety, with no one aspect of the definition dominating the decision process. The subjective nature of the process makes it essential that responsible personnel are trained to recognize events or conditions that require rapid assessment and categorization decisions.

The following sections describe how the examples of OE events or conditions given in the Order should be used to develop facility- and site-specific criteria to support recognition and *categorization* of emergency events or conditions. A variety of techniques may be used to integrate this recognition/decision process with existing operations, management, emergency response, and reporting activities (e.g., existing occurrence reporting and hazardous materials recognition/classification procedures)

4.4.1 Direct Health and Safety Impacts

Events or conditions that represent, cause, or have the potential to cause serious health and safety impacts to workers or members of the public and exhibit the general characteristics contained in the definition given in Section 4.3 are OEs.

(1) ***Discovery of radioactive or other hazardous material contamination from past DOE/NNSA operations that may have caused, is causing, or may reasonably be expected to cause uncontrolled personnel exposures exceeding protective action criteria.***

Discussion. This example applies to the discovery of contamination that: 1) may have caused past, unrecognized exposures of about the same magnitude as would currently require protective actions when dealing with environmental release of hazardous materials, and/or 2) may pose a future threat of similar exposures. An OE of this type has two defining characteristics. First, if it is possible that people were exposed unknowingly in the past, effort may be needed to identify the exposed individuals, assess their exposure, determine if any of them exhibit health effects that could be linked to the exposure, and provide them with necessary medical follow-up. Second, without prompt and effective action, it is likely that people will continue to be exposed to the contamination. In either case, the acute dose or exposure to individuals who come in contact with the contamination will be at or above the level at which protective actions are currently planned when dealing with environmental release of hazardous materials. The example applies to any newly discovered onsite or offsite contamination area that was not under access control at some time in the past, or for which access control was not immediately established upon discovery and personnel may thereby have continued to gain access without DOE/contractor knowledge while the magnitude and extent of the contamination was being characterized. Minimum severity thresholds for this condition may have one of several bases, as follows:

- For radioactive material in general, a multiple of the Significance Category 2 Occurrence Reporting criterion for offsite radioactive contamination (Cf. DOE M 231.1-2 under Subgroup 6 B) may be used.

- For gamma emitters, dose conversion factors can be used to determine the contamination level that would result in a dose of 1 rem Effective Dose Equivalent (EDE) to a person exposed to the contaminated area for a short period of time (for example, a week or less).

- For radionuclides that pose an inhalation hazard, inhalation dose factors and an assumed average resuspension factor can be used to estimate the surface contamination level that corresponds to a 1 rem dose commitment Total Effective Dose Equivalent (TEDE) for a short period (i.e., a week or less) of exposure to the contaminated area.

- For nonradioactive hazardous materials, an assumed average resuspension factor can be used to estimate the surface contamination level that corresponds to an Acute Exposure Guideline Level (AEGL)-1 (or equivalent) concentration in air above the contaminated area.

Methods. Using bases such as those cited above, facilities that store or process significant quantities of hazardous materials (or have done so in the past) may select a "contamination" criterion on which they will declare an OE. Facilities that have potential for contamination with several hazardous materials may develop simple conversion factors, formulae, or tables to permit rapid evaluation of measured contamination values against protective action criteria. Any discovery of high levels of contamination will typically result in technical assessments and internal notifications preliminary to initiation of the Occurrence Report required by DOE M 231.1-2. Therefore, internal procedures and training related to radiation protection and industrial hygiene (e.g., directions for handling of unusual survey results) and Occurrence Reporting can be used to alert safety/health and Occurrence Reporting personnel to the requirement for an OE declaration and prompt notifications if contamination exceeds certain levels well above the Occurrence Reporting values.

(2) ***An offsite hazardous material event not associated with DOE/NNSA operations that is observed to have or is predicted to have an impact on a DOE site such that protective actions are required for onsite DOE workers.***

Discussion. This example applies to any release of hazardous material from an external source that requires onsite personnel to evacuate or take shelter. Such releases may originate from fixed facilities or transportation activities outside the site boundaries, from non-DOE transportation accidents on roads, railroads, or rivers that traverse the site, or from private industrial activity being conducted on the DOE site. However, if hazardous materials from the offsite event could lead to loss of control over onsite DOE hazardous materials, then the event should be classified on the basis of the potential onsite release. (See Section 4.5)

The need for onsite protective actions may be based on measurements or consequence projections by site personnel or on a recommendation from the on-scene Incident Commander (IC), offsite emergency management authorities, or the responsible carrier. Any significant concentration of DOE and/or contractor personnel should be considered "onsite" for purposes of this example, even if they occupy a leased offsite building or facility. Such offsite buildings should be considered if the occupants have principal site operations and management responsibilities. Offsite subcontractor offices, hotels/motels, company picnics, and conference facilities need not be included.

Methods. Because hazardous material releases may originate from any transportation artery and many industrial facilities, this condition applies to every site and facility occupied by DOE or prime contractor staff. Local area, site, and building emergency procedures, and associated building emergency warden training, may be used to help ensure recognition of this situation as an OE requiring prompt reporting. Although DOE M 231.1-2 does not explicitly identify offsite hazardous materials events impacting DOE sites/workers as reportable occurrences, local Occurrence Reporting procedures, guidelines, and training of Occurrence Reporting personnel can be used to help ensure recognition. Because events involving onsite releases of hazardous material are classified in accordance with Section 4.5 of this guidance, emergency classification (EAL) procedures, which are likely to be consulted for any hazardous material event with impact on people, can be used to identify this condition as an OE not requiring classification.

(3) ***An occurrence (e.g., earthquake, tornado, aircraft crash, fire, explosion) that causes or can reasonably be expected to cause significant structural damage to DOE/NNSA facilities, with confirmed or suspected personnel injury or death.***

Discussion. This example applies to events such as earthquakes, tornadoes, fires, explosions, and vehicle accidents that cause significant structural damage to DOE or contractor facilities, such that death or injury to personnel might reasonably be expected. Damage to the structure does not need to be total or exceed any particular cost threshold, nor does death or injury need to be confirmed. The threat to personnel safety in conjunction with ***significant structural damage*** is the key to this example. Accordingly, a fire that destroys a building that is abandoned (or is thought to be unoccupied) is not an OE, whereas the collapse of the roof of a normally occupied building during working hours ***is*** an OE, even if no death or injury of the occupants is initially evident.

Methods. Any facility that is routinely occupied by personnel could be subject to such events. Because initial response to an event of this nature is likely to be carried out by local fire and rescue organizations, building emergency/fire plans, management notification lists, and incident command training (e.g., regarding the initiation of additional alarms or calls for backup units as OE recognition factors) can be used effectively to ensure recognition. Local Occurrence Reporting guidelines and training of Occurrence Reporting personnel may also prompt a review of the site-specific criteria for categorizing a building evacuation as an OE.

(4) ***Any facility evacuation in response to an actual occurrence that requires time-urgent response by specialist personnel, such as hazardous material responders or mutual aid groups not normally assigned to the affected facility.***

Discussion. This example applies to any normally occupied DOE or contractor facility. The event or condition that requires evacuation and time-urgent response by specialist personnel may be a fire, hazardous material (HAZMAT) spill, or safeguards/security incident. However, a precautionary evacuation and response by specialist personnel that does not involve any significant threat to health, safety, or security (such as a HAZMAT team investigating a report of an unusual odor or firefighters responding to a reported smell of smoke without any other indication of fire) is not an OE. Neither is an event that is managed successfully by specialist personnel assigned to the affected facility or by site assets that serve as the primary specialist responders to the facility. However, if the primary responders find a condition that requires supplemental response of the same type (e.g., fire, HAZMAT) or a <u>different type</u> of specialized assistance, the condition should be categorized as an OE. If an airborne release of significant quantities of hazardous material to the environment occurs or is likely to occur, such events are OEs requiring classification, as described in Section 4.5.

Methods. Because the additional response assets from outside the immediate affected area/local event scene may be by fire/rescue, HAZMAT, security, or other specialist personnel, the procedures for those responses can be used to help ensure that the condition is recognized and categorized as an OE. Local Occurrence Reporting guidelines and training of Occurrence Reporting personnel may be used to prompt review of the site-specific criteria for categorizing a "facility evacuation" OE.

(5) ***An unplanned nuclear criticality.***

Discussion. Any unplanned nuclear criticality is an OE because it represents major failures of safety systems and practices and has the potential to cause facility damage and release of radioactive material. Criticality events that result in an airborne release of significant quantities of radioactive material to the environment are OEs requiring classification, as described in Section 4.5.

Methods. Only facilities dealing with fissionable materials in quantities approaching a minimum critical mass need to consider this potential condition. Local Occurrence Reporting guidelines and training of Occurrence Reporting personnel could be used to help ensure timely recognition and categorization of criticality events. Because most inadvertent criticalities will be classified as Alert or higher due to actual or potential radioactive releases, emergency classification (EAL) procedures and emergency response procedures should identify the specific conditions under which a criticality is to be categorized as an OE not requiring classification.

(6) ***Any mass casualty event.***

Discussion. This example applies to events that result in numbers of deaths or injuries that significantly exceed an occurrence reporting Subgroup 2A, Significance Category 1 threshold for occupational illness/injuries. A number and severity of casualties that exceed the readily available treatment capability defines the term "mass casualty." Indicators of this level of casualties include the need to exercise triage at the event scene, request ambulances and medical personnel from offsite, or dispatch victims to multiple medical facilities to ensure adequate and timely treatment.

Methods. Emergency planners for facilities and sites may elect to establish a local definition for "mass casualty" based on such factors as available emergency medical resources and distance to treatment centers. Emergency medical responder and incident command training and procedures can use that definition to ensure timely recognition and categorization of an OE. Since any event that has the potential to be a "mass casualty" will almost certainly be recognized as a potentially reportable occurrence, local Occurrence Reporting guidelines and training materials for Occurrence Reporting personnel can be annotated with the local definition for "mass casualty."

4.4.2 Environmental Impacts

Events or conditions that represent, cause, or have the potential to cause serious detrimental effects on the environment and exhibit the general characteristics contained in the definition given in Section 4.3 are OEs.

(1) ***Any actual or potential release of hazardous material or regulated pollutant to the environment, in a quantity greater than five times the Reportable Quantity (RQ) specified for such material in 40 CFR 302, that could result in significant offsite consequences, such as major wildlife kills, wetland degradation, aquifer contamination, or the need to secure downstream water supply intakes.***

Discussion. The specified release of hazardous material or regulated pollutant to the environment is an OE if it results in actual or potential offsite consequences of the type and magnitude specified in the example. Although the Order refers to "offsite consequences," many DOE sites contain sensitive and valued "onsite" environments. Examples include wetlands, streams, rivers, lakes, aquifers, and endangered species of wildlife. Such sensitive areas should be considered if contamination would generate response and interest equivalent to similar contamination of offsite areas. To facilitate recognition and categorization, sites and facilities should identify material storage and potential release locations, including locations on transportation routes, which could produce impacts such as those described in the example. This will allow releases to be categorized on the basis of the material, quantity, and release location rather than on field/in situ measurements of the impact, which may require days or weeks to quantify. Specific material release scenarios that, in addition to causing environmental degradation, have the potential to cause acute airborne exposure hazards to people are OEs requiring classification, as discussed in Section 4.5.

Methods. This condition applies to facilities/sites for which the Hazards Survey has identified quantities of hazardous materials or regulated pollutants that could cause significant damage to the environment. Plans, procedures, and training related to environmental spill response and reporting can be used to ensure recognition of the need to categorize specific releases as OEs. Local Occurrence Reporting guidelines and training of hazardous waste management and Occurrence Reporting personnel can also be used to prompt a review of the site-specific criteria for categorizing such releases as an OE.

(2) ***Any release of greater than 1,000 gallons (24 barrels) of oil to inland waters; greater than 10,000 gallons (238 barrels) of oil to coastal waters; or a quantity of oil that could result in significant offsite consequences (e.g., need to relocate people, major wildlife kills, wetland degradation, aquifer contamination, need to secure downstream water supply intakes, etc.) [Oil as defined by the Clean Water Act (33 U.S.C. 1321) means any kind of oil and includes petroleum.].***

Discussion. Any release of oil exceeding the stated quantities or any smaller release that produces or is likely to produce offsite consequences of the type and magnitude specified is to be categorized as an OE. To facilitate categorization, sites and facilities should identify oil storage and potential release locations, including locations on transportation routes that could produce impacts such as those described in the example.

Methods. This condition applies to facilities/sites for which the Hazards Survey has identified the potential for release of more than 1,000 gallons to inland waters, 10,000 gallons to coastal waters, or any release that could result in significant offsite consequences. Plans, procedures, and training related to environmental spill response and reporting can be used to ensure recognition of the need to categorize specific releases as OEs. Local Occurrence Reporting guidelines and training of Occurrence Reporting can prompt a review of the site-specific criteria for categorizing oil/petroleum releases as OEs.

4.4.3 Safeguards and Security Events or Conditions with Direct Health and Safety or Environmental Impacts

Events or conditions that represent, cause, or have the potential to cause degradation of safeguards or security conditions with actual or potential direct harm to people or the environment and exhibit the general characteristics contained in the definition given in Section 4.3 are OEs.

(1) ***Actual unplanned detonation of an explosive device or a credible threat of detonation resulting from the location of a confirmed or suspicious explosive device.***

Discussion. Detonation or discovery of an explosive device at any DOE or contractor facility should be categorized as an OE. However, in some cases, the location of the explosive device and its size may need to be considered. For example, a common firecracker or rifle cartridge should not be considered an "explosive device" unless the conditions under which it is found or exploded suggest deliberate placement and destructive intent. Discovery or credible threat of any explosive device in a location where it clearly threatens DOE property or site personnel is an OE. Placement or detonation of a device that causes or threatens a release of hazardous material with the potential for acute airborne exposure hazards to people is an OE requiring classification, as discussed in Section 4.5.

Methods. All DOE and prime contractor facilities and sites are subject to this type of malevolent act. Security plans and security response procedures may be used to identify criteria for declaration of an OE in terms of safeguards/security status or response level triggered by an event meeting these descriptions. Local Occurrence Reporting guidelines and training of Occurrence Reporting personnel can prompt a review of site-specific criteria for categorizing explosive device events as OEs.

(2) ***An actual terrorist attack or sabotage event involving a DOE/NNSA facility/site or operation.***

Discussion. An armed assault involving a DOE site, facility, or operation might be directed at an individual DOE or contractor employee, at gaining access to valuable property or classified material, or at causing damage to the DOE property. Therefore, the term "terrorist attack" should be interpreted broadly; any armed assault that takes place at a DOE or contractor facility should be categorized as an OE because the motivation for and objectives of the assault are not likely to be known until long after the fact. Exceptions to this generalization might include violent confrontations between individuals or simple acts of vandalism that take place incidentally on DOE or contractor premises. Any confirmed attempt to sabotage facilities or equipment should be categorized as an OE, even if it initially appears to be unsuccessful, because of uncertainty concerning other undiscovered, but related potentially destructive acts. If these destructive acts impact control over or result in the release of significant quantities of hazardous materials, they are OEs requiring classification, as discussed in Section 4.5.

Methods. All DOE and prime contractor facilities and sites are subject to this type of malevolent act. Local security plans, response procedures, and guidelines for reporting events of security concern may be used to identify criteria for declaration of an OE in terms of safeguards/security status or response level triggered by an event meeting these descriptions.

(3) ***Kidnapping or the taking of hostage(s) involving a DOE/NNSA facility/site or operation.***

Discussion. Kidnapping of a DOE site employee or family member or taking of hostages may be undertaken to extort money, materials, or concessions from the DOE or its contractor. DOE, its contractors, and their employees may come under great pressure to meet a perpetrator's demands, some of which might have safety, health, or environmental implications. Such occurrences should not be categorized as OEs if kidnapping or hostage taking occurs off the DOE site and motivation for the crime is not believed to involve DOE interests (e.g., the "kidnapping" of children involved in a custody dispute).

Methods. All DOE and prime contractor facilities and sites are subject to this type of malevolent act. Local security plans, response procedures and guidelines for reporting events of security concern may be used to identify criteria for declaration of an OE in terms of safeguards/security status or response level triggered by an event meeting these descriptions.

4.4.4 Offsite DOE Transportation Events or Conditions

Events or conditions that represent an actual or potential release of radiological or non-radiological hazardous materials from a DOE shipment outside a DOE site and exhibit the general characteristics contained in the definition given in Section 4.3 are OEs.

(1) ***Any accident/incident involving an offsite DOE/NNSA shipment containing hazardous materials that causes the initial responders to initiate protective actions at locations beyond the immediate/affected area.***

Discussion. Initial on-scene response to any accident/incident involving offsite transportation of DOE-owned hazardous materials will be carried out by State and local emergency services groups (e.g., police, fire, and HAZMAT) responsible for the accident locale. In many cases, the vehicle driver will have no detailed knowledge of the potential hazard and no control over the actions of the local responders. If local responders determine that protective actions are necessary beyond the immediate event scene, the event is to be categorized as an OE by the DOE entity responsible for the shipment (usually the shipper). Thus, only two facts from the scene are needed to support an OE declaration:

- On-scene responders (the responsible local authorities) have implemented either evacuation or shelter as protective actions in response to the accident/incident

- The area within which protective actions have been implemented extends more than about 100 meters in any direction from the vehicle or spill location.

Even if no hazardous material release occurs, implementation of protective actions is likely to cause intense public awareness and media interest in the DOE shipments. It will also require the shipper and other DOE entities to support local authorities in assessing any hazard. Finally, any of several different DOE technical capabilities may need to be deployed to the scene to determine the status of the shipment, arrange for repackaging, conduct decontamination, and oversee disposal of waste.

Methods. Responsibility for recognizing, categorizing, and reporting OEs associated with offsite transportation activities rests with the DOE entity that has direct operational control of the shipment (usually the shipper). Transportation plans, procedures, and personnel training for specific types of materials may incorporate information and criteria needed to ensure that conditions requiring an OE declaration are promptly recognized and reported to the office or individual responsible for categorization.

(2) ***Failures in safety systems threaten the integrity of a nuclear weapon, component, or test device.***

Discussion. This example applies to systems that prevent unauthorized access to nuclear weapons, components, or test devices during transport, and to the systems that prevent or minimize the likelihood of damage to or detonation of the weapon, component, or device. Significant failures of either type should be categorized as OEs if they require the deployment of technical support to assist transportation personnel in restoring the shipment to the required envelope of safety and/or security conditions.

Methods. For transportation events involving nuclear weapons, devices, or components, OE declaration may be keyed to the initiation of response procedures or reporting conditions that are unique to nuclear explosive safety events. As an example, events occurring offsite and categorized using Department of Defense (DOD) terminology, such as a “Bent Spear” or “Broken Arrow,” would both be OEs. Some Broken Arrow events would clearly be classified as Alert or higher if occurring on a DOE site, depending on the potential for release of radioactive material to the atmosphere.

(3) ***A transportation accident results in damage to a nuclear explosive, nuclear explosive-like assembly, or Category I/II quantity of Special Nuclear Materials.***

Discussion. Offsite transportation accidents that cause actual or likely damage to devices or materials specified in this example should be categorized as OEs. Based on analyses conducted in accordance with DOE G 151.1-2, Chapter 2 observable indications of possible damage to the weapon, device, or material (such as fire or breach of shipping container) should be determined. If these indications are observed, the condition should be categorized as an OE. [A planned document in the DOE G 151.1-series will specifically address the EPHA associated with Office of Secure Transportation (OST) shipments].

Methods. For transportation events involving nuclear weapons, devices, or components, OE declaration may be keyed to the initiation of response procedures or reporting conditions that are unique to nuclear explosive safety events.

4.4.5 Release of (or Loss of Control Over) Hazardous Materials

Events or conditions that involve actual or potential release of significant quantities of hazardous (radioactive or non-radioactive) materials to the environment and exhibit general characteristics contained in the definition given in Section 4.3 are OEs that require classification. The following characteristics distinguish these hazardous material OEs.

- The hazardous material is, or is likely to be, released to the environment (i.e., outside of a structure or enclosure).

- The material immediately threatens those who are in close proximity and has the potential for dispersal beyond the immediate vicinity in quantities or concentrations that threaten the health and safety of onsite personnel or the public.

- The material has a rate of transport and dispersion in the environment that requires time-urgent response to implement protective actions. Essentially all of these hazardous material OEs involve airborne releases because the air pathway represents the most time-urgent situation, requiring rapid, coordinated emergency response on the part of the facility, collocated facilities, and surrounding jurisdictions to protect workers, the public, and the environment.

A hazardous material OE is to be classified as either an **Alert**, **Site Area Emergency**, or **General Emergency** based on the projected or measured hazardous material impact. Classified emergencies are a subset of the OE category. Therefore, when an event is classified, it is (by definition) also categorized as an OE at the same time. The categorization that is implicit in the classification of a hazardous material emergency does not require any notifications or actions beyond those otherwise specified for classified emergencies.

4.5 Classification of Hazardous Material Operational Emergencies

Event classification is the process of assessing hazardous materials OEs to determine if they fall into one of the three emergency classes. Classification provides further definition to this subset of OEs beyond the categorization of "Operational Emergency."

4.5.1 Principles of Event Classification

During the development of an event classification system, the following basic principles governing the purpose, expected results, and event classification methods should be taken into consideration.

The purpose of a standard event classification system is to:

- Initiate a set of pre-planned response actions appropriate to all events of a given class or severity (e.g., notification, mobilization of resources, and protective actions)
- Activate necessary analytical and decision-making capabilities to make sound determinations of the need for other actions
- Enhance the likelihood that mitigative action will be taken to prevent conditions from becoming more severe

Accurate event classification is the key to achieving a graded response. A graded response is the mobilization of personnel and resources in proportion to the severity of events or conditions. An underlying purpose of event classification is to minimize the impact of the consequences of an event by quickly bringing technical resources to bear on the problem. The implementation of the event classification process should provide for the following.

- Prompt notification of minor events to prevent escalation to more serious consequences
- Mobilization of resources to provide better management of the event or to arrest degradation of safety
- Sufficient lead-time to activate facilities and prepare for protective actions

- Protection of the public and employees at some distance from the event site in case of a release of hazardous material

- Prompt and accurate flow of information

Event classification methods should have the following characteristics.

- **Timely:** If possible, classification of a degrading safety condition should occur early enough in the progression of events that effective use of emergency response resources could arrest degradation or reduce consequences.

- **Reliable:** Classification should be based upon indications that are consistently associated with the event/condition and, whenever possible, have a direct correlation to the severity of the event.

- **Internally consistent:** Different events of a similar severity should result in the same classification. Different indications of the same event/condition should lead to the same classification decision.

- **Anticipatory:** Classification should be based on the most likely progression and future consequences of an event or condition, not just the situation as it exists at the time it is recognized.

- **Redundant:** Whenever possible, there should be several different indicators and criteria for recognizing and classifying an emergency.

- **Complete:** The event classification system should provide for recognition and classification of all the emergency events and conditions that are identified in the Emergency Planning Hazards Assessment (EPHA).

- **Conservative:** Where detailed or quantitative information is lacking, events should be classified on the basis of conservative estimates of conditions and consequences.

- **Usable:** Event classification methods should incorporate sound human engineering principles (e.g., express EALs in units consistent with instrument readings and standard terminology, use consistent and familiar format, place all necessary information and references in one location, use color coding or other pointers).

- **Integrated:** Event recognition and classification should be integrated with normal and off-normal operations practices. Entry points into the event classification procedure should be identified in procedures. Instrument readings, checklists, safety notes and precautionary statements in procedures, and other operational practices that support emergency recognition/classification should be identified.

4.5.2 Event Classification and Protective Action Criteria

For emergency events/conditions involving the actual or potential release of hazardous materials, each emergency class is defined in terms of health impact or risk to the general public or facility/site workers. If the impact or risk approaches or exceeds some predetermined level, then steps to protect the public and workers should be taken. These predetermined levels are expressed in terms of doses, exposures, or concentrations and are termed "protective action criteria." The Order states that the specific Protective Action Criteria (PACs) to be used in emergency planning for radioactive materials are the Environmental Protection Agency (EPA) Protective Action Guides (PAGs). For toxic chemicals, the Order specifies one of three sources of PAC values. In order of preference they are AEGLs promulgated by the EPA, Emergency Response Planning Guidelines (ERPGs) published by the American Industrial Hygiene Association (AIHA) and Temporary Emergency Exposure Limits (TEELs) developed by DOE. These PACs are discussed in detail in DOE G 151.1-2, Appendix F.

The threshold between emergency classes can be defined in terms of the actual or potential consequences from a release of hazardous material resulting in a dose or exposure that exceeds a PAC at the predetermined receptor location (e.g., 30 meters, facility boundary, and site boundary). At the Alert level, emergency event consequences exceed a site-specific criterion corresponding to 10% of the PAC at or beyond the facility boundary. Alternatively, the Alert may be defined in terms of consequences exceeding the PAC could be expected outside the facility at or beyond 30 meters from the point of release, but not beyond the facility boundary. A facility/site should choose one of these definitions and use it consistently. Facilities/sites are discouraged from developing EAL sets based on both Alert definitions.

At the Site Area Emergency level, consequences exceeding the PAC would exist onsite at or beyond the facility boundary, but not offsite or in onsite areas where the general public has *unescorted* access. A General Emergency exists when consequences exceed the PAC at or beyond the site boundary or in onsite areas where the general public has *unescorted* access.

For purposes of this guidance, *unescorted* access correlates to the site boundary definition contained within DOE G 151.1-2, which states:

> **If the general public can gain unescorted access to areas of the DOE site, such as public highways or visitor centers, those areas should be considered as offsite for purposes of emergency class definition, unless it is assured that those areas can be evacuated and access control established within about one (1) hour of any emergency declaration.**

Note that it is not the intent of the guidance related to classification to suggest that wind-direction-dependent initial classification criteria (EALs) be developed. In general, the use of real-time meteorological conditions as a factor in determining initial event classification (*and initial protective actions*) is not encouraged. Doing so requires a sophisticated understanding of the local atmospheric transport/dispersion environment, accurate information on current meteorological conditions, and a high degree of confidence in the forecast. It also complicates, and potentially lengthens, the decision processes. The need for reliable real-time weather information and on-call meteorological expertise, together with the added complexity of the decision process, make such an approach unsuitable for reaching timely, conservative and anticipatory classification (*and protective action*) decisions as required by DOE emergency management policy.

Finally, results of the EPHA are used to identify specific indications (i.e., alarms, monitor readings, sample results, observed conditions) that correspond to actual or potential consequences that equal or exceed a PAC at the receptor of interest. These indications become the criteria (EALs) by which events are classified as Alert, Site Area Emergency or General Emergency.

4.5.3 Emergency Class and Severity Level

The severity of each of the three OE classes and the general extent (area) of impact intended is summarized in **Table 4-1**.

4.5.4 Integration of Event Classification with Normal Operations

Monitoring of various indications and recognition of abnormalities and their safety significance are routine functions of a facility's operations staff. The transition to emergency operations begins with recognition of specific indications or symptoms of an emergency event or condition. To the extent possible, methods to enhance detection and recognition of emergencies and transition to emergency operations should be integrated with routine operating practices. Detailed guidance is presented in Appendix A.

Table 4-1. Summaries of Emergency Classes

Emergency Class	***Facility***	***Weapons/Devices/Components***
Alert	Substantial actual/potential degradation of level of safety. Hazardous material releases are not expected to exceed *PAC* levels at or beyond facility boundary.	Substantial actual/potential degradation of level of safety. No immediate threat to workers or general public.
Site Area Emergency	Actual/potential major failures of functions needed for protection of workers and public. Hazardous material releases are expected to exceed *PAC* levels beyond facility boundary, but not offsite.	Actual/potential system failures that threaten the integrity of the device. May adversely impact health and safety of workers in immediate vicinity, but not the general public.
General Emergency	Actual/imminent catastrophic reduction of safety systems with potential or actual loss of hazardous material. Hazardous material releases are expected to exceed *PAC* levels offsite.	Actual/likely catastrophic failures of safety or secondary systems threatening the integrity of the device. May adversely impact health and safety of both workers and public.

4.6 Development of Emergency Action Levels (EALs)

4.6.1 Role of the Facility EPHA

The EPHA constitutes the technical basis for a facility's hazardous material emergency management system. The EPHA identifies and characterizes the facility hazards, postulates a range of events and conditions that could lead to releases, and quantifies the potential consequences of each release.

For each release scenario, the EPHA identifies likely initiating conditions and contributing events (such as fire, equipment failure or loss of power) and methods by which either the initiating condition or the release might be detected and recognized. Examples of detection/recognition methods include alarms, instrument readings, equipment status indicators (e.g., on/off, open/shut), field or laboratory measurements, or direct observations of conditions or phenomena (such as fire or high winds).

The EPHA provides a quantitative estimate of the consequences of each release at specific locations, expressed in terms of radiation dose or peak concentration of toxic chemicals. This information determines the emergency class associated with the release.

For detection and recognition methods that correlate directly with consequences, the EPHA provides a basis for calculating specific values or conditions that correspond to each emergency class. Specific values or conditions (instrument readings, sample analysis results, equipment status, etc.) indicating that a PAC has been or will be reached at the facility or site boundary should be identified as EALs. For example, if a particular release of radioactive material through the facility's stack would produce consequences exceeding the PAC at the site boundary, and one means of detection is the installed stack monitor, then instrument readings corresponding to the Alert, Site Area Emergency, and General Emergency classifications should be calculated and defined as EALs.

In some accident situations, it may not be possible to confirm or quantify the hazardous material release. However, if a readily recognizable *event* or *occurrence* (e.g., a structure fire) is determined to have the potential to cause release of hazardous material but the actual release would be impossible to confirm or quantify in a timely manner, then <u>recognition of the event itself</u> (i.e., the fire) becomes the EAL, and classification is based upon the maximum consequences determined in the EPHA. In many cases involving non-radioactive hazardous material in outdoor storage areas, there is no installed instrumentation to detect or quantify a release. As a result, EALs for this type of hazardous material storage are usually stated in terms of the initiating event (such as a vehicle crash or explosion) or the observed release condition (spray from pressurized piping, spilling of liquid), and the resulting event classification is based on the consequences of releasing the maximum quantity of material known to be present.

The correlation of EPHA information and data leading to the creation of EALs is briefly discussed in DOE G 151.1-2, Section 2.6.3.

4.6.2 Symptom-Based and Event-Based EALs

By custom and usage, EALs that are stated in terms of specific *symptoms* (or combinations of symptoms) of a degraded safety condition are termed "symptom-based" or "symptomatic." EALs that are expressed in terms of the occurrence of an *event* or condition that is generally recognized by the sum of its features and characteristics are described as "event-based." The distinction is not absolute and some EALs may actually exhibit both qualities.

Symptom-based (symptomatic) EALs define the emergency condition in terms of one or more facts or observations, such as instrument readings or alarms. By definition, existence of the "symptom" is sufficient basis for declaring an emergency and the emergency *needs to be declared* if the symptom is observed. It is not necessary for the person making the classification decision to know anything about the underlying cause or the sequence of events that produced the symptom.

In general, symptom-based EALs are most applicable to well-instrumented and more complex process facilities. The "symptoms" may indicate actual release of hazardous material or the actual or impending failure of barriers or controls that keep such materials in a safe condition. Using symptomatic EALs, the classification decision can be reached by simply comparing the observed "symptom" (e.g., alarm, instrument reading, and equipment status) to the EAL. No additional interpretation or understanding of the underlying cause or sequence of events is required.

Event-based EALs are stated in terms of events or conditions that are recognized by the sum of their features, indications and characteristics (e.g., a "major earthquake" or "ventilation system upset"). To apply such an EAL, the user should assess all the observed facts/indications in the context of a written definition or common understanding (the "institutional knowledge") of the event addressed by the EAL. The user needs to decide if the "event," as represented by the sum of its indications, corresponds to the intent of the EAL.

For event-based EALs, the degree to which the "event" is expected to degrade the safety of hazardous materials will determine the emergency class. Safety degradation may result from the event's detrimental impacts on systems and equipment, confinement barriers, or the ability of personnel to monitor and/or control vital processes. The rationale that connects the occurrence of the "event," the actual or possible loss of control over hazardous material, and the emergency class should be clearly documented in the EPHA. For example:

- Situation. Collapse of Building X is expected to damage containers of hazardous material. Release of the material is shown in the EPHA to produce consequences exceeding the Site Area Emergency criterion. Structural analysis indicates severe damage to the building is expected if ground acceleration exceeds 0.2 g.

- "Event" EALs for Building X (Site Area Emergency).

- *Earthquake with sensible ground motion indicated by displaced furniture.*
- *Earthquake causes collapse or significant structural damage to Building X.*

- Basis/Rationale. If horizontal ground acceleration exceeds 0.2 g, Building X is expected to sustain severe structural damage and may collapse. Even if the structure remains standing through the initial shocks, it may be so weakened as to collapse without warning. Until the building has been inspected for latent damage and judged sound OR the hazardous material inventory has been removed, imminent release of the material should be assumed following ground acceleration of 0.2 g (horizontal) or greater. If the building collapses without warning, the release will begin immediately and any necessary protective actions will have to be carried out under conditions that are more hazardous. In anticipation of an imminent release, a Site Area Emergency declaration is warranted.

By focusing the decision-maker's attention on a few key parameters and indications, symptom-based EALs make the classification decision process more timely and less subject to error. For facilities where safety-significant systems are monitored with instruments and alarms, a large fraction of the EALs may be symptomatic in nature, whereas classification procedures for simple facilities with few instruments will consist almost exclusively of event-based EALs. In general, all EAL sets should contain event-based EALs for major events (such as fire or earthquake) that are addressed in the EPHA.

Event-based EALs should be stated in quantitative or objective terms by including, if practical, specific conditions (e.g., parameter values) that define the "event." For example, the first "Building X" example EAL given earlier in this section could be enhanced by identifying the source of the ground acceleration measurement: *Earthquake with ground acceleration exceeding 0.2 g (horizontal) as measured at (location/ instrument).* Purely symptomatic EALs are not very practical for some types of events. Classifying events involving security challenges, for example, may require that a number of qualitative factors and indications (such as the national terror alert status, the availability of backup response from offsite law enforcement agencies, or the credibility of specific threats) be taken into account when determining the overall degree of safety degradation.

Table 4-2 illustrates key differences between event-based and symptom-based EAL statements for the same condition. **Tables 4-3** and **4-4** illustrate symptom-based and event-based EALs for conditions of the same type and increasing severity.

4.6.3 Barrier Approach to EAL Development

Physical and administrative controls that maintain hazardous materials in a safe condition can be viewed as "barriers" to release. In some cases, it may be possible to define the degree of safety degradation in terms of the status (intact, challenged, or failed) of specific barriers. However, classification criteria (EALs) that relate emergency class to barrier status need to be justified, in each case, in terms of the basic class definitions and classification principles. Because barriers will vary widely in their importance to safety, locally defined emergency class distinctions based on barrier status will tend to be valid only for a specific material, location and barrier configuration. Since too few applications within DOE, such as reactors, benefit from the potential advantages, simplification, and improved internal consistency of the classification system to justify the extensive development and documentation effort, the system will not be addressed in detail here. See Appendix B for suggested guidance.

Table 4-2. Examples of Event-Based and Symptom-Based EAL Statements for the Same Condition

Initiating Condition	***Event-Based EAL Statement***	***Symptom-Based EAL Statement***
Fire	Fire in the chemical make-up room of the ABC facility that is not extinguished by automatic fire suppression systems.	Potential loss of chemical make-up room integrity ***as indicated by***: Chemical make-up room temperature greater than 300° F for >5 minutes as indicated on FP-T-007 **OR** Negative pressure in chemical make-up room of less than 0.25 in. H_2O (convert) as indicated on DP-CMR-96.
Radiological release	Fire, explosion, or cooling water system rupture reported in the 243-X HEPA filter or charcoal banks	ABC stack alpha monitor PA-SM-691 reading > 3E+3 µCi/sec (convert) **OR** ABC particulate gamma monitor PG-SM-96 reading (convert) > 5E+4 µCi/sec
Natural phenomena	Observed wind/tornado damage to ABC facility creating the potential for a radiological release	ABC building integrity loss as indicated by: Any ABC Facility fence line FL-ARM-2001 system monitor reading >1 mrem/hr, **OR** HVAC system not maintaining > 0.2" w.g. (convert) negative pressure in Ventilation Zone A

Table 4-3. Example Symptom-Based EALs for Different Severity Levels for the Same Initiating Condition

Initiating Condition	***Example EALs For:***		
	Alert	***Site Area Emergency***	***General Emergency***
Nitric acid tank release	Tank NA-15 level decreasing at > 1.0 ft/min (with no transfer operation in progress and pump discharge valve N.V.-3 indicating shut)	Tank NA-15 level decreasing at > 2.5 ft/min (with no transfer operation in progress and pump discharge valve N.V.-3 indicating shut)	Tank NA-15 level decreasing at > 5.0 ft/min (with no transfer operation in progress and pump discharge valve N.V.-3 indicating shut)
Radiological release (see formula)	Stack Monitor I-40 (µci/cc) X SF-50 (CFM) X (4.27 E-4) reading > 2E0 Ci/sec **OR** Any combination of two ARMs or portable survey instrument readings >500 mrem/hr in the area outside the ABC Facility, but within the security fence	Stack Monitor I-40 (µci/cc) X SF-50 (CFM) X (4.27 E-4) reading > 1E+1 Ci/sec **OR** Any combination of two fence line ARMs or perimeter portable survey instrument readings of >1000 mrem/hr	Stack Monitor I-40 (µci/cc) X SF-50 (CFM) X (4.27 E-4) reading > 3E+1 Ci/sec **OR** Any combination of two portable survey instrument readings outside the security fence of >1500 mrem/hr **OR** Any combination of two portable survey instrument readings at the site boundary of >500 mrem/hr
Waste tank failure by internal reaction	3 hottest RTDs > 90°F **AND** Any 2 pressures > + 1 in H_2O	3 hottest RTDs > 90°F **AND** Any 2 pressures > 1.0 PSIG in past hour **AND** "A" OR "B" rupture disk failure alarm	No analyzed chemical reaction and tank failure result in General Emergency

Table 4-4. Example Event-Based EALs for Different Severity Levels for the Same Initiating Condition

Initiating Condition	*Example EALs For:*		
	Alert	*Site Area Emergency*	*General Emergency*
Nitric acid railroad tank car release within facility boundary	Rupture of 2-in. transfer line during Xfr operation **OR** Other minor breach **AND** Visible acid plume length or personnel distress at >2 RR tank car lengths	Rupture of 5-in. transfer line during Xfr operation **OR** Other major breach **AND EITHER** Visible acid plume length or personnel distress at >4 RR car lengths **OR** Plume crossing facility security fence line	With present use of 80% nitric acid and limit of one RR tank car at the facility, there is NO RR tank car rupture scenario resulting in a General Emergency
Process line A loss of power (only applicable in mode A operation)	Loss of AC power to SWGR A-19 for >20 minutes	Loss of AC power to SWGR A-19 for >1 hour **AND** Any 2 local or panel A-RTD-10 temperatures exceed 500°F	Loss of AC power to SWGR A-19 for >2 hours **AND** Indication that process line A is auto-catalytic by ANY of following indications: · Panel A-RTD-10 temperatures >1000°F **OR** · Visible smoke outside room A **OR** · Shift Manager judgment
Natural phenomena impact Tornado	Tornado observed on site and approaching facility as confirmed by either: Visual report **OR** Wind speed > 80 mph on MET tower M-16 or M-19	Tornado observed to touch down within facility boundary as confirmed by either: Visual report **OR** Wind speed > 80 mph on MET tower M-20 or AM-1	Tornado-driven objects breach filter Bldg F-202 walls as indicated by either: Observed damage to building walls or exterior panels **OR** HVAC system unable to maintain > 0.2" w.g. negative pressure in F-202

4.6.4 Site-wide EALs

Most emergencies that involve or affect a single facility or activity will be classified using facility/activity-specific indications and EALs. However, some conditions external to the facility may also represent general or specific threats to control over hazardous materials and therefore warrant classification. Such conditions are not necessarily identified through the EPHA process and are likely to be classified only by a site-wide emergency management authority. Examples include:

- Incidents such as earthquakes, severe weather or floods, that may degrade control over hazardous materials at multiple operating areas or facilities

- A security incident or degraded condition not specific to a single facility/activity that may affect site hazardous materials facilities

- Offsite hazardous material releases that may cause degraded control over onsite hazards

- Onsite hazardous material transportation accidents that occur away from any facility

Personnel responsible for developing EALs should be cognizant of initiating events that are site-wide (non-facility-specific) and applicable to multiple facilities and should ensure that EALs for such events are included in facility and site-wide classification procedures.

4.6.5 Discretionary EALs

To compensate for possible incompleteness in the EAL set or unanalyzed conditions, such as concurrent events or loss of essential instrumentation during an accident, ***facility and site classification procedures should contain EALs which the responsible individual can use to declare the level of emergency that most closely corresponds to the apparent conditions, even if it cannot be determined that any other specific EAL has been exceeded***. These “judgment” or “discretionary” EAL statements are necessary to ensure that any unforeseen emergency condition can be rapidly classified using a straightforward criteria-based decision process. “Judgment” EALs should be provided for ***all three emergency classes***.

4.6.6 Equipment Availability

Equipment expected to provide key indications used to classify some emergencies may be non-operational in certain scenarios (e.g., due to loss of power, extreme environmental challenges, or conditions outside the operating range of instruments). The likely availability and usefulness of indications and instruments under emergency conditions should be considered when selecting EALs to classify those very conditions. Whenever possible, classification procedures should include redundant EALs that make use of different means of detection, such as visual observations by facility staff, and readings taken with portable survey instruments.

4.6.7 Facility Operational Modes

If applicable, the different operational modes of a facility (e.g., operating versus shutdown) should be considered when developing EALs. A specific instrument reading may clearly indicate an accident condition in one operating mode but not in another. Also, an instrument that is relied upon to detect an accident condition during normal operations may not be available while in stand-by mode. For example, during routine operations in a facility, an elevated reading on a specific area radiation monitor may be a clear indication of an emergency condition; whereas the same reading may be normal and expected when shielding is removed during maintenance. Classification procedures may have separate sections for each operating mode or the mode applicability of individual EALs can be noted in the procedure.

4.6.8 Method of EAL Presentation

Facility EALs should be approved by management and issued in the form of an Emergency Plan Implementing Procedure (EPIP) that embodies good human factors principles. The technical bases for the EALs should be maintained separately in either a basis/reference document or the facility EPHA. The following factors should be considered in determining the method of presentation.

- **Intended User.** A person closely associated with the facility, such as a shift manager/supervisor, senior operator, or duty officer, will usually perform the initial event classification. Therefore, the facility's event classification procedure should be presented in a form familiar to operations personnel. After the Emergency Response Organization (ERO) has been activated, the classification responsibility will typically pass to an emergency director (manager) who will make classification decisions using site-wide classification guidelines and facility EALs, as well as input from facility staff and other elements of the ERO, such as a consequence assessment team in the command center or EOC.

- **Conditions of Use.** The facility EAL procedure should be designed for use during times of rapidly changing conditions, uncertainty and high levels of user stress, such as often exist during the initial event classification when the decision-maker may also be directing facility response activities.

- **Availability of Assistance.** The initial user of the procedure will likely have the least amount of help in interpreting the EALs. Therefore, all the information necessary to make an initial classification decision should be presented clearly and concisely in the EAL statements.

The users of the EAL procedures should play an integral role in the development of the classification tool. The users should be comfortable with the presentation style of the EALs and have no difficulty in interpreting the terminology, criteria, and logic of the EAL statements. Their input should be solicited throughout the development of the procedures so that the users can take “ownership” of the final product and mechanisms developed for verification and validation of EAL accuracy and usability (see Section 4.7 below).

4.6.9 Event Termination Criteria

Once an emergency has been declared, EALs should never be used to downgrade (reduce) the emergency classification. Instead, general criteria should be established in the emergency classification procedure, or elsewhere, that will allow ERO personnel to formally terminate the emergency response and enter into a recovery phase. *Protective*

Actions and Reentry criteria and guidance are provided in DOE G 151.1-4, Chapter 7; *Termination and Recovery* is addressed in detail in Chapter 10.

4.7 Testing Categorization Criteria and EALs

4.7.1 Operational Emergencies Not Requiring Classification

Proposed facility or site criteria for categorizing OEs that do not require classification should be tested against potential scenarios to ensure that the criteria developed for each OE is: complete; discriminates between occurrences included in the Significance Categories 1-4 and OEs; depends on recognizable observables related to the event or condition; and, can be effectively and accurately used by the responsible authority to ensure an accurate and timely categorization.

4.7.2 Operational Emergencies Requiring Classification

The proposed facility or site EALs should be tested against a range of initiating conditions and accident/emergency event scenarios to determine if the indicated emergency class is appropriate. If necessary, EALs should be modified or additional EALs developed to ensure that the full range of possible emergency conditions could be classified in a timely manner. It is also prudent to test the EALs in a simulated response environment (drills and table-top exercises) with the personnel who will actually apply them (Emergency Directors, Shift Supervisors, etc.), to ensure that consistent, timely and correct classification decisions are reached.

APPENDIX A. Integration of Event Categorization/Classification with Normal Operations

A.1 Introduction

Even the best-designed set of event recognition procedures will not function properly if the detection, recognition, and communication chain necessary to alert those responsible for event categorization and classification fails. In this context, categorization refers to determining if an event is an Operational Emergency (OE), as defined in the Order. These events may require classification (i.e., as an Alert, Site Area Emergency, or General Emergency) if they involve a potential or actual release of radiological or non-radiological hazardous materials. A major problem encountered when designing an event recognition system is ensuring that events/conditions are compared to categorization and classification criteria in a timely and efficient manner. In general, if the severity of a condition or event is beyond that covered by DOE M 231.1-2, then there should be some way of detecting it, a means to ensure that its significance is recognized, and a mechanism for communicating the information to those responsible for event categorization and classification.

Elements that ensure the proper sequence of actions leading to event categorization and classification include the following:

- Means of detecting symptoms/indications
- Recognition of the significance of indications
- Proper response to recognition (i.e., communication with categorization and classification authority)

Within the facility/site operating structure, many varied detection methods exist. Recognition of the significance of what is detected depends on training, the existence of “attention-getting” devices, and procedural links. Transmission of information to the person with the authority to perform event categorization and classification depends on the establishment of clear, well-understood reporting relationships.

Most DOE/NNSA facilities/sites had existing occurrence notification, environmental spill reporting, and hazardous materials emergency classification systems in place when the original DOE O 151.1 was issued in 1995. The Order included new requirements to categorize certain events as OEs not requiring classification and to report the events within a specified time. Most sites found it convenient to add the new event categorization criteria and reporting instructions to one or more of the existing systems. For example, implementing procedures for occurrence reporting were modified to indicate the events that should be categorized as OEs not requiring classification. The procedure specifies the accelerated notification requirements for these events. With this alternative, the existing Emergency Action Level (EAL) procedures could continue to be used for event classification. A second alternative was to expand the existing event classification procedures to include the categorization criteria for OEs not requiring classification.

The symptom, detection, recognition, and communication chain can be implemented through integration with normal operational activities and procedures. Categorization will usually be based on general criteria and judgment of the need to notify people up the chain. Classification should be less subjective and based on pre-established EAL criteria. Rigorous integration of event recognition procedures is unnecessary and could cause difficulty in maintaining facility procedures. However, keeping the recognition procedures totally separate and relying solely on memory and training during periods of high stress is equally insufficient. Visual cues and other indicators are sometimes employed in facility procedures to alert users to consult the event recognition procedures.

Some accident/emergency event symptoms/indicators, potential methods of detection, and methods for incorporating the recognition of event classification into normal operations are discussed in the sections that follow. Sections A.2 – A.4 address methods that apply to the management and operation of three types of facilities that are typical of many DOE/NNSA operations: complex hazardous material facilities, "ordinary" industrial facilities, and office buildings. Section A.5 discusses methods that apply to emergency services organizations and first responder elements. Section A.6 addresses detection and recognition of natural phenomena that may result in emergencies.

Note that the groupings and listings used in these discussions are not intended to be all-inclusive but are used only for illustrative purposes.

A.2 Complex Hazardous Material Facilities

Complex processes, such as reactors and waste vitrification facilities, are included in this group. Potential symptoms or indications that could identify the onset of an accident condition include abnormal indications for temperatures, pressures, fluid levels, flow rates, power loss, radiation levels, and fire detection. Detection methods include the following:

- Installed instrumentation/hardware
- Routine or off-normal sampling results
- Operator observation during log-taking and other inspection/walkdown routines
- Employee observation during normal work activities

Methods for implementing the categorization and classification transitions include the following:

- **Facility operating procedures.** Facilities with complex processes have a system of procedures that may include individual equipment procedures, integrated plant procedures, normal operating procedures, system compliance procedures, alarm response procedures, off-normal operating procedures, and emergency procedures. Technical Safety Requirements (TSRs) or Technical Specifications may also govern the facility. These procedures and documents can be annotated, where appropriate, to refer the user directly to an event categorization or classification procedure. Many methods use accepted human engineering principles for annotating text to call the users attention to a particular piece of important information. Some of these include the use of flags, margin notes, color-coding, or other special symbols, such as stars or triangles. Regardless of the method used to catch the user's attention, the entry should be specific as to the condition for triggering the comparison with the event categorization and classification procedures and the section of the categorization or classification procedure that applies.

- **Inspection/walk-down observations.** The formality of these activities varies from one facility to another. Procedures, standing orders, checklists, log sheets, or verbal instructions may govern these activities. Using the results of the facility's Emergency Planning Hazards Assessment (EPHA), it can be determined which accident symptoms/indicators these activities could be expected to detect. Procedures, checklists, log sheets, and other instructions can be annotated, as discussed above, to assist the user in recognizing when an accident indicator has been encountered. The annotation should contain specific instructions on whom to notify and how to notify them (e.g., job position or title and phone number). A specific reference to the procedure and section could also be included. Personnel performing inspections/walkthroughs form a human interface with the system or process. Judgment and interpretation are required to initiate the recognition, communication, and event categorization and classification chain. As a result, training is a key element in ensuring that this chain functions properly.

- **Standing orders/instructions to personnel.** General guidance provided to personnel, often job-specific, encouraging awareness of certain conditions, symptoms, and indicators for making notifications of such to specific personnel and/or responding with prescribed actions. A standing order should contain guidance on how to recognize and interpret symptoms and indicators, as well as instructions on who to contact and how to contact them in the event that they are observed. The person identified should be directly responsible for comparing the symptom/indicator to event categorization and classification criteria or be provided with additional guidance and instructions to ensure that the information is promptly communicated to someone who is authorized to perform these tasks. Once again, recognition and communication are highly dependent upon human judgment and interpretation; therefore, training plays a key role.

Facilities in this grouping are generally comprised of relatively complex systems required to have a variety of detection systems and alarm features. Usually, the operation of these facilities is highly formalized and controlled by detailed procedures. A system of inspections and walk-downs should augment the detection process. Personnel working in these facilities should be highly trained to improve the probability that symptoms/ indicators will be recognized and a prompt response initiated. The path from detection to the personnel responsible for event recognition is often short and direct, which is necessary because these are often high-hazard facilities with a small response window for protective actions.

A.3 Industrial Facilities

This grouping covers activities such as shops, transportation, laboratories, burial grounds, tank farms, storage tanks, transfer lines, etc. Hazardous materials may be involved with some of these activities. Methods for detecting an emergency include the following:

- Observation during inspections/walk-downs
- Alarms and monitors
- Sampling or measurements
- Employee or public report

Methods for implementing the recognition/categorization and classification transition include the following:

- **Procedures and reporting relationships.** There are fewer and less formal procedures within this grouping than the previous group. The procedures that do exist can be annotated, where appropriate, to refer to emergency categorization and classification procedures. Because fewer procedures exist, the associated reporting structure is less formalized and complete. The normal reporting relationship between the point of detection/recognition and the position responsible for performing event categorization and classification may be less direct than it was in the previous grouping. For example, the reporting chain might include supervisor, operations manager, and building/area emergency director. Therefore, in addition to the considerations mentioned above for annotating procedures, it is important to shorten the normal reporting chain to bring the information to the attention of the authority responsible for event categorization and classification as rapidly as possible.

- **Procedural response to alarms and monitor readings.** Within this grouping, less instrumentation exists for the detection of event symptoms/indicators. Examples of the types of instrumentation that may exist include radiation monitors [i.e., Continuous Air Monitors (CAMs), Area Radiation Monitors (ARMs), transfer line monitors, environmental surveillance monitors, etc.,] and non-radiological hazardous materials monitors (e.g., oxygen level indicators, chlorine monitors, explosive level indicators, fire detectors, tank level indicators/alarms, transfer line leak detectors). As discussed above, these response procedures can be annotated to facilitate the recognition to event classification chain.

- **Response to sampling and measurement results.** Sampling and monitoring activities are usually governed by procedures and the results recorded on checklists, log sheets, or another form of permanent record. Any of these are candidates for notations to alert the user that they have encountered the symptoms/indicators of a potential OE. Methods for implementing this form of user aid have been discussed above.

Within this grouping, the detection/recognition/categorization and classification chain is less reliant on installed instrumentation and more on human judgment and interpretation. Therefore, training is once again an important element. The individual at the point of detection is further removed from the event classification authority. A strong training program and periodic safety meetings coupled with good procedural and reporting interfaces are necessary to ensure the completion of the detection/recognition/categorization and classification transition.

A.4 Office Buildings

Large office buildings may have a building management organization for utilities, a building security force, volunteer building evacuation wardens, and a building emergency plan. Although smaller office buildings will likely have none of these building-specific organizations and plans, they may be covered by a site-wide plan and emergency organization. Contractors may also have company policy manuals that address emergency notifications and response. At office buildings, emergency detection will usually depend on employee or public report and installed fire detection systems. Applicability of the Order to contractor and subcontractor employees in offsite buildings should be determined on an individual basis by contracting officers.

Methods for detecting the symptoms/indicators of an emergency at an office building include the following:

- Fire alarm systems
- Security and building management force observations
- Employee observations or public report

Methods for implementing the recognition/categorization and classification transition include the following:

- **Security force and building management organization procedures and standing orders.** Procedures that do exist can be annotated, where appropriate, to refer to emergency categorization and classification procedures or to notify a designated person in the occupant organization who is trained to make the categorization and notification determination.

- **Building emergency plans.** Large multi-story office buildings will have an emergency plan that identifies evacuation routes and provisions for the evacuation of handicapped persons. As previously mentioned, references and notations can be included to link these plans to the categorization authority and procedures.

- **Security force, employee, or public recognition of an emergency.** Office building occupants should be trained to respond to fire alarms and other potential emergencies at their work location, but most of them will have little, if any, knowledge of event categorization and reporting requirements. The assignment of a building warden can provide the link to categorization and notification. Large DOE sites typically have an Emergency Duty Officer (EDO) who is notified of all emergencies on the site. The

EDO can categorize the emergencies for buildings that do not have an established emergency organization. Contractors typically arrange to be notified by security and fire departments for off-hours emergencies that affect their buildings. The public generally receives no formal training, but is often provided with phone numbers and points of contact for use when conditions that may impact security or health and safety are observed.

A.5 Emergency Response Organizations (EROs)

EROs may include security forces, fire departments, emergency medical providers, 911 centers, and fire dispatch centers. These organizations are often the first to know of an emergency, since employees are trained to call them immediately to obtain aid. Notification is usually by telephone or installed security and fire alarms. Their first priority is the dispatch of the needed aid. These organizations can either provide the emergency categorization and classification directly or initiate a notification call tree to the categorization and classification authority. This authority is typically a Site EDO, Facility/Building Emergency Director, centralized occurrence notification center, or On-Call Manager.

Methods for detecting the symptoms/indicators of an emergency include:

- Security alarm systems
- Fire alarm system
- Employee observations or public report

Methods for implementing the recognition/categorization and classification transition include the following:

- **Procedures and standing orders.** Procedures, standing orders, and training can identify specific conditions that require declaration of an OE and/or notification of the categorization and classification authority. It is important that the security, fire, and emergency preparedness plans establish the structure for close coordination between the organizations. The working-level implementation is carried out within the procedures, standing orders, checklists, and training. Links between the security and fire response systems and the emergency response system need to exist to ensure that the potential health and safety aspects of an emergency are recognized and that the information is communicated to the emergency response event categorization/classification authority. Establishing specific measurable criteria as trigger points for notifying the event categorization/classification authority is not always straightforward. Annotations and references in procedures and standing orders may require more than simple margin notes, and the success of the transition will depend heavily on training.

- **Operating, off-normal, and emergency procedures.** These may contain specific instructions for operations during a security incident. As previously mentioned, references and notations can be included.

- **Training security personnel to recognize a health and safety threat.** Fire department personnel are well trained to fight fires, but are less prepared to recognize when an event also has health and safety implications. Employees receive limited training on how to recognize a reportable emergency condition and respond according to general standing orders. Training on the recognition of health, safety, and operational implications stemming from emergency events is important for emergency response personnel and general employees. The public generally receives no formal training but is often provided with phone numbers and points of contact should any conditions that may impact security or health and safety be observed.

- **Procedural reporting relationships.** Within the EROs, the reporting relationships governing the response are proceduralized and understood. However, the reporting relationship between emergency response groups and the ERO is often poorly defined and understood. Even less distinct and understood are reporting relationships for general employees.

Emergency response groups (security and fire) maintain a highly structured response system implemented by well-trained personnel, whose responsibilities are well-defined within their emergency response plan. However, their event classification criteria may not be integrated with facility event classification criteria. Site emergency plans and security and fire plans should be coordinated to ensure strong, well-understood links in both directions. Procedures, standing orders, and training should include information and aids for fire and security personnel to coordinate with other elements of the ERO.

A.6 Natural Phenomena

This group covers those emergency conditions that occur as a result of natural phenomena. Symptoms/indications that could identify an actual or potential threat include observed tornado, high winds, high/low water levels, range or forest fire, earthquake, and lightening. Methods for detecting the symptoms/indicators of events caused by natural phenomena include the following:

- Meteorological instrumentation
- Weather forecasts
- Water level sensors
- Seismic monitors
- Employee/public observation
- News media reports (e.g., report of range fire, tornado sighting, weakening of earthen dam upstream of site; may not classify based upon report but might initiate investigation that would result in detection)

Methods for implementing the recognition/classification transition include the following:

- **Comparison of observed or measured conditions to limits/specifications.** Often personnel at the point of detection are not directly related to the operational organization of a particular facility and do not have the experience or training to recognize when their observations indicate that an operational limit is being approached or exceeded. Field measurements are not always taken in the same units specified in the TSR or event classification criteria, thus adding to the difficulty in recognizing their significance (e.g., seismic monitors read out in the Richter scale and the criterion is in units of acceleration). Therefore, log sheets or other methods used to record observations should be annotated, and training should include instructions to aid personnel in recognizing and reporting events needing comparison to the event classification criteria.

- **Procedural response and reporting relationships.** Procedures used for taking measurements that are indicators of natural phenomena should be annotated where appropriate (e.g., meteorological station procedures, water control procedures, etc.). Because the personnel at the point of detection are often separate from the facility operations organization, the path for reporting information may be long and informal.

Diverse, unrelated groups who are often far removed from both the facility operations organization and the event categorization/classification authority may perform the function of detection of natural phenomena events or conditions that affect facility safety. Few formalized procedures or other aids exist to facilitate the recognition/reporting/ categorization/classification process. To make the transition work properly, it is important to establish trigger points that direct personnel to bring abnormal conditions to the attention of the event categorization and classification authority.

APPENDIX B. Methods and Examples for Implementation of Event Categorization and Classification

B.1 Introduction

This appendix contains suggestions for the implementation of event categorization and classification procedures. Section B.2 addresses the placement of Operational Emergency (OE) categorization criteria within existing facility/site programs and procedures for operations, safety, security, emergency response, and occurrence reporting procedures. Sections B.3 and B.4 discuss the application of the barrier approach to Emergency Action Level (EAL) development and provide examples of EAL organization and format by presenting EALs developed for the hypothetical facility Emergency Planning Hazards Assessment (EPHA) presented in DOE G 151.1-2, Appendix H.

B.2 Operational Emergency Categorization Procedure Integration

Section 4.4 of DOE G 151.1-4 includes a general discussion of the means by which the recognition and categorization of OEs could be implemented through the development of facility and site procedures, based on the examples of OEs given in the Order. It is not intended that facilities/sites develop detailed and quantitative categorization criteria for each type of OE described in the Order. If, however, upon examining the OE potential and likely response, facility/site officials determine that additional measures are needed to ensure prompt recognition and categorization, these methods and examples may prove useful. The following sections provide examples of how OE recognition criteria and alerting or prompting questions may be inserted within several types of existing facility/site procedures. For facilities/sites that have existing, consolidated occurrence reporting and classification procedures, the new OE categorization criteria should be summarized in a companion procedure or appendix to existing procedures.

B.2.1 Health and Safety

1. **Order Example:** *Discovery of radioactive or other hazardous material contamination from past DOE/NNSA operations that may have caused, is causing or may reasonably be expected to cause uncontrolled personnel exposures exceeding protective action criteria.*

   Possible Implementation Method:

   - Include referral to local OE criteria in site-specific Radiological Control Manual and internal procedures for reporting radiological problems and abnormal survey findings.

   - Include criteria in site Occurrence Reporting guidelines, such as: *Radioactive contamination in an uncontrolled area in excess of 500 times the surface* *contamination levels specified in Appendix D, 10 CFR 835, is to be reported as an OE in accordance with DOE O 151.1C, Chapter VIII.*

2. **Order Example:** *An offsite hazardous material event not associated with DOE/NNSA operations that is observed to have or is predicted to have an impact on a DOE/NNSA site such that protective actions are required for onsite DOE workers.*

   Possible Implementation Method:

   - Provide standing instructions to the single point of contact for emergency communications (site 911 operator, Security Watch Commander, or equivalent) to the effect that: *Any advisory or warning that an offsite hazardous materials release is in progress or imminent and that onsite people may be affected is an OE.*

   - Insert a statement in the facility/site emergency classification procedure, Hazardous Materials Events section, such as: *Any hazardous material release from offsite that requires evacuation or sheltering of onsite personnel is to be reported as an OE in accordance with DOE O 151.1C, Chapter VIII.*

3. **Order Example:** *An occurrence (e.g., earthquake, tornado, aircraft crash, fire, explosion) that causes or can reasonably be expected to cause significant structural damage to DOE/NNSA facilities, with confirmed or suspected personnel injury or death or substantial degradation of health and safety.*

   Possible Implementation Method:

   - Include provision in site fire/rescue procedures and building pre-fire plans such as: *Any fire or rescue response to ___ building may require prompt notification of DOE Headquarters and offsite authorities. Immediately notify __(emergency duty officer)__ of call-out to this facility.*

4. **Order Example:** *Any facility evacuation in response to an actual occurrence that requires time-urgent response by specialist personnel, such as hazardous material responders or mutual aid groups not normally assigned to the affected facility*.

   Possible Implementation Method:

   - Include provision in site fire/rescue, hazardous materials (HAZMAT) team or security augmentation procedures and building pre-fire plans such as: *Any fire, HAZMAT or security response to ___ building may require prompt notification of DOE Headquarters and offsite authorities. Immediately notify (emergency duty officer) of call-out to this facility.*

5. **Order Example:** *An unplanned nuclear criticality.*

   Possible Implementation Method:

- Include specific criteria in facility/site emergency classification (EAL) procedure to allow distinction between a criticality that requires classification and one that does not, such as: *Valid criticality alarm or other indication of criticality in cell with effluent high range monitor or facility Area Radiation Monitors (ARMs) reading less than <u>(value indicating dose outside facility walls exceeding site-specific Alert criterion)</u> is to be reported as an OE in accordance with DOE O 151.1C, Chapter VIII.*

6. **Order Example:** *Any mass casualty event.*

   Possible Implementation Method:

   - Provide training and a checklist item for Incident Commanders to require them to make the judgment call on whether they are dealing with a "mass casualty," such as: *Onsite illness/injury events requiring activation of mutual aid from both <u>(offsite medical centers/ambulance services)</u> to transport casualties is an OE. Have Dispatcher immediately advise <u>(emergency duty officer)</u> of situation.*

B.2.2 Environment

1. **Order Example:** *Any actual or potential release of hazardous material or regulated pollutant to the environment, in a quantity greater than five times the Reportable Quantity (RQ) specified for such material in 40 CFR 302, that could result in significant offsite consequences such as major wildlife kills, wetland degradation, aquifer contamination, or the need to secure downstream water supply intakes.*

   Possible Implementation Method:

   - Provide training and a checklist item in spill response plan/procedures to direct the team leader to initiate notifications under certain conditions, such as: *The following conditions have been identified as potential OEs requiring prompt notification of DOE Headquarters and offsite authorities. Immediately advise <u>(emergency duty officer)</u> of the situation.*
     - *Breach of tank __ with contents reaching the drainage canal.*
     - *Overflow or breach of the __ retention dam.*

2. **Order Example:** *Any release of greater than 1000 gallons (24 barrels) of oil to inland waters; greater than 10,000 gallons (238 barrels) of oil to coastal waters; or a quantity of oil that could result in significant off-site consequences (e.g., need to relocate people, major wildlife kills, wet-land degradation, aquifer contamination, need to secure downstream water supply intakes, etc.). [Oil as defined by the Clean Water Act (33 U.S.C. 1321) means any kind of oil and includes petroleum.]*

   Possible Implementation Method:

   - The same discussion applies as in example 1 above.

B.2.3 Safeguards and Security

1. **Order Example:** *Actual unplanned detonation of an explosive device or a credible threatened detonation resulting from the location of a confirmed or suspicious explosive device.*

   Possible Implementation Method:

   - Link the OE declaration to the security response level that corresponds and include notifications in the security force procedures and checklists for that level response, such as: *Security Alert II -- Any unplanned detonation of an explosive device or a credible threatened detonation may be an OE requiring prompt notification of DOE Headquarters and offsite authorities. Immediately advise (emergency duty officer) of the situation.*

2. **Order Example:** *An actual terrorist attack or sabotage event involving a DOE/NNSA facility/site or operation.*

   Possible Implementation Method:

   - The same discussion applies as in example 1 above.

3. **Order Example:** *Kidnapping or the taking of hostages involving a DOE/NNSA facility/site or operation.*

   Possible Implementation Method:

   - The same discussion applies as in example 1 above.

B.2.4 Offsite DOE Transportation Activities

1. **Order Example:** *Any accident/incident involving an offsite DOE/NNSA shipment containing hazardous materials that causes the initial responders to initiate protective actions at locations beyond the immediate/affected area.*

   Possible Implementation Method:

   - Provide drivers, dispatchers, and responsible program personnel with criteria for determining the protective actions taken by local responders and explicit instructions to follow if a criterion is exceeded. For radioactive shipments, such criteria and instructions might be: *Any mishap that causes local emergency authorities (police, fire, HAZMAT responders) to order evacuation or sheltering for people at distances greater than about 100 meters from the vehicle or spill location is a DOE OE. Immediately notify (emergency duty officer) at (telephone number).*

2. **Order Example:** *Failures in safety systems threaten the integrity of a nuclear weapon, component, or test device.*

Possible Implementation Method:

- Provide drivers, dispatchers, escorts, and responsible program personnel with criteria for determining emergency status of shipments and explicit instructions to follow if a criterion is exceeded. Such criteria and direction might be incorporated within Office of Secure Transportation procedures for reporting and responding to abnormal conditions that meet the "Broken Arrow" or "Bent Spear" description.

3. **Order Example:** *A transportation accident results in damage to a nuclear explosive, nuclear explosive-like assembly, or Category I/II quantity of Special Nuclear Materials.*

Possible Implementation Method:

- The same discussion applies as in example 2 above.

B.3 Determining Emergency Class Using Barrier State as a Measure of Safety Degradation

A method for using the condition or state of protective "barriers" as a quantitative measure of facility or process safety degradation for purposes of determining hazardous materials facility event class is described in this section. The method can be adapted to a broad range of facilities and processes and used to develop an internally consistent EAL scheme for each major hazard at a DOE site.

The Order requires that OEs requiring classification be placed in one of three classes by degree of severity. The assigned emergency class should reflect the actual or potential consequences of the situation. The Order emergency class definitions are stated in terms of "safety degradation" and "actual or potential failure of safety functions," as well as in units of consequence (dose, exposure, or concentration).

In developing EALs, each facility should determine the observable conditions that equate to various levels of "safety degradation." The standard set of Example Initiating Conditions provided by the NRC (in NUREG-0654 and in Industry Standard NUMARC/NESP-007) defines the levels of degradation for commercial nuclear reactors in terms that are specific to large light-water-cooled power reactors. This method has worked well for the commercial nuclear industry because the facilities are quite homogeneous (i.e., virtually every site has the same basic design features and similar organizational structure). To provide technically consistent and coherent example initiating conditions for each type of emergency at all the possible types of DOE hazardous materials facilities would be a formidable task.

Lacking standard sets of example initiating conditions, facilities can develop coherent systems to drive graded, anticipatory responses to threats, challenges, and failures. This is done by viewing physical and administrative controls as the barriers that maintain hazardous material in a safe condition and constructing the EAL scheme around the status of those barriers. EAL schemes developed in this manner may be event-based but are typically more symptom-based in nature. The character of the site-specific EAL scheme will be largely dependent on the type and level of sophistication of installed systems that monitor the barrier status. In general, the more complete and quantitative the information provided by monitoring systems, the more symptom-based the EAL scheme can be. Conversely, if monitoring is largely dependent on staff observation of events, the scheme will tend to be more event-oriented.

B.3.1 Barrier Definition

The various "layers of protection" afforded facility and site personnel, the general public and the environment by the design and operational controls of each facility can be thought of as barriers. Facility design features that contain hazardous materials or separate them from people or the environment are physical barriers in the traditional sense. This concept of barriers is the one typically applied when analyzing commercial nuclear reactor plants. However, in order to develop a complete EAL scheme, barriers other than those of a physical nature (such as administrative or procedural controls) may have to be considered. Examples of various types of barriers are as follows:

- Physical
  - Containments
  - Glove boxes
  - Binding agents
  - Confinements
  - Hot cells
  - Overpacks
  - Cylinders
  - Process piping
  - Shipping casks
  - Tanks
  - Tunnels/shafts
  - Building Heating, Ventilation, and Air Conditioning (HVAC) systems

- Configuration
  - Safe geometries
  - Segregated storage
  - Process controls
  - Temperature controls
  - Cryogenic traps
  - Humidity controls
  - Arming circuits
  - Security systems (e.g., cipher locks)

- Administrative
  - Procedural compliance
  - Inventory control

- Two-man rules
- Access controls
- Safeguards and security rules
- Meteorological restrictions
- Training
- Knowledge
- Line management oversight

B.3.2 Criteria for Failure and Challenge of Barriers

In order to develop EALs based on barrier condition, "barrier failure" and "barrier challenge" should be defined. Failure of a barrier can usually be recognized by the readings or output from plant instruments, such as valve position indicators, failed fuel monitors, pressure sensors, or stack effluent monitors. Criteria for declaring that a particular barrier is failed should be stated in terms of specific values on specific instruments (e.g., "Main Stack Radiation Monitor System (RMS)-19 indicates > 1.5E + 8 uCi/sec," or "Any Valve Position Indicator on panel CI-903 indicates Open").

To achieve an anticipatory and conservative declaration in the case where all indications of a barrier's condition are lost during an upset condition or operating transient, it may be necessary to consider the barrier to be failed until conditions can be verified satisfactory by other means (e.g., visual inspection, portable monitoring equipment, etc.) For example, if, following a building isolation signal, the control room position indicators for two of the ten installed isolation valves/dampers show neither an open or shut indication, then the associated valves/dampers should be considered failed open until they can be verified shut by another method.

A barrier should be considered "threatened" or "challenged" if the events in progress may result in a barrier failure. In general, classification should not be delayed by the expectation that mitigating activities in progress are likely to correct the degraded conditions. EAL statements should take into account the likelihood that corrective actions can and will be taken within the time necessary to prevent barrier failure such that the decision is not left to user. For example, recognition of a fire that could challenge a barrier may be a good basis for classifying the event at a level corresponding to failure of that barrier. The degree of challenge is directly related to the duration of the fire (and thus indicative of the success of mitigation efforts) and can be reflected in an EAL statement such as "Fire in Zone 1 lasting more than 15 minutes," where the 15 minutes is related to the time that the barrier could remain intact under fire conditions.

B.3.3 EALs Based On Barrier Status

A method for developing facility-specific EALs based on barrier status is outlined in the following steps:

1. Identify, from the facility EPHA prepared in accordance with the Order [and as further detailed in DOE G 151.1-2], the radiological and hazardous/toxic materials sources of significant operational concern.

2. For each material and source (i.e., storage or process location), determine the highest possible emergency class from release of that material, as analyzed in the facility EPHA.

3. Determine the physical, administrative, and configuration barriers between each of the sources and the outside environment.

   For the purposes of the EAL development process, it is unlikely that more than three barriers (physical and other) can be reasonably credited for any hazard source. For simplicity, no more than three overlying and independent barriers should be considered. Justification for selecting barriers should be provided in an accompanying technical basis document. For example, a building and its HVAC system should not be considered a barrier unless the HVAC filtration system can remove a high enough percentage of the material of interest during the maximum credible release to prevent exceeding any exposure criterion at the facility perimeter while maintaining a negative pressure in the building. Additionally, the continued operation of the filtration system should be assured due to design considerations such as redundant power supplies.

   NOTE: This method is based on the assumption that the barriers are approximately equal in their safety significance. If the barriers differ widely in the degree to which they ensure control over the hazardous material, their failures (or challenges) cannot logically be treated as equal safety decrements for purposes of assigning an emergency class. No more than three significant barriers should be considered.

4. Develop facility-specific EALs for each hazardous material source at the facility using the concepts of barriers "failed" or "challenged" as follows.

   - Select the independent barriers (between the source and the environment) for which credit will be taken.

   - For each barrier selected, identify the symptoms or observable indications of the barrier being either failed or challenged.

   - If all of the barriers are either failed or challenged, then the symptoms of barrier challenge or failure, taken collectively, constitute an EAL for declaring the highest emergency class, identified in Step 2 above. For example, in the case of a hazardous material source that is capable of producing a General Emergency and has three barriers preventing its release, the comprehensive EAL set for the General Emergency class would include indications of the following combinations.

     – Three barriers failed
     – Two barriers failed, one barrier challenged
     – One barrier failed, two barriers challenged
     – Three barriers challenged

- For the second and third combinations, there may be three permutations each. For example, if A, B, and C designate the individual barriers, the second combination (two barriers failed and one challenged), may be either:
  - A and B failed, C challenged, or
  - A and C failed, B challenged, or
  - B and C failed, A challenged.
- If all <u>except</u> one barrier is failed or challenged, the condition is classified at one level lower than if all are failed or challenged. In the three barrier examples cited above, the class would be Site Area Emergency and the comprehensive EAL set for the Site Area Emergency class would include indications of the following combinations:
  - Two barriers failed, one barrier intact and not challenged;
  - One barrier failed, one barrier challenged, one barrier intact and not challenged; and
  - Two barriers challenged, one barrier intact and not challenged.
- If all except two barriers are failed or challenged, the condition is classified <u>two</u> levels lower than if all are failed or challenged. For the three barrier example cited above, the class would be Alert and the EALs for the Alert classification would be based on indications of one barrier either failed or challenged and two barriers intact and not challenged. This case requires some special attention, since the purposeful and controlled breaching of a barrier (in a multiple barrier facility), such as the temporary opening of a truck lock door or the performance of carefully planned maintenance activities on a barrier, should not be considered a failure or challenge.

5. Events or conditions that represent a reduced margin of safety, but with no predicted barrier failure or challenge in the next few hours, should be treated as an OE not requiring classification or under the DOE Occurrence Reporting System, as applicable. Similarly, if the third barrier is failed (e.g., reactor containment), but the inner barriers of fuel clad and primary system have not failed and reactor shutdown must occur, the containment failure should be treated as an OE not requiring classification since an actual release of hazardous materials has not occurred and the potential for release is very low.

B.3.4 Examples of EALs Based On Barrier Failure and Challenge

The process described in the previous sections can be applied to hazard sources having less than three barriers and sources for which the highest emergency class is Site Area Emergency or Alert. In the example below, only two barriers exist, a single-wall chemical process tank and the building within which it is located. The building can be sealed against maximum credible pressures. It has been calculated that the maximum credible release, a sudden complete breach of both the tank and the building, should be classified as a Site Area Emergency. If the barriers are considered to be nearly equal in their safety significance, their condition can be used as <u>a measure of the degree of safety degradation</u>, and hence, as the basis for determining emergency class.

The EALs for Site Area Emergency should include indications of the following conditions.

- Two (both) barriers failed
- One barrier failed, one barrier challenged
- Two barriers challenged

Likewise, the EALs for Alert should include indications of the following conditions.

- One barrier failed, one barrier intact and not challenged
- One barrier challenged, one barrier intact and not challenged

Accordingly, Site Area Emergency EALs might read as shown in **Table B-1**.

The example in Table B-1 represents only a subset of the possible EALs applicable to the hypothetical facility. The EAL development process should attempt to define all of the symptoms of failure or challenge to barriers. To the maximum extent possible, EALs should be stated in terms of specific installed indications, such as individual fire alarm panel temperature and ion detectors identified by zone, or process pressure and temperature indicators identified by panel and instrument number. There are obviously hazards capable of generating a Site Area Emergency or General Emergency to which the barrier approach cannot be applied (e.g., a single-wall tank, in an open area, with little or no remote instrumentation). The EALs for events impacting such a hazard are usually worded to describe events, even though the events are really "single-barrier failures."

Between 5 and 20 categories will be sufficient for most facilities. If more categories are used, the categories will tend to be more explicit and narrowly defined. While it is easier for the user to understand and relate to more explicit individual category titles, the resulting larger number of categories makes it more difficult for a user to scan the entire EAL set and select the applicable statements in a limited time.

Example List of EAL Categories

The following list of 12 EAL categories covers a wide range of possible events and conditions that could occur at a DOE facility:

1. Barrier status
2. Radiological releases
3. Hazardous chemical releases
4. Fire or explosion
5. Electrical failures (power supply)
6. Abnormal process system conditions (leakage, temperature, pressure, reaction rates)
7. Loss of control and indicator features (automatic trips, indicating systems, safe-shutdown systems)
8. External events (man-made)
9. Safeguards and Security events
10. Natural phenomena impacts
11. Criticality control

12. Miscellaneous

Table B-1. Example Site Area Emergency EALs

(a) Two Barriers Failed

Two Barriers Failed	***As Indicated By***
Tank 501A ruptured	Any two building sump high alarms **OR** Tank 501A rapid level decrease **OR** Monitor HF-23 >1000 PPM **OR** Relief 501A-2 open
AND	
Building 602 failed	Visual observation **OR** One or more HVAC dampers not shut **OR** Truck lock air seal failure alarm

(b) One Barrier failed and One Barrier Challenged

One Barrier Failed; One Challenged	***As Indicated By***
Tank 501A ruptured	Any two building sump high alarms **OR** Tank 501A rapid level decrease **OR** Monitor HF-23 > 1000 PPM **OR** Relief 501A-2 open
AND	
Building 602 challenged	Fire potentially degrading HVAC or door seals **OR** HVAC air operating system pressure <85 PSIG **OR** Building 602 pressure >2" H_2O
OR	
Building 602 failed	Visual observation **OR** One or more HVAC dampers not shut **OR** Truck lock air seal failure alarm
AND	
Tank 501A challenged	501A pressure > 125 PSIG **OR** 501A temperature > 355° F **OR** Loss of cooling water flow to 501A **OR** Fire out of control in Building 602

Table B-1. Example Site Area Emergency EALs (cont'd)

(c) Two Barriers Challenged

Two Barriers Challenged	***As Indicated By***
Tank 501A challenged	501A pressure > 125 PSIG **OR** 501A temperature > 355°F **OR** Loss of cooling water flow to 501A **OR** Fire out of control in Building 602
AND	
Building 602 challenged	Fire potentially degrading HVAC or door seals **OR** HVAC air operating system pressure <85 PSIG **OR** Building 602 pressure >2" H_2O

Table B-2 provides examples of expanding the EAL category, Barrier Status, depending on the type of facility and the degree to which barrier status is used to quantify the safety state of the facility and processes.

Table B-2. Example EAL Sub-Categories for Category Number 1

Facility Type	***Possible Barrier-Status EAL Sub-Categories***
Reactors	Fuel cladding, reactor vessel and coolant piping, confinement or containment building
Expended fuel	Fuel cladding, storage building, and HVAC system
Chemical/materials processes	Tanks, pipes, traps, hot cells, building, and HVAC systems
Radioactive waste	Binding/solidifying agent, drums and tanks, buildings, geologic containments
Toxic material storage	Tanks, cylinders, building, and HVAC system
Weapons and fissile material	Configuration, arming features, assembly facilities, geologic containment, configuration controls

B.4 Hazardous Materials Facility EAL Organization and Format. Example EALs for a Hypothetical Facility

As discussed in Section 4.6.8 of this chapter, facility-specific EALs should be organized into an implementing procedure that is logical and comprehensive, yet concise and usable.

DOE G 151.1-2, Appendix H describes a hypothetical DOE facility and presents results of its EPHA, including the emergency classes most appropriate to the analyzed accidents or emergency events. The results of the accident/event consequence analyses are summarized in Tables 5.1a-b and 5.2a-b in Appendix H, and examples of the technical basis arguments for possible EALs are summarized in example Section 7 of the appendix.

Table B-3 represents the culmination of the EAL development effort that began with the facility EPHA. The "conceptual" EALs that were identified in the EPHA process have been translated into specific EALs and presented in the form of an emergency classification table for the hypothetical ABC Facility. The table is intended to illustrate the following.

- How specific EALs can be developed from the results of the facility EPHAs.
- How EALs can be stated in terms of the most objective observable conditions.
- Use of EAL categories to aid facility staff in identifying and applying the EALs that are most applicable to an observed event or condition.
- One acceptable format and organization for an EAL table.
- Principle of redundancy (i.e., EALs in different categories that lead to classification of an event at the same level, even if it is recognized by different means).

Integration of the EALs with the Reportable Occurrence and OE (not requiring classification) recognition procedures is left to the individual site.

Table B-3. Emergency Action Levels for the ABC Facility

EAL	*As Indicated By*	*Emergency Class*
1. Barrier Status		
1.a HF cylinder breached in warehouse or outside	Direct observation of breach	General Emergency
1.b HF cylinder breached in operating corridor, HVAC function maintained	Direct observation of cylinder breach **AND** At least one HVAC exhaust fan running **AND** Operating corridor pressure indicator PI-xxxx reading negative relative to atmospheric pressure	Alert
1.c One or more TDI drums breached in warehouse or outside	Direct observation	Site Area Emergency
1.d TDI drum breached in process area and HVAC function lost	Direct observation of TDI drum breach **AND** Process area pressure indicator PI-yyyy reading zero or positive relative to atmospheric	Site Area Emergency
1.e TDI drum breached in room 101; HVAC function maintained	Direct observation of TDI drum breach **AND** At least one HVAC exhaust fan running **AND** process area pressure indicator PI-zzzz reading negative relative to atmospheric	Alert

Table B-3. Emergency Action Levels for the ABC Facility (cont'd)

EAL		*As Indicated By*	*Emergency Class*
1.f	One or more Pu nitrate bottles breached with vault (room 109) breached	Direct observation of bottle breach **AND** Direct observation of vault outside wall breached	Site Area Emergency
1.g	Pu nitrate bottle breached in ABC building producing airborne release	Direct observation of bottle breach **AND** Stack alpha monitor indicating >3000 counts per minute	Alert
1.h	Pu powder can breached outside cell producing airborne release	Direct observation of powder can breach **AND EITHER** Operating corridor CAM alarms **OR** Stack alpha monitor indicates >3000 counts per minute	Alert
2. Radiological Releases			
2.a	Stack release rate	Stack alpha monitor indicates off-scale high >60,000 Bq/sec **OR** Pu-238 stack grab sample results indicate >1E+4 Bq/m^3 Pu-238 in effluent air at normal exhaust flow rate	General Emergency
2.b	Stack release rate exceeding 20,000 Bq/sec Pu-238	Stack alpha monitor indicates >1.2E+5 counts per minute **OR** Stack grab sample results indicate >3E+3 Bq/m^3 Pu-238 in effluent air at normal exhaust flow rate	Site Area Emergency
2.c	Stack release rate exceeding 4,000 Bq/sec	Stack alpha monitor indicates >3E+4 counts per minute Pu-238 **OR** Stack grab sample results indicate >8E+2 Bq/m^3 in effluent air at normal exhaust flow rate	Alert
2.d[1]	Any release of radioactive material to atmosphere producing actual or predicted dose to a person at or beyond any site boundary in excess of an applicable EPA PAG	Sample or measurement of air concentration outside the facility taken in accordance with EPIP-38[2] **OR** Prediction of committed dose using the SUPERRAD model and actual dispersion conditions	General Emergency
2.e	Any release of radioactive material to atmosphere producing actual or predicted dose to a person at or beyond any facility boundary, but not beyond any site boundary, in excess of an applicable EPA PAG value	Sample or measurement of air concentration outside the facility taken in accordance with EPIP-38 **OR** Prediction of committed dose using the SUPERRAD model and actual dispersion conditions	Site Area Emergency

Table B-3. Emergency Action Levels for the ABC Facility (cont'd)

EAL	*As Indicated By*	*Emergency Class*
2.f Any release of radioactive material to atmosphere producing actual or predicted dose to a person boundary >0.1 EPA PAG value at or beyond any facility	Sample or measurement of air concentration outside of the facility taken in accordance with EPIP-38 **OR** Prediction of committed dose using the SUPERRAD model and actual dispersion conditions	Alert
Note 1: EALs 2.d, 2.e, and 2.f are the generic equivalent to EALs 2.a, 2.b, and 2.c. They allow for event classification based upon field measurement results or based on dispersion calculations (e.g. stack monitor not available, etc.). Note 2: The use of the procedure number in this EAL statement implies that the procedure specifies the use of specific instrumentation for obtaining field samples and/or measurements and that it provides the user with a method for relating the methodology for relating the results to the applicable EPA PAGs.		
3. Hazardous Chemical Releases		
3.a Contents of HF cylinder released in warehouse or outside	Direct observation	General Emergency
3.b HF cylinder contents released in operating corridor, HVAC function maintained	Direct observation release **AND** At least one HVAC exhaust fan running **AND** Operating corridor pressure indicator PI-xxxx reading negative relative to atmospheric pressure	Alert
3.c One or more TDI drums spilled in warehouse or outside	Direct observation	Site Area Emergency
3.d TDI drum spilled in process area and HVAC function lost	Direct observation of TDI spill **AND** Process area pressure indicator PI-yyyy reading zero or positive relative to atmospheric	Site Area Emergency
3.e TDI drum spilled in room 101, HVAC function maintained	Direct observation of TDI drum breach **AND** At least one HVAC exhaust fan running **AND** Process area pressure indicator PI-zzzz reading negative relative to atmospheric	Alert
3.f[1] Any release of hazardous chemical to atmosphere that produces actual or predicted peak concentration at or beyond any site boundary in excess of the ERPG-2, or equivalent, value for that chemical.	Sample or measurement of air concentration in accordance with EPIP-42[2] **OR** Prediction of air concentration using the SUPER model and actual dispersion conditions	General Emergency

Table B-3. Emergency Action Levels for the ABC Facility (cont'd)

EAL		*As Indicated By*	*Emergency Class*
3.g	Any release of hazardous chemical to atmosphere producing actual or predicted peak concentration at or beyond any facility boundary, but not beyond any site boundary, in excess of the ERPG-2, or equivalent, value for that chemical	Sample or measurement of air concentration in accordance with EPIP-42 **OR** Prediction of air concentration using the SUPER model and actual dispersion conditions	Site Area Emergency
3.h	Any release of hazardous chemical producing actual or predicted peak concentration at or beyond any facility boundary, but not beyond any site boundary, in excess of the ERPG-1 or equivalent value for that chemical	Sample or measurement of air concentration in accordance with EPIP-42 **OR** Prediction of air concentration using the SUPER model and actual dispersion conditions	Alert
Note 1: EALs 3.f, g, and h are the generic equivalents to EALs 3.a, b, c and d. They allow for event classification based upon field measurement results or based upon dispersion calculations. Note 2: The use of the procedure number in this EAL statement implies that the procedure specifies the use of specific instrumentation for obtaining field samples and/or measurements and that it provides the user with a method for relating the methodology for relating the results to the applicable ERPG or equivalent value.			
4. Fire or Explosion			
4.a	Fire in warehouse not extinguished by automatic suppression systems	Direct observation of flames or smoke **OR** Fire alarm on zone 4 **AND** Fire not extinguished by automatic suppression systems	General Emergency
4.b	Fire or explosion in cell B with release from cell.	Direct observation of fire or explosion in cell B **OR** Cell B fire suppression system alarm initiates on Panel ABC-0123 **AND** Alarm on operating corridor CAM-xxx-01	Site Area Emergency
4.c	Fire in room 101	Direct observation of flames or smoke in room 101 **OR** Fire alarm on zone 8 **AND** Fire not extinguished by automatic suppression systems	Alert
4.d	Fire or explosion in room 101 that breaches building integrity	Direct observation of flames or explosion **OR** Fire alarm on zone 8 **AND** Direct observation of penetration of exterior wall within 5 minutes of first alarm or observation	Alert

Table B-3. Emergency Action Levels for the ABC Facility (cont'd)

EAL	*As Indicated By*	*Emergency Class*
5. Electrical Failures (power supply)		
5.a Loss of AC power for more than 10 minutes	ABC Vital Equipment Bus voltage less than 450 volts on distribution panel ABC-56-78 for >10 minutes	Alert
6. Abnormal Process System Conditions		
6.a Collapse of Pu nitrate storage rack with breach of bottle(s)	Direct observation of rack collapse and breach of one or more nitrate bottles	Alert
6.b Over temperature condition in process no. 1 polymer reactor	High temperature alarm on process annunciator T-4 **AND EITHER** TI-1234 indicates >400°C **OR** combustion product sensor alarm on process annunciator T-6	Alert
7. Loss of Control and Indication Features		
7.a Stack monitor not operable during upset condition	Stack Monitor Failure alarm on building annunciator M-11 **OR** Stack monitor determined by inspection to be out of service **AND EITHER** Any ABC Building CAM in alarm state **OR** Fire alarm: zone 1, 2, 3, 5, 6 or 8 **OR** Any explosion or missile damage to process No. 2 areas	Alert
7.b Loss of power to process no.1 control and annunciator of power panel during production run	Direct observation of control and annunciator panel loss **OR** Process no. 1 Control Power failure alarm on Building annunciator P-009 **AND** Polymer mixing/extrusion run in progress	Alert
7.c Cell pressure control lost causing Pu release to operating corridor	Alarm on Cell A/B/C diff. pressure annunciator **AND** Alarm on any Cell A/B/C operating corridor CAM	Reportable Occurrence
8. External Events		
8.a Aircraft crash within ABC Protected area	Direct observation	Alert
8.b Any external impact on the ABC building that breaches a building wall or causes fire	Direct observation	Alert

Table B-3. Emergency Action Levels for the ABC Facility (cont'd)

EAL		*As Indicated By*	*Emergency Class*
8.c	Any external event that forces evacuation of the ABC Building during process no. 1 production run	Process no. 1 production run in progress **AND** ABC Building evacuation ordered by Building Emergency Director	Alert
9. Safeguards and Security Events			
9.a	Sabotage of HF cylinder(s)	Direct observation	General Emergency
9.b	Physical control of any part of ABC Facility lost to armed intruder(s)	Direct observation	General Emergency
9.c	Unauthorized person in ABC Facility security controlled area with evidence of malevolent intent.	Unauthorized person observed in warehouse or ABC Building proper **AND EITHER** Evidence of tampering with any lock, seal or access control device **OR** Evidence of sabotage to any hazardous material storage area or container, safety system or control system	Site Area Emergency
9.d	Unauthorized person in any part of ABC facility	Direct observation **AND** Intruder resists or avoids attempt by facility staff to identify and apprehend	Alert
10. Natural Phenomena Impacts			
10.a	Earthquake exceeding ABC Facility design basis is experienced	Site seismic monitoring station reports ground acceleration in excess of 0.20 g horizontal or 0.12 g vertical has been recorded	Alert
10.b	Winds exceeding ABC Facility design basis	Site meteorological station reports observed wind speed in excess of 110 km/hr at station 4 **OR** Direct observation of winds causing structural damage to ABC Building or warehouse	Alert
10.c	Flood exceeding facility design basis	Site meteorological station predicts river level to exceed 490-ft elevation within 24 hours	Alert
10.d	Snowfall approaching roof design load limits	Accumulation of >18 in. of snow on facility roof	Alert
11. Criticality Control			
---NONE---			
12. Miscellaneous			
12.a	Any degradation of safety not otherwise directly covered in other specific EALs	Shift Manager judgment	Alert; Site Area Emergency; General Emergency

5. NOTIFICATIONS AND COMMUNICATIONS

5.1 Introduction

The purpose of this chapter is to assist DOE and NNSA field elements in complying with the DOE O 151.1C requirement to ensure that ***initial emergency notifications*** are made promptly, accurately and effectively to workers and emergency response personnel/ organizations, appropriate DOE/NNSA elements, and other Federal, Tribal, State, and local organizations and authorities. Following the initial notifications, accurate and timely follow-up notifications or ***emergency status updates*** should be made when conditions change, when the classification is upgraded, or when the emergency is terminated. Also, continuous, effective, and accurate communications among response components and/or organizations should be reliably maintained throughout an Operational Emergency (OE).

This chapter is designed primarily for facilities/sites and activities that are required to implement an Operational Emergency Hazardous Materials Program and directed at operations and emergency management staff at Field Elements and operating contractor organizations responsible for DOE and NNSA facilities/sites and activities.

5.2 General Approach

Prompt and accurate notifications are essential during OEs to mitigate consequences, activate emergency response organizations and facilities [e.g., Emergency Operations Centers (EOCs)], recall essential personnel, and notify offsite agencies responsible for protecting the health and safety of the public. An emergency notification system (e.g., public address systems, alarms, etc.) should provide timely notice to site and facility personnel, DOE or NNSA field Operations Centers, and Federal, State, Tribal and local emergency response organizations and authorities for all emergencies under the most limiting set of adverse conditions. For the purposes of this Guide, "timely" means fast enough for response activities to be effective in protecting worker and public health and safety. Additionally, provisions should be in place to continue effective communication throughout an emergency. All aspects of notification should be carefully preplanned, documented, tested under a variety of adverse conditions, and implemented through approved notification procedures, reliable primary and backup communications equipment, and formal training programs.

Notifications associated with OEs are designed to perform the following:

- Protect facility and site personnel and emergency workers through dissemination of information necessary to implement accountability and protective actions (PAs), such as sheltering, evacuation, and decontamination.

- Notify cognizant offsite authorities and agencies, including applicable Federal, Tribal, State, and local organizations, which have PA decision-making authority for the emergency to facilitate public notification.

- Activate elements of the Emergency Response Organization (ERO), consistent with the categorization and classification of the emergency.

- Provide initial notifications, emergency status updates (also known as situation reports or SITREPs), and effective communication among emergency response organizations throughout the emergency.

- Formally document categorizations and classifications, notification times, PAs, protective action recommendations (PARs), and emergency condition changes.

- Comply with regulatory notification requirements.

- A timely, reliable, and accurate communications system is essential for emergency notifications, and provides the framework for conducting emergency response operations. Establishing adequate communications to support on-scene activities is a time-urgent operation. Equally important to effective management of the emergency response is timely establishment of communications to offsite support organizations [Cf. DOE G 151.1-4, Chapter 2], including verification that initial notifications were received. Elements of this communications system include the communications equipment, a notification system (to include reporting requirements), and a simple and effective information management structure.

- Development and implementation of notification and communication capabilities should be "commensurate with hazards" and depend on the results of the Hazards Survey and Emergency Planning Hazards Assessments (EPHAs). The guidance in this chapter supports the development of communications systems for facilities/activities with varying types and levels of hazards and with differing organizational structure and complexity.

Also addressed are essential aspects of emergency notification and communications including: notification requirements, report contents, communications equipment, and effective responder communications. Section 5.3 includes guidance related to emergency reporting, which includes both *initial notifications* to onsite personnel and offsite authorities and *emergency status updates*. Initial notifications include verifying confirmation of receipt of notification by appropriate personnel. Section 5.4 includes guidance for selecting and maintaining emergency communications equipment. Also in Section 5.4, effective responder communications addresses accurate, timely, and useful exchange of information during an emergency response. Finally, documentation of the response activities and emergency and recovery reports are covered in Section 5.5.

5.3 Notifications

DOE Orders and other Federal regulations require extensive internal (within facilities and DOE or NNSA) and external (offsite) notification and reporting. Emergency notifications are time sensitive and provide information necessary to initiate a variety of response actions. Event information and reporting requirements may be duplicative across Orders and regulations. Notification procedures should be designed to differentiate between critical notifications associated with OE response and other less urgent information and reporting requirements.

Due to the critical importance of response measures taken in the early stages of an emergency, such as implementing timely protective actions, the content of initial emergency notification messages should focus on information needed to facilitate these essential activities, including:

- Assessing accident consequences
- Initiating onsite PAs for workers and others in the affected facility and collocated facilities
- Developing and providing PARs to offsite authorities for notification of the public
- Activating the ERO and emergency centers
- Augmenting facility staff

If actions have already been taken, the results of the activities should be relayed. Notification should not be delayed in order to fine-tune information. The notification system should also include a rapid method to provide emergency status updates when emergency conditions and information change. Both initial notifications and emergency status updates should use a pre-arranged and standardized content and format.

5.3.1 Notification System

Provisions should be in place for prompt initial notification of workers and emergency response personnel and response organizations, including appropriate DOE or NNSA elements and other Federal, Tribal, State, and local organizations. There should be continuing/effective communication among the ERO throughout an emergency. The following should be considered in developing an effective notification system:

- Specify the organizations or individuals to receive notifications by job position or title.
- Establish a recall system used to make initial notifications and emergency status updates to primary and alternate response staff that includes authentication and acknowledgement indicating success of the contact.
- Organizations receiving emergency notifications should have a capability to receive and acknowledge reports on a 24-hour basis.
- Notification messages, methods, and procedures should be an established part of annual training offered to affected organizations.

- Preplanning should include consideration of special circumstances, such as power outages or other conditions, which could affect notifications.

- Periodic verification of all emergency telephone and FAX numbers.

- Notification systems should be designed to permit multiple notifications at the same time.

The notification system developed and implemented for a given site or facility should be consistent with the potential hazards of the facility, as determined by a current Hazards Survey and EPHA. Where several facilities at a site are dependent on a single site notification system, the system design will be more complex. Each additional interface increases complexity in equipment, procedures, personnel, and training. Standardization and simplification of procedures, forms, and interfaces can result in systems that are more efficient. Separating critical notifications from routine or administrative notification and reporting further simplifies critical notifications.

5.3.2 External Notification Requirements

According to DOE O 151.1C, the manager/administrator, or designee, of each DOE/NNSA- or contractor-operated facility/site or activity should provide initial notifications to:

- State and local officials, the DOE/NNSA Cognizant Field Element EOC and Headquarters Operations Center within ***15 minutes*** and all other organizations within ***30 minutes*** of classification of an OE involving the onsite release of (or loss of control over) hazardous materials as an Alert, Site Area Emergency, or General Emergency; all other organizations are notified within ***30 minutes***.

- Cognizant Field Element EOC and Headquarters Operations Center within ***30 minutes*** of the declaration of an OE not requiring classification; and notify Tribal, State, local, and all other organizations within ***30 minutes*** or as established in mutual agreements.

The notification system should provide for periodic emergency status update reports and effective communication of emergency conditions and status throughout an emergency. Status updates should occur as required or as directed by a higher Emergency Management Team (EMT). Rapidly changing conditions should dictate more frequent status updates. Significant changes in event conditions, requiring a change in classification or protective actions, require notification as soon as possible. If a change occurs while a notification or follow-up message is being sent, the outgoing message should be completed and then immediately followed with an updated report.

Initial emergency notifications require time-urgent reporting to DOE/NNSA Headquarters Operations Center. Emergency notifications to the Headquarters Operations Center should consist of a phone call providing as much information as is known at the time. The same information is also provided by e-mail or a fax either immediately before or following the phone call. Information for initial notification includes as much as possible of the following:

- An OE has been declared and, if appropriate, the classification of the emergency
- Description of the emergency
- Date and time the emergency was discovered
- Damage and casualties
- Whether the emergency has stopped other facility/site operations or program activities
- PAs taken and/or recommended
- Notifications made
- Weather conditions at the scene of the emergency
- Level of any media interest at the scene of the emergency or at the facility/site
- Contact information of the DOE or NNSA point of contact

5.3.3 Onsite Notifications

Onsite notification messages to facility personnel should support activation of the facility ERO (including necessary recall) at a level appropriate to the event categorization/ classification. Further, notification messages should contain sufficient information to initiate immediate and appropriate protective response for personnel in the facility. Pre-arranged, standardized scripts for public address announcements to be made for various emergency scenarios and classifications should be used. Public address or alarm systems in high noise areas should also be considered. Pagers, where used, should provide for positive feedback through call-in or other methods to confirm that notification was successful and recall of personnel will be achieved. Other facility- or site-specific procedures may be necessary, depending on whether sites have collocated facilities; field offices, which are not located onsite; or other non-standard arrangements.

5.3.4 Initial Offsite Notifications and Emergency Status Updates

Report content and format for both initial notification and emergency status updates should be prearranged, standardized, and described in the emergency plan and implementing procedures. Initial notification messages should be brief and contain information that supports higher DOE or NNSA headquarters EMT activation decisions and offsite authorities need to alert the public and implement PAs. Although initial notification information should be tailored to offsite agency needs, the time, date, location, contact point or person, type of emergency, appropriate emergency class and time, current event status (e.g., ongoing), and the PAR should be included.

Both the site or facility and the receiving offsite agency should use identically formatted "fill-in-the-blank and check-box" message forms. Close coordination between the facility/site and offsite agencies will be necessary to standardize the message format and the initial information requirements. In addition, similar training programs for communicators will ensure information transfer without questions or delay. A sample emergency reporting form for both initial notifications and emergency status updates that may be tailored to satisfy local needs is provided in Appendices C and D, respectively.

At the onset of the emergency, some items may not be known or not be known in detail. Lack of specific information should not preclude or delay notifications. When information is not available, the responsibility for emergency status updates should be identified and communicated in the initial notification message. The emergency status updates should be used to supplement the initial notification as information becomes available. The following information should be considered (NOTE - Items marked with an asterisk should be included in the initial notification message.):

*(1) Location (site/facility/building) of the event, name, organization, location, and telephone number of the caller
*(2) Indication of whether event is still in progress
*(3) Categorization and classification of emergency and time of declaration
*(4) Brief description, date, time of the event, and time zone

*(5) Injuries or casualties involved
*(6) Status of the affected facility/site/activity
*(7) Status of other facilities/operations/activities on the site
(8) Type of actual/projected release and duration (source term or release characterization)
*(8A) Release in progress (Yes/No)
(8B) Actual or projected doses or dose rates that exceed Protective Action Criteria (PAC) at a critical location (e.g., the site boundary, municipal jurisdiction, school, hospital, reservoir) relative to the organization receiving the notification
*(9) Recommended protective actions with timing considerations, where applicable
*(10) Notifications made
*(11) Meteorological conditions, such as wind speed, wind direction, stability class, precipitation, etc.
*(12) Level of any media interest at the scene of the emergency or at the facility/site
*(13) Contact information of the DOE or NNSA point-of-contact

To document reports, the reporting organization should record the organizations notified and the names and positions of the persons contacted. Where dedicated ring-down circuits are used to established emergency or operational centers, such verification may not be necessary. Documentation is extremely important with regard to event reconstruction, lessons learned, protective action recommendation decisions, litigation, and liability. Copies of all reporting forms should be retained and archived.

In accordance with DOE O 151.1C, all emergency-reporting messages should be reviewed for classified information and Unclassified Controlled Nuclear Information (UCNI) and protected accordingly. The review should be preplanned and addressed in the training program, procedures, and form development so that classification considerations will not delay notification.

Content of initial notification messages to Tribal, State and local EROs should be negotiated with those agencies and documented in the facility/site emergency plan. For those offsite organizations with their own consequence assessment capabilities, information needed to perform the consequence assessment should be provided to the extent available. In the event that state and local agencies refuse to participate in the planning effort, facility plans should call for providing the information specified in 40 CFR 355, as well as the event categorization and classification.

5.4 Communications

A formally established and proceduralized communication chain for reporting and notification within the facility, site-wide, to the Joint Information Center (JIC), and to offsite organizations should form the basis for all communications during an emergency event. Decisions on communications requirements and the equipment selected for use in emergency response and in emergency response facilities should be based on an analysis of Hazards Survey and EPHA results that considers the severity of potential emergency events and the functions to be accomplished by the response organization.

5.4.1 Communications Equipment

Communication system equipment should satisfy the following general criteria:

- Highly reliable primary equipment with backup equipment identified, powered by uninterruptible power sources where appropriate.

- Periodic routine testing during normal and off-hour periods and demonstration during drills and exercises.

- Security provisions commensurate with the type of information being transferred. Classification reviews should be preplanned to eliminate delays.

- An authentication or verification system (e.g., “Caller-ID,” passwords) should be established among notification network parties, except for dedicated circuits in secure facilities.

- Specific communication frequencies, telephone numbers, and verification details should not be quoted in public documents.

- Ability to handle voice and data communications, as well as a teleconferencing capability. A video-teleconferencing capability is preferred.

- Ability to record all voice communications.

Selected communications equipment, which could be used in notification and reporting systems, includes standard telephones, dedicated leased lines, automatic ring down circuits, facsimiles, radio, paging systems, and computer data transfer configurations. Dedicated phone lines, automatic ring-down circuits, and dedicated facsimiles are preferred over standard phone lines or radio circuits, which are more subject to overload, failure, or compromise. Ring-down circuits are particularly useful where numerous towns, counties, or agencies are involved with a single site. All equipment should have formal procedures incorporating the operating instructions, qualified operators, and identified backup equipment in case of primary equipment failure.

Installed PA and siren systems should accomplish the notifications of workers and onsite or neighboring public:

- Building and area alarms or public address systems should be installed to alert facility personnel to emergency conditions.

- Systems should be in place for notification of onsite workers and the public who are present onsite, but outside the immediate vicinity of the affected facility.

- Where agreements with offsite agencies dictate, systems should alert the public outside the site boundary.

Installed voice communications systems should be developed with the following characteristics to accomplish notification and information exchange processes consistent with potential response requirements:

- Reliable equipment exists for communications with emergency organizations and response personnel.

- Dedicated primary and backup voice communications links are provided between key emergency response facilities and sufficient non-dedicated voice communication links are provided to access offsite organizations.

- Mobile and commercial phone lines are available.

Technical specifications, compatibility, reliability, and security of communications and data transfer equipment for use in EOCs should be considered in selecting communications equipment. Consistency and compatibility between transmission methods is essential.

Equipment should be included in a formal preventive maintenance program. Where interfaces exist between onsite and offsite equipment, agreements should be negotiated to ensure all components of the communication system are maintained. Special maintenance response agreements may be necessary for vendor supplied notification equipment, such as pagers, tone-alert radios, copying, or facsimile machines.

5.4.2 Effective Responder Communications

Continuous, effective, and accurate communications (for notification and reporting) among response components and/or organizations [e.g., event scene responders, Emergency Directors (EDs) and respective EMTs, response facilities, offsite response organizations, and workers who have taken PAs] should be reliably established and maintained throughout an OE. *Continuous communications* implies that there is no loss of the ability to communicate when needed; there is *continuous* connectivity or capability to communicate. *Continuous* includes frequent or periodic in the sense that whenever it is necessary to communicate with a response component, nothing prevents that from happening.

Uniformity and standardization in content and format are important to each site's notification and reporting scheme to ensure that all organizations can effectively exchange technical information. The use of jargon should be avoided and uncommon or facility/site-specific abbreviations and acronyms should be fully described in oral notifications and spelled out in subsequent written reports. Notifications and reports should use measurements, terms, acronyms, abbreviations, building names, etc., that are known and understood by all parties. Notification clerks, communicators, and dispatchers should be trained and qualified to minimize communication errors.

Aspects of standardized notifications that should be considered for offsite organizations are:

- Methods and provisions for verification of message authenticity
- Possible methods, primary and backup, by which each organization may receive notifications
- Feedback links for verifying information or requesting additional information (without interfering with site or facility operations)
- Facility-specific terms, acronyms, and measurements
- Methods used to conduct system tests
- Methods to ensure differentiation between exercise and real events
- Minimizing differences between facility notification systems
- Use of consistent time zones in communications. (All communications should use the same time zones or always identify the time zone when discussing times).

5.5 Documentation and Reports

This section addresses the documentation of emergency response communications and activities as well as the final emergency and recovery reports.

5.5.1 Response Documentation

An essential activity associated with the emergency response is the implementation of a formal system to record, sequence, validate, and track the flow and chronology of emergency information. Notifications and key communications should be properly documented; they should be displayed in emergency response facilities to keep the ERO staff and decision-makers current on the emergency condition and response activities. Logs should be maintained and other record-keeping methods utilized to support post-event analysis, report production, and a legally defensible chronology of notification and communications activities. Records should be maintained according to the requirements in the National Archives and Records Administration (NARA)-Approved DOE Record Schedules, which list the required records that need to be maintained and the retention period. [Record retention is a requirement of DOE O 243.1, *Records Management Program*.]

5.5.2 Final Emergency Report

Following the termination of emergency response, and in coordination with the Final Occurrence Report (see DOE O 231.1A Chg 1), each activated EMT submits a Final Emergency Report on the emergency response to the ED for submission to the Associate Administrator, Office of Emergency Operations (NA-40).

The Final Emergency Report will include the following:

- Executive summary of the event, actions taken, lessons learned, and emergency management system changes planned
- List (or organization charts) of the complete EROn involved in the response to include other agencies, offsite organizations, and DOE or NNSA contractor and Federal employees
- Copies (or summaries if appropriate) of all notifications and reports generated during the emergency
- Copies of all press releases and briefing transcripts
- Response summary including time sequences, actions taken, and results. The response summary should address the following topics:
  - ERO
  - Offsite Response Interfaces
  - Notifications and Communications
  - Emergency Medical Support

  - Emergency Facilities and Equipment
  - Emergency Public Information
  - Event Categorization/Classification
  - Consequence Assessment
  - Protective Actions and Reentry
  - Termination and Recovery

- Lessons learned with planned corrective actions. Summary results of event investigation, if available

- Other issues identified by event responders and emergency management team personnel

5.5.3 Recovery Reports and Records

Recovery reporting requirements are established during recovery planning and are based on the event and agreements between the recovering element and the Headquarters or oversight element. After the emergency, the ED shall decide what records should be maintained for documentation and record purposes and for any legal action that may develop. Records should be maintained according to the requirements in the NARA-Approved DOE Record Schedules, which list the required records that need to be maintained and the retention period. [Record retention is a requirement of DOE O 243.1, *Records Management Program*.]

APPENDIX C. Emergency Notification Form

The following form is a sample providing the types of information that should be included in emergency reports used in notifying offsite authorities, including Tribal, State, and local agencies and all three tiers of the emergency response system: facility/site or activity, Cognizant Field Elements, and DOE/NNSA Headquarters. This form is designed to support the reporting requirements of DOE O 151.1C, but does not necessarily fulfill DOE O 231.1A Chg 1 occurrence reporting requirements. Data is only filled out if it applies or is appropriate. For example, release data would not be filled out if presently unknown or it does not apply for the particular event. All available information should be provided; however, initially the only items that need to be filled out are the top part and those items with an asterisk by the line number.

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(Security Classification & Category)

EMERGENCY NOTIFICATION FORM

__ INITIAL NOTIFICATION **__STATUS UPDATE** **__TERMINATION**

As of: Date ___________ Time (include zone): _____________

Received by (to be filled upon receipt):

Name: __________________________Date: ______________ Time (include zone):

---

1. *Sent by:

Name: ___________________________Position: ________________ Telephone: _______________
Organization: ____________________Site/Location: _____________________________________
Facsimile: ______________________Building/Facility: ___________________________________

2. *Incident Location:

____

3. *Emergency Category/Classification: ***Operational Emergency***

Not Classified OE: __General Health and Safety __Environmental

__Offsite DOE Transportation __Safeguards and Security __Biological

Classified OE: ___Airborne Hazardous Materials Release (Radioactive or Chemical)

O Alert
O Site Area Emergency
O General Emergency

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(Security Classification Level & Category)

____
(Security Classification Level & Category)

4. ***Description of Incident** (include dates/times/time zones):

____
____
____

5. ***Casualties, if any (Identify if DOE Employee or contractor or public. Include number of personnel, nature of injuries, treatment status, and next-of-kin notifications):**

____
____

6. ***Status of affected facility/site or activity:**

____
____
____

7. ***Status of other facilities/operations/activities on the site:**

____
____
____

8. **Release Information (if any):**

A. *Release in Progress: ___Yes ___No
B. Material: ___Radiological ___Chemical ___Biological
C. Nature of release: ___Airborne __Waterborne __Ground

Status: __Continuing __Intermittent __Terminated
Source: ___________Quantity:________Rate: ________________
Material: Name ________________________ Concentration __________________

Other release information:

____
____

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(Security Classification Level & Category)

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(Security Classification Level & Category)

9. *Protective Action Decisions/Recommendations and Health Effects:

Onsite:

____

____

____

Offsite:

____

____

____

10. *Field Notifications Made – *Notifications complete*: __Yes __No

	Organization	POC	Date/Time
A.	____________	____________	____________
B.	____________	____________	____________
C.	____________	____________	____________
D.	____________	____________	____________

(If more space is needed use blank lines at the end of the form)

11. *Meteorological Conditions:

Wind Speed____ mph Wind direction from______ to _______ Stability class ___________
Temperature _____________ Precipitation: __ Yes __ No

Conditions/Forecast:

____

____

____

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(Security Classification Level & Category)

(Security Classification Level & Category)

12. *Media Interest: Level of media interest at the emergency scene or at the facility/site

13. *DOE/NNSA Point of Contact:

(Security Classification Level & Category)

APPENDIX D. Emergency Status Updates

The following page displays the emergency status update report (also, known as situation reports or **SITREP**s) that can be used to keep HQ updated on the progress of the emergency. Section 5.3.4 of this chapter provides a general discussion of the information.

HQ EMT SITREP - Page 1 of 5

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(Security Classification Level & Category)

HQ EMT SITREP # ___________________________ **Date/Time: __________________________**

(The HQ EMT requires specific information from the affected facility/site/program/activity in order to satisfy the demands of Departmental senior management and meet the requirements associated with requests from the White House, Congress, other Federal agencies, and the media. At a minimum, the questions listed below need to be answered as soon as possible and then updated as appropriate and when changed over the course of the emergency and response.)

1.0 Description of the emergency/event

1.1 What happened?		
1.2 When did it happen or was it discovered?		
1.3 Where did it happen?		
1.4 What is the immediate impact/effect of the event on Departmental facilities, sites, programs, and/or activities? (i.e., damage to facilities, operations, etc.)		
1.5 Describe any off-site impact which has occurred, is occurring, or which may occur		
1.6 Who are the on scene senior emergency management POCs? (names, number/means for contacting site emergency manager/director, Senior Energy Official, and On Scene Commander)		
1.7 Depending on the nature of the event:		
	1.7.1 What is the category of the event (e.g., OE, Energy Emergency, and Emergency Assistance)	
	1.7.2 What is the classification of the event (only if event involves Hazardous Materials Program facility/site; e.g., General Emergency, Site Area Emergency, Alert)	
1.8 What hazardous materials were involved and their potential/actual impact:		
	1.8.1 Types, amounts, and/or concentrations	
	1.8.2 Status of leak/spill/release (e.g., ongoing or stopped)	

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(Security Classification Level & Category)

HQ EMT SITREP - Page 2 of 5

____
(Security Classification Level & Category)

HQ EMT SITREP # ___________________________ **Date/Time:** __________________________

(Information is included and/or updated as appropriate and when changed.)

1.0 Description of the emergency/event (continued)

1.9	Current meteorological data at event scene:	
	1.9.1 Temperature	
	1.9.2 Humidity	
	1.9.3 Wind speed and direction	
	1.9.4 Precipitation type and/or forecast	
	1.9.5 Stability condition	
1.10	Information on effects measurements (e.g., actual measurements, dose estimates, and model predictions) and/or potential for increased severity	
1.11	What decontamination requirements are there? (if any)	
1.12	What other potential hazards associated with the site or operations are affected by the event?	
1.13	If the event is security-related:	
	1.13.1 What is the type and/or nature of the security threat(s)? (e.g., bomb, arson, shooting, hostage, etc.)	
	1.13.2 What is/are the threat or other deadlines?	
	1.13.3 What response actions have taken and are planned? (and anticipated outcomes)	
	1.13.4 What is the status of any hostages involved? (number, names, location, conditions, and demands)	
	1.13.5 What internal and external law enforcement involvement is on scene? (e.g., site security, FBI, state, local)	
	1.1.3.6 What information is there on perpetrators?	

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(Security Classification Level & Category)

HQ EMT SITREP - Page 3 of 5

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(Security Classification Level & Category)

HQ EMT SITREP # __________________________ **Date/Time:** _________________________

(Information is included and/or updated as appropriate and when changed.)

2.0 Response/Protective Actions

2.1	What protective actions have taken and/or are planned onsite?	
2.2	What protective action recommendations have been made, planned, and/or provided to offsite agencies?	
2.3	What is the anticipated duration of onsite and offsite protective actions?	
2.4	Plume model (if available, provide to HQ)	
2.5	What is the recovery planning status?	

3.0 Casualties

3.1	DOE employee(s) (organization):	
	3.1.1 Number and nature of injuries	
	3.1.2 Number and cause of fatalities	
	3.1.3 Contamination status of injured and/or dead	
3.2	DOE contractor(s) (firm, DOE organization supported):	
	3.2.1 Number and nature of injuries	
	3.2.2 Number and cause of fatalities	
	3.2.3 Contamination status of injured and/or dead	
3.3	Others (e.g., if visitors, bystanders, etc.):	
	3.3.1 Number and nature of injuries	
	3.3.2 Number and cause of fatalities	
	3.3.3 Contamination status of injured and/or dead	
3.4	What is the current location(s)/ disposition(s)/status of next of kin notifications?	

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(Security Classification Level & Category)

HQ EMT SITREP - Page 4 of 5

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(Security Classification Level & Category)

HQ EMT SITREP # ___________________________ **Date/Time: __________________________**

(Information is included and/or updated as appropriate and when changed.)

4.0 Status of radiological emergency response assets

4.1	What assets are onsite and operational?		
4.2	What assets are onsite, but not yet operational?		
4.3	What assets are in route and what is their estimated time of arrival (ETA)?		
4.4	What additional assets are needed or anticipated?		

5.0 Notifications

5.1	DOE organization(s):		
	5.1.1	What support has been requested and provided?	
	5.1.2	What issues have been raised?	
5.2	Federal Department(s)/Agency(s):		
	5.2.1	What support has been requested and provided?	
	5.2.2	What issues have been raised?	
5.3	State, Tribal, and/or Local governments and/or response organization(s):		
	5.3.1	What support has been requested and provided?	
	5.3.2	What issues have been raised?	
5.4	Congress (Senate & House members, committees, staff, offices):		
	5.4.1	What support has been requested and provided?	
	5.4.2	What issues have been raised?	

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(Security Classification Level & Category)

HQ EMT SITREP - Page 5 of 5

____
(Security Classification Level & Category)

HQ EMT SITREP # ___________________________ **Date/Time: __________________________**

(Information is included and/or updated as appropriate and when changed.)

5.0 Notifications (continued)

5.5 Energy industry firms and/or organizations (oil, gas, electric, pipeline):		
	5.5.1 What support has been requested and provided?	
	5.5.2 What issues have been raised?	
5.6 Media (local/regional/national):		

6.0 Public Affairs

6.1 Assessment of media interest (e.g., high, medium, low and description)	
6.2 What additional Press Releases have been issued? (number, date, & time)	
6.3 What press briefings have been conducted and/or planned? (information provided to HQ)	
6.4 What is the location and status of JIC?	
6.5 What are the media and public information contact numbers?	

7.0 Points-of-Contact

7.1 Who are the on-scene POCs? (names, position/functions, phone numbers)	
7.2 Who are the Field Element POCs? (names, position/functions, phone numbers)	

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(Security Classification Level & Category)

6. CONSEQUENCE ASSESSMENT

6.1 Introduction

The purpose of this chapter is to assist DOE and NNSA field elements in complying with the DOE O 151.1C requirement that the impacts of the release of (or loss of control over) hazardous materials (i.e., radioactive, chemical) be evaluated during an Operational Emergency (OE). The Order requires that estimates of onsite and offsite consequences of an actual or potential release of hazardous materials be correctly calculated and assessed in a timely manner throughout the emergency. Consequence assessments are to be integrated with event classification and protective action decision-making functions, incorporate facility and field indications and measurements into the assessments, and be effectively coordinated with offsite agencies.

The capabilities and processes of the Consequence Assessment program element necessary to meet the time-urgent and accurate consequence estimate needs of emergency response are addressed in this chapter. The guidance focuses specifically on the processes implemented by initial responders, consequence assessment team personnel, and others who provide the necessary information for decision-makers responsible for ensuring the health and safety of workers and the public.

This chapter is designed primarily for facilities/sites and activities that are required to implement an Operational Emergency Hazardous Material Program and is directed at operations and emergency management staff at Field Elements and operating contractor organizations responsible for DOE and NNSA facilities/sites and activities.

6.2 General Approach

Consequence assessment is the analysis, evaluation, and interpretation of available information associated with an actual or potential release of hazardous materials to the environment for estimating potential exposures or doses to the workers and to the public. These estimates are then compared to applicable human health indicators, Protective Action Criteria (PACs) [e.g., Protective Action Guides (PAGs), Acute Exposure Guideline Levels (AEGLs), Emergency Response Planning Guidelines (ERPGs), or Temporary Emergency Exposure Limits (TEELs)], and used as the basis for emergency management decision-making for DOE/NNSA and involved Tribal, State, and local organizations. Consequence assessment results support decision-making in the following areas: event classification, protective action determinations, notifications to and communications with DOE/NNSA Field Elements and Headquarters, Tribal, State, and local organizations, and emergency public information.

The primary objective of the consequence assessment process is to provide timely and useful information to assist emergency response decision-makers in making informed decisions to protect people (e.g., workers, the public, and responders) from the potential consequences of a release of hazardous materials. For purposes of this guidance, “timely” means rapidly enough so that informed decisions can be made and protective actions subsequently implemented to avoid or reduce consequences to people (i.e., dose savings). "Useful" means the right information in the correct units and in sufficient detail, which is communicated clearly and effectively to the appropriate people. "Information" includes answers to the following key questions: "Where (i.e., geographically) will the impact be observed?", "Who will be affected?", "When will the impact begin?", "When will the impact end?", and "What will be the nature and magnitude of the impact?" In addition to facility or site emergency managers, other important recipients of consequence assessment information include responders, in-field commanders, workers, the public, the media, regulators (i.e., local, State, and Federal), and Tribal or other government officials.

Consequence assessment capabilities at DOE/NNSA sites should reflect the type and magnitude of potential hazardous material releases included in facility/site Emergency Planning Hazards Assessments (EPHAs) and should primarily apply to worker locations and the public within the Emergency Planning Zone (EPZ). However, the capability should be flexible enough to address consequence assessment in a limited extension beyond the EPZ to provide assistance to Tribal, State, and local authorities, as requested, including support for confirmatory field/environmental monitoring.

The guidance identifies three phases of the consequence assessment process: 1) Event recognition, categorization/classification, and initial protective actions; 2) Timely Initial Assessment (TIA); and 3) Continuous Ongoing Assessment (COA). The guidance primarily focuses on the second and third phases that follow the conservative consequence estimates implicit in the ***initial*** assessments. TIA provides the process for supporting and confirming the critical ***initial*** pre-planned decisions, using available real-time data. The COA is the subsequent cyclic activity that occurs throughout the emergency that refines the initial assessments as more confirmatory information and physical and technical resources become available.

In the following sections, the three phases of consequence assessment will be discussed in more detail. As indicated previously, however, the guidance will focus on the two processes that follow the consequence estimates implicit in the initial classification and protective action decisions, namely, TIA and COA.

The appendices that follow this chapter provide detailed discussions of two areas of concern for consequence assessment. Appendix E contains a brief discussion of consequence calculations related to the radioactive material ingestion pathway, which can carry over into the recovery phase following emergency termination. Appendix F provides guidance on various aspects of field monitoring and how the results are integrated into the consequence assessment process for both radioactive and chemical hazardous materials.

6.3 Decision-Making in an Emergency Environment

The consequence assessment process consists of a series of technical activities in which information related to an OE involving an actual or potential release of hazardous material is identified and collected, analyzed and calculated, assessed to estimate consequences (i.e., adverse human health impacts), communicated to appropriate response personnel and agencies, and used in interfaces with other program elements. The process needs to provide useful support for emergency decision-making when and where it is needed, under complex and changing conditions.

The dynamic conditions that exist during an emergency event that have the greatest effect on the structure of the consequence assessment process and its essential decision-making role include the following:

- **Time-Urgent Need for Decision Support**. The need for timely information is greatest when the consequence assessment resources and the ability to accomplish required analyses are least favorable. Consequence analysis support for initial response decisions (i.e., classification and protective actions) is provided during the planning process. The tools provided to assist with these first response decisions and actions are based on consequence calculations performed for and documented in the EPHA. These *initial* determinations are among the most critical and time-urgent that the decision-maker will make in the first minutes of the response; it is within this early period that the overall seriousness of the event should be determined as accurately as possible in order to broadly establish the overall scale of the emergency response. Hence, the need is truly "immediate," since incorrect determinations at this stage can have a significant negative effect on the subsequent emergency response.

  With the *initial* event classification and protective action decisions made and pre-planned response actions begun, the next decision support need is to confirm that the initial decisions were accurate, appropriate, and conservative (i.e., protective of workers and the public), based on a first assessment of event-specific information. Like the initial decision, this *confirmation* is a high priority and time-urgent need for the decision-maker.

  As the emergency progresses, decision support becomes somewhat less time-sensitive because the conservative initial classification and protective actions have been confirmed and the follow-up decisions need refined analyses. The information becomes more available and the consequence assessment process utilizes assessment tools that are more complex and able to produce consequence estimates that more accurately incorporate real-time event and environment conditions.

- **Availability of Information**. While the need for decision support is greatest at the beginning of the response, the availability of information on which to base projections is most limited early in the emergency. Usually, very little relevant information is available at the beginning of an event, and what information is available may have large uncertainties, may be conflicting, or may be simply "wrong." These limitations and uncertainties of the information need to be understood, reconciled, and communicated. As the emergency progresses, the information needed to project consequences typically improves in both quantity and quality. The ability to acquire the available information for consequence assessment use also improves overall as more human resources become available within the Emergency Response Organization (ERO). In some situations, however, a fast-moving, complex emergency may cause information saturation and overload to occur, where the availability of too much information, arriving too fast, becomes an unwelcome, complicating factor. In these cases, the skill of the consequence assessment personnel becomes important in determining which information to integrate into the process.

- **Availability of Consequence Assessment Resources**. Both technological and human resources are needed to perform consequence assessment. The classification authority (e.g., Duty Officer, Facility Manager) usually activates these resources immediately following the classification of an OE. Thus, the real-time consequence assessment process begins after the *initial* classification and protective action decisions have been made. As with other functions or activities in the ERO, consequence assessment capabilities will increase as individual Consequence Assessment Team (CAT) members arrive at their work center [e.g., Emergency Operations Center (EOC)]. All consequence assessment team members should be trained to perform TIA activities so that the first personnel to arrive can begin the initial assessment. As the team continues to assemble, more of the consequence assessment objectives can be met. On-call subject matter experts and specialists (e.g., industrial hygienists, facility experts) can be subsequently activated, as needed, and brought into the assessment by the core team. Finally, there are sufficient resources to establish specialized work groups to address auxiliary functions (e.g., evaluate contingency events, plan reentry activities, support recovery planning). If the emergency is protracted, rotating shift coverage may be required.

Considering the decision-making environment described above, it has been determined that consequence assessment can be most effectively performed in three distinct phases to meet the expected changing conditions of an OE. These phases are designated as:

1. ***Initial:*** Event Recognition, Categorization/Classification, and Protective Actions
2. Timely Initial Assessment (TIA)
3. Continuous Ongoing Assessment (COA)

The following section describes the general characteristics of the consequence assessment process during an OE.

6.4 General Consequence Assessment Process

The initial phase of consequence assessment follows event recognition and selection of the appropriate Emergency Action Levels (EALs). The EALs were developed utilizing conservative consequence estimates to determine ***initial*** (default) categorization/ classification and associated ***initial*** (default) protective actions. With this initial phase of consequence assessment completed (i.e., the *initial* event categorization/classification and *initial* protective action decisions made) and pre-planned response actions begun, the next time-urgent activity is to quickly *confirm* that the initial decisions were accurate, appropriate, and conservative (i.e., protective of workers and the public). Like the initial decision, this *confirmation* is high priority and time-urgent, and represents the second phase of consequence assessment, the TIA.

The TIA is the first attempt during consequence assessment to incorporate real time event information and is conducted in the very early stages of response, as soon as trained members of the ERO are available. This activity includes a review of the most current event information available to ensure that the most appropriate EAL was chosen and that initial calculations of consequences, based on current event information and meteorological conditions, confirm that the *initial* protective action decisions are protective of workers and the public. If the original recommendations are not sufficiently protective, then modifications to the initial protective actions should be made. The TIA information also serves as the initial basis for addressing health and safety concerns for on-scene response personnel and for directing the initial efforts of field monitoring teams. Hence, the results of the TIA are essential. Even if event information is lacking or unverified, pre-planned event and source term information (associated with the EAL) and simplified calculation methods should be available for these early, critical consequence calculations.

During COA, the improving flow of information and data is processed to enhance the accuracy of the consequence assessment estimates. The results are used to:

- Determine if changing conditions warrant increasing the event classification.
- Modify or extend protective actions.
- Provide information to support health and safety recommendations for response personnel.
- Direct field monitoring activities.
- Integrate field-monitoring results into the total consequence picture.
- Provide field-monitoring information to the local, State, Tribal, and Federal organizations/agencies.
- Compare and reconcile assessment results with those of other response agencies.
- Perform "*what-if*" calculations to explore options for decision-makers.
- Update protective action recommendations to offsite agencies.
- Assess consequences from additional pathways (e.g., ingestion, resuspension).
- Provide information to support the public information process.
- Provide information relevant to event termination.

Further assessments are needed throughout the emergency as the data related to the event becomes available (e.g., source term), the event itself changes (e.g., fire spreads to another building), and environmental conditions change (e.g., meteorological conditions). As control is gained over the emergency and conditions stabilize, consequence assessment results are required to support the recovery planning process. This information may be necessary to support reentry activities, identify health and safety concerns, and formulate long term protective actions related to environmental contamination.

The initial phase of the consequence assessment process uses EALs that contain an initial classification and protective actions that were developed during the emergency management program planning process, based on the analysis of scenario results documented in the EPHA. This initial phase is not strictly a process, but a single decision that produces critical initial information about the OE based on available event information. The initial event classification contained in the EAL represents an *initial consequence projection* or a bounding estimate of consequences relative to the PAC at specified distances from the event. Hence, the initial classification is more than just an administrative label to be included on notification forms; it yields the *very first* estimate of consequences related to the unfolding OE event. The initial protective actions are pre-planned actions to be taken by site workers and, as appropriate, recommended for the offsite public, based on the same consequence estimates used to initially classify the event.

The two subsequent phases can be represented by a general consequence assessment approach consisting of five basic tasks:

- Identify and Collect Data/Information
- Analyze and Calculate
- Assess and Estimate Consequences
- Communicate
- Interface

<u>Task 1</u>: ***Identify and Collect Data/Information*** necessary to conduct a consequence assessment. The data and information gathered is verified as much as possible within the time constraints and urgency of the requirements. This information may include: event and source information, meteorological conditions, key receptors (e.g., impact locations, areas, or population distributions), and field monitoring results.

<u>Task 2</u>: ***Analyze and Calculate*** is the application of consequence assessment tools to analyze the information that has been gathered to: estimate source term, based on event observations and indicators; perform transport and dispersion calculations to produce consequence estimates, based on the source term and current meteorological conditions; and estimate health effects, based on the consequence calculations compared against the appropriate PAC at identified receptor locations.

<u>Task 3</u>: ***Assess and Estimate Consequences*** involves the assessment and best estimate of consequences at that particular time for each receptor. The task involves the integration of modeling and, as available, monitoring results to produce a best estimate of consequences. Estimated consequence projections, event classification and the appropriate PACs are summarized for unambiguous comparison.

<u>Task 4</u>: ***Communicate*** all of the results described above. Ensure that the results are prepared and subsequently communicated in a form that can be used quickly and unambiguously by site emergency decision-makers and affected Federal, Tribal, State and local agencies in making emergency response decisions.

<u>Task 5</u>: ***Interface*** with appropriate ERO components. Ensure that the current classification and protective actions remain valid and sufficient to protect the health and safety of workers and the public or are appropriately adjusted. For example, interfaces with Emergency Public Information (EPI) personnel ensure that results released to the public and to the media are consistent, are interpreted correctly, and are accurately transmitted to offsite entities. [Here *accurately transmitted* implies that the information produced by the consequence assessment team and intended for distribution to offsite entities is the information actually transmitted to them.]

Each of the three phases of the consequence assessment process will be discussed in more detail in Sections 6.5, 6.6, and 6.7, which follow.

6.5 Initial Event Recognition, Categorization/Classification, and Protective Actions

As previously stated, initial event recognition, categorization/classification, and protective actions are the first consequence assessment results that are obtained, providing the extremely important and time-urgent decision support for initial event classification and protective action determinations. Event parameters and event symptoms are recognized through direct observation of event indicators (e.g., fire in a building; puncturing of a 55-gallon drum) and/or the monitoring of specific indicators, such as those that detect the consequences of the event (e.g., radiation monitors, temperature or pressure gauges). Comparison of the observed indicators to the set of EALs leads to the selection of the applicable EAL. No specific detailed calculations of consequences are required since the consequences will be implicit in the EAL selected.

Because the consequences are pre-calculated, the full range of potential event parameters associated with the specific hazardous material source, the daily variability of meteorological conditions, or possibility of frequently changing meteorological conditions occurring during the emergency ***cannot*** be reflected in the ***single calculation*** associated with each EAL. To account for the broad range of potential event and meteorological condition uncertainties, the projected consequence estimates, and thus event classification and initial protective action decisions, are developed with deliberately conservative parameters. This conservatism bounds the emergency response, ensuring that initial protective actions are sufficient to protect the health and safety of the workers and the public (e.g., initial protective actions are independent of wind direction; that is, they are implemented for 360^0).

The process and methodology for performing a facility/site EPHA and methodology for developing criteria for event categorization and classification are discussed in the DOE G 151.1-2, Chapter 2 and DOE G 151.1-4, Chapter 4. Initial protective action determination is discussed in DOE G 151.1-4, Chapter 7.

6.6 Timely Initial Assessment (TIA)

The purpose of the TIA phase is to provide a rapid confirmation of the initial event classification and protective action decisions. In the first minutes of a response, actions are taken to use available real-time information to improve the quantitative understanding of potential impacts. TIA yields a rapid, event-specific estimate of the potential consequences, based on known event conditions and current meteorological conditions. Since TIA occurs at a time when decision-support is time-urgent, information is most likely limited, and consequence assessment resources are minimal, uncertainties in the projections will usually remain substantial. However, TIA estimates of the consequences should provide sufficient accuracy and bounding conservatism to confirm that initial decisions are sufficiently conservative to protect workers and the public. TIA can also provide consequence results for preliminary emergency response planning needs (e.g., support to event scene responders, dispatching field monitoring teams, determining rally points, facility habitability).

Prior to the arrival of the full ERO CAT, TIA may be conducted by consequence assessment-trained first response personnel, by on-call members of the CAT, who possess the necessary tools and information in their homes or other remote locations, or by the first members of the CAT to arrive at the EOC.

The consequence assessment process specific to TIA is shown in **Figure 6-1**. Sufficient information and resources should be available soon after the EAL selection (e.g., ~30 minutes to 1 hour) to perform an initial consequence assessment that is specific to the actual or potential event. Source term and receptor information should be based on the EAL selected and associated calculations from the EPHA, with modifications appropriate to the event observations and indicators based on available information from the event scene and other sources. Meteorological information should be based on event-scene observations and available monitoring data. However, as indicated in the figure, the availability of field monitoring information is unlikely at this early time in the response.

Lack of verified information on the event or source term should not prohibit TIA from being performed. Since timeliness and a conservative assessment are essential characteristics of TIA, it is important that the process be designed to work effectively and efficiently using the limited information expected at this early stage of an emergency. The following discussions of the basic process tasks provide suggestions for developing an efficient TIA process that quickly produces a conservative, useable decision in spite of incomplete or uncertain information.

6.6.1 Identify and Collect Data/Information

The three inputs required to perform a consequence assessment are event observations and indicators, meteorology, and receptors. Note that field-monitoring results are not likely to be available in the early stage of consequence assessment, unless the initial emergency recognition is triggered by field-monitoring activities.

To facilitate the TIA process, emergency planners should take the following steps:

- Develop assumptions and default inputs to support rapid estimates.
- Organize assumptions and default inputs and key them to recognizable event conditions.
- Identify expected sources of real-time information to replace assumptions and default inputs, and estimate when they are expected to be available.
- Make provisions for incorporating real-time information into the analysis, once it becomes available.
- Identify receptor locations of interest based on initial real-time meteorological conditions.

The information listed above can be organized into a series of calculation tools to aid personnel in making a rapid estimate of consequences, based on the limited information available in the first few minutes of response. Well-organized material, necessary in an emergency response situation, can facilitate easy access and convenient numerical manipulation.

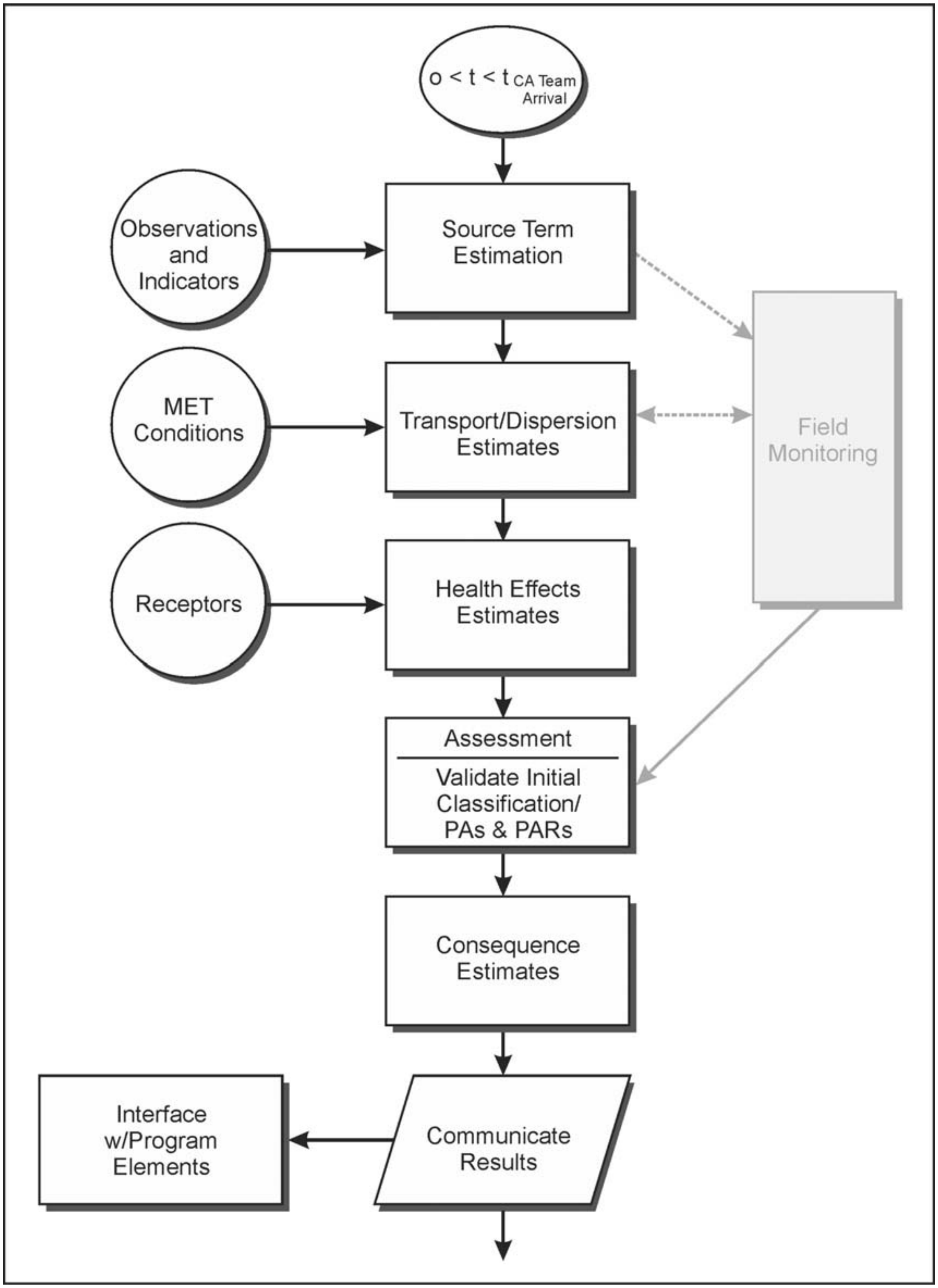

Figure 6-1. Basic Functions in the Timely Initial Assessment Process

6.6.2 Analyze and Calculate

During the first minutes of response, there is insufficient information or resources available to perform lengthy or complex transport and dispersion calculations. Personnel responsible for the TIA should be provided with pre-calculated results and/or simplified calculation methodologies.

An EPHA identifies a range of initiating events and scenarios that could lead to the release of hazardous materials. Potential consequences of each scenario are estimated and summarized in tabular form. These pre-calculated consequences, in conjunction with results of other types of analyses, serve as the bases for the development of initial consequence assessment tools. To produce an effective TIA tool, event and scenario results should be gathered together, tabulated, and indexed for quick reference. To help the user quickly identify the most applicable pre-calculated result, they should also be keyed to observable conditions and EALs. Presentation of results in tabular and/or graphic format will allow the user to interpolate or more closely approximate actual conditions. Source terms on which the pre-calculated results are based should be briefly described and readily available so that it is possible, under emergency conditions, to select the one that is most representative of the event at hand or to apply the best modifying factors.

When simplified calculation models (e.g., hand calculations, nomograms, overlays, simple PC-based models) are developed, assumptions and default inputs to the models should be used to support rapid estimates of consequences. The data should include inputs for release rate and magnitude for radioactive or chemical source terms and atmospheric transport and dispersion conditions. Default input sets should be organized and keyed to recognizable conditions to aid users in quickly selecting the most appropriate inputs. Consequence assessment personnel should be sensitive to changes in input parameter values and be able to explain and qualify results to all decision-makers.

Expected sources of real-time information that replace assumptions and default values should be identified. If some sources of information come from offsite organizations [e.g., National Weather Service (NWS)], prior arrangements should be implemented through a Memorandum of Understanding (MOU) to ensure its availability. Provisions should be made for incorporating real-time information (e.g., instrumentation readings and sample results) into analyses as soon as it becomes available. Whenever possible, back-up sources of information should be identified.

All of the tools (e.g., pre-calculated results, simplified calculation methods) developed to support TIA can be combined into a single reference. The design of the reference should provide for easy and rapid use with minimal chance of application error. As an alternative to producing a document separate from the EPHA, the consequence calculations and input data in the EPHA can be constructed with the TIA response in mind. This option eliminates the necessity of modifying two documents when hazards change in a facility or when periodic reviews are required.

Real-time data that are likely to be available to responders are wind direction and speed. With minimal effort, this information can be used to modify the pre-calculated results to determine who is at risk and when consequences will occur. If an indicator of stability class is available, TIA tools can be developed to allow the user to scale the dose or exposure results rapidly.

6.6.3 Assess and Estimate Consequences

The resulting consequence projections from the previous task are assessed to confirm the initial EAL-based event classification and protective actions. It should be noted that the initial event classification should not be downgraded as the result of the TIA analysis, unless it is determined that the classification was made in error. An incorrect choice of applicable EAL, which underestimates required protective actions, should be corrected as soon as the validation process is complete and the error is identified. In contrast, corrections of overestimates of severity should only be modified with caution and to avoid significant health and safety impacts caused by the overestimates.

TIA yields a rapid, event-specific estimate of the potential consequences based on known event conditions and current meteorology. These calculations should not be used to provide protective actions that are dependent on current meteorological conditions. However, TIA estimates of the consequences should reflect sufficient accuracy and conservatism to confirm that initial decisions are sufficiently conservative to protect workers and the public; ***if not***, the protective actions should be modified.

6.6.4 Communicate

Results of the consequence assessment should be transmitted to decision-makers in the ERO using formal, written worksheets and notification forms and briefings, as necessary. Facilities should ensure that TIA results are communicated in a clear, concise, and timely manner to the person with the responsibility to perform subsequent event categorization/classification and notification. All uncertainties should be well documented to assist decision-makers in interpreting the results and making defendable recommendations. An estimate of the time that the first complete consequence assessment results will be available should also be communicated. Information that differs from initial or previous notifications should be clearly indicated and documented and provided to the proper individuals for offsite communications.

A clear and straightforward format should be developed and used for communicating results. The results should be connected easily and clearly to the specific protective actions to be implemented. A map or graphic display may also be considered, since a "picture" of the affected areas may lend clarity.

6.6.5 Interface

TIA results provide initial response personnel with the best available real-time estimate of consequences for their use in planning or implementing emergency response activities. At this point, the primary interface will be with the Emergency Director (ED) (or appropriate position title for person in charge of the ERO) and, to some degree, with the Incident Commander (IC) or on-scene support staff. The ED needs information to determine the adequacy of previous event classification and protective actions and to determine if further protective actions are necessary. The IC will need information to determine protection measures for on-scene responders.

6.7 Continuous Ongoing Assessment

The purpose of COA is to project updated consequences as the emergency progresses and the event characterization improves in both quantity and quality of information. The COA phase begins when TIA is complete and builds upon improved information and technical and human resources. Increasing levels of sophistication in the analysis tools, input accuracy (e.g., source term, meteorology), technical expertise, and eventually feedback from field monitoring efforts, all lead to refined projections, which are more reliable and realistic than the EAL-based assessments and TIA results.

The consequence assessment process specific to the COA phase is shown in **Figure 6-2**. Event, source, meteorological and receptor information become increasingly complete, comprehensive, and reliable during this phase. Field monitoring information may become available, especially for later assessments.

With additional resources and time for analysis, more comprehensive consequence projections can be conducted. These serve as further refinements to the results and recommendations from TIA, as well as updated analyses and recommendations for the changing event and the changing meteorological conditions. At this point in the analysis, forecasted meteorological conditions should be incorporated. The event classification is reevaluated, but not downgraded, during each assessment and protective action decisions are updated.

COA is performed in a cyclic fashion, incorporating the most current data and information into each cycle. Since emergency decision-making depends critically on timely consequence assessments, urgent results cannot wait on the anticipation that the data will shortly become more complete and accurate. The goal is to use <u>all currently available information and data to refine the assessment continuously</u> to reduce uncertainty and to improve accuracy and understanding by using improved input information, sophisticated models, and the expertise of subject matter experts. Tasks include the use of all available current information and data to: (1) re-evaluate event classification; (2) re-evaluate protective actions; (3) initiate and confirm health and safety decisions for responders; (4) coordinate and reconcile results with offsite consequence assessment teams; and (5) perform “what if” estimates in anticipation of changing conditions and to support requests from decision-makers. In the later stages of response, COA can provide information to support a termination decision and initial recovery planning.

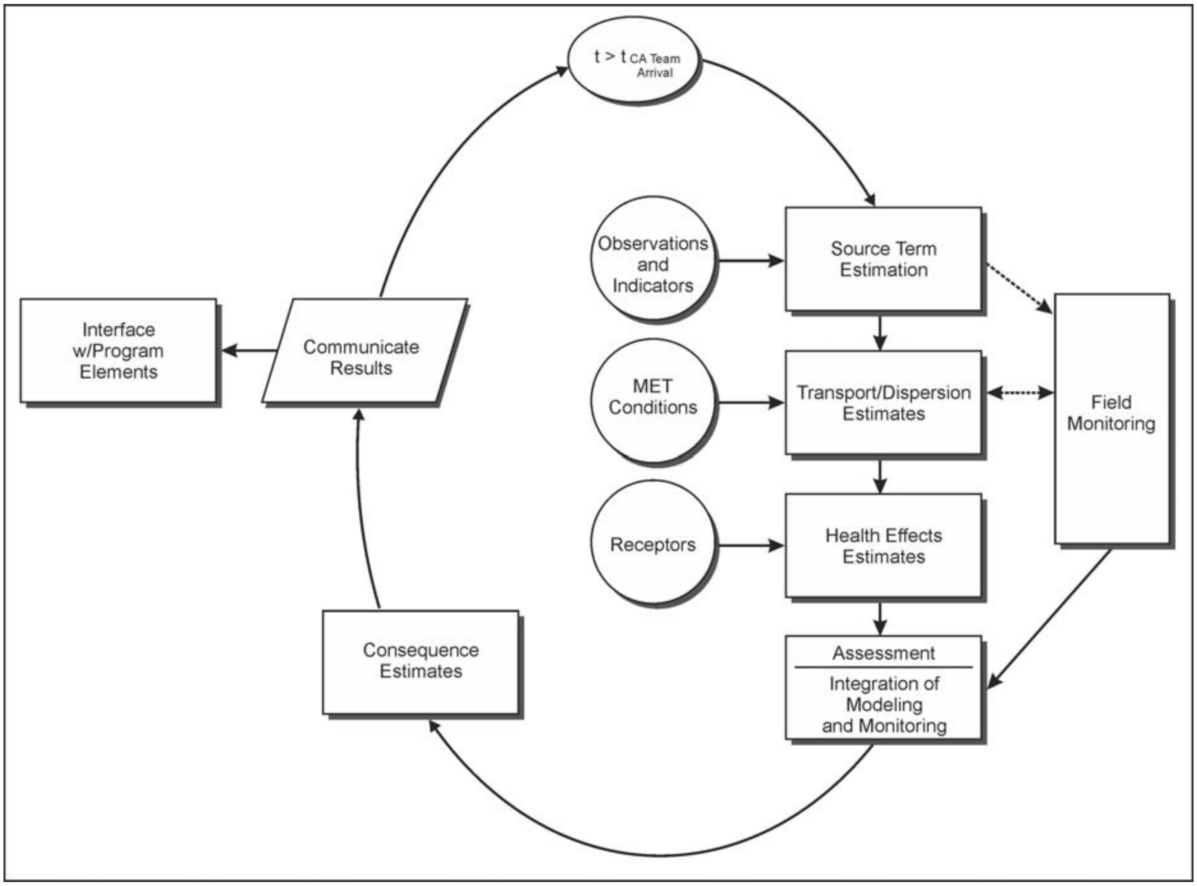

Figure 6-2. Basic Functions in the Continuous Ongoing Assessment

6.7.1 Identify and Collect Data/Information

As with TIA, procedures should be established for incorporating event-specific data into analyses as it becomes available. Methods and instrumentation should be identified to determine the status of affected systems, release parameters, and environmental conditions. These methods and instrumentation should be specific to the point of release, pathway, and material of concern. Methods and equipment should be referenced and incorporated into consequence assessment procedures, with the following considerations:

- Identify and reference in procedures any methods or documents that could be used to determine potential source-term (i.e., hazardous material) inventories.
- Establish correlations between monitoring instrument readings and concentrations, cumulative exposure/dose, and/or exposure/dose rate at specific receptors.
- Identify instrumentation that estimates, but does not directly measure, quantity or concentration of released or stored material (e.g., building air monitors, storage tank pressure indicators); document correlations between instrument readings and quantities of interest.

- For identified instrumentation, provide all necessary conversion factors or techniques.

- Develop methods to acquire and use real-time meteorological data and meteorological forecast conditions.

- Establish procedures for incorporating event-specific data into analyses as it becomes available.

- Identify alternative methods for gathering input information.

- Develop plans and procedures for supporting field monitoring activities and provide the tools/training necessary to incorporate the information into the consequence assessment process.

- Develop a method for verifying the accuracy of data and information received.

- Identify subject mater experts within the organization who have experience with radioactive or chemical hazardous materials and their associated phenomena. Ensure that they are members of the CAT or are available for consultation at any time during the emergency response.

Data and information needed to perform consequence assessment falls into four categories: observations and indicators; meteorological conditions (e.g., wind direction, wind speed, indicator of atmospheric turbulence); receptor locations; and field monitoring results. The first category of information, observations and indicators, represents observable event conditions and available measurable event parameters that will be useful for estimating the source term magnitude. The source term indicates how much hazardous material has been or is being released into the environment. Meteorological information is used to determine to what extent the hazardous material will be diluted and dispersed, where it will be transported through the atmosphere to the downwind receptors, and how rapidly the oncoming plume will affect receptors. Receptor information identifies the specific locations and distances from the release at which consequence estimates are needed. Lastly, field-monitoring data can provide event scene and downwind readings of surface contaminate levels and an airborne concentration for contaminates remaining in the atmosphere. Each of these four categories of data and information is discussed in more detail below.

Observations and Indicators. The "source term" represents the amount of, or rate at which, hazardous material (e.g., radioactive or chemical) is released to the environment. The information from event observations or indicators (e.g., monitored parameters; instrument readings; documented material characteristics) that are needed to characterize the source term can include the following parameters:

- Event initiators and associated parameters [e.g., fire duration and sensible heat effects, energetic and explosive effects, seismic parameters, natural phenomena parameters (e.g., high winds, tornadoes)]

- Total quantity of material present (i.e., Material at Risk [MAR])
- Quantity of material released from the primary barrier
- Quantity of material released to the environment
- Properties of the material (e.g., temperature, storage pressure)
- Phenomenology of the release (e.g., pressurized liquid aerosolization and evaporation)
- Location of the release on the tank or confinement body
- Presence of dikes or impoundment basins that limit evaporation
- Duration and rate of release
- Particle size distribution of particulate or aerosol release
- Height of release
- Vertical velocity and buoyancy of materials exiting from elevated release points

Not all of the information listed above may be necessary for an adequate estimate of the release source term and its duration. The information necessary will depend on the material of interest and the parametric requirements of the model or calculation technique used. Some of this information may be determined by real-time measurements and used directly in models (e.g., volume of material in tank, stack monitor reading). Other information may only be known theoretically (e.g., gas density) or may be based on limited empirical evidence (e.g., particle size distribution) in order to arrive at a release estimate that can be used in calculating consequences. Indicators (e.g., system pressure, flow rate, radiation level, release rate, etc.) necessary to continually assess consequences of the emergency event should be identified prior to an emergency based on the known hazardous material inventory.

Meteorological Data. The types of meteorological data used in consequence assessments include default and real-time wind speed, wind direction, and an indicator of atmospheric turbulence. Real-time information, representative of the site meteorological conditions, is gathered in the vicinity of the release to characterize the region of transport. Regional meteorological information and forecasts are used to determine whether changing meteorological conditions (e.g., frontal passages) may affect protective actions and in-field activities. Natural phenomena (e.g., tornadoes, floods, severe rain and winds, ice and snow), which may result in or exacerbate an emergency condition, should be carefully monitored by either online NWS information, or similar products offered by the private sector.

For complex meteorological conditions that may be present in mountain/valley and coastline sites, additional real-time data from the region of transport may be necessary to adequately characterize three-dimensional transport and dispersion. For DOE/NNSA facilities on these sites, real-time data should be used to replace default values as soon as practical. Regional meteorological data and forecast information is used in parallel with real-time meteorology to semi-quantitatively determine temporal and spatial changes in meteorological parameters that could affect consequence assessment calculations and subsequent protective actions.

The most important real-time meteorological parameters for emergency response are related to the wind direction and the wind speed. The mean wind direction and wind speed provide the basis for determining *where* and *when* consequences will occur, respectively. The wind speed (i.e., dilution magnitude), coupled with atmospheric turbulence intensity (i.e., dispersion magnitude), provides the basis for determining how much hazardous material will arrive at the downwind receptor.

Other atmospheric and source term factors that have an effect on the transport, dilution and dispersion, deposition, and resuspension of material include the inversion layer height, precipitation intensity, gravitational settling (i.e., particle size distribution), temperature, and humidity. For chemical releases that are liquids stored under pressure, internal pressure and temperature, as they compare to ambient pressure and temperature, are also important parameters for determining flash coefficients and pool formation.

The minimum data necessary to drive intermediate or advanced atmospheric dispersion models are wind speed, wind direction, and an indicator of atmospheric turbulence, or stability class. These parameters and their role in dispersion calculations are addressed below:

- Wind Direction:
  - Establishes plume trajectory and the concomitant downwind receptors. Has little or no effect on concentration of effluents, except when terrain effects are included in the modeling.
  - By convention, wind is *from* the direction reported.
- Wind Speed:
  - Establishes plume arrival time at a particular receptor.
  - Dilutes source material (i.e., inversely proportional).
  - Determines transport times to establish radioactive decay and plume depletion for radiological sources.
- Indicator of Atmospheric Turbulence or Stability Class:
  - Determines plume concentration at a particular receptor.

   - Disperses source material (Note: Gaussian approximation often used for straight-line models).

Methods to acquire and use meteorological and other relevant environmental data (e.g., hydrological data for aquatic dilution) in consequence assessments should be commensurate with quantities of radiological and chemical hazardous materials present in the facility and the need to characterize the transport and dispersion of materials during a release. The environmental monitoring program required for consequence assessment should be based on an extension of the general environmental protection program required by DOE O 450.1, Chg 3, for each facility.

If the EPHA indicates that no potential emergencies and releases of material will be classified higher than Alert, no real-time meteorological monitoring capability is necessary beyond that required by other programs (e.g., effluent and environmental monitoring, Clean Air Act compliance). Access to representative meteorological information from non-facility resources, such as the NWS at a local airport, will suffice, as long as that NWS office provides meteorological data that is spatially representative of the DOE/NNSA site and techniques are available to convert NWS parameters to establish an indicator of atmospheric turbulence [e.g., Satellite Applications and Research (STAR), Solar Radiation/Delta-T (SRDT)].

If the EPHA indicates that no potential emergencies and releases of material will be classified higher than a Site Area Emergency (SAE), then the following general criteria for the geographic area within the site boundary can be used:

- Sufficient continuous real-time meteorological information should be available to characterize atmospheric dispersion within the entire region bounded by the site boundary. This capability should include a means to determine wind speed, wind direction, and an indicator of atmospheric turbulence (e.g., stability class) via in situ or remote instrumentation or by trained observation.

- Generally, the measuring station providing meteorological input should be located within approximately 2 km of the potential release points. The number and location of meteorological monitoring stations necessary to characterize atmospheric transport and dispersion conditions are dependent upon the number and location of the potential release points, the size of the affected area, and the complexity of the meteorological conditions in the region of transport.

- Calculation models used for consequence assessment should be appropriate for characterizing transport and dispersion conditions specific to the facility and its vicinity. Facility-specific characteristics to be addressed should include height of release points (i.e., elevated, ground level, or mixed-mode), effluent temperature and efflux velocity to establish mechanical and buoyant plume rise from a stack, and building geometry and configuration relative to the release point to establish aerodynamic building effects (i.e., cavity and wake regions). Local meteorological factors to be considered include lake-breeze or sea-breeze formation, penetration, and movement inland; spatial extent of urban heat island effects; configuration of mountain/valley winds; configuration of up-slope/down-slope winds; and other terrain effects that may impact plume transport trajectory and consequence calculations.

If the EPHA indicates potential General Emergency (GE) classification based on postulated emergency release scenarios, the following additional criteria apply in the region of transport:

- A sufficient number of continuous real-time in situ or remote monitoring meteorological data sources should be available to characterize atmospheric dispersion for the area encompassed by offsite areas potentially affected by a maximum radiological, chemical or biological material release. The number of monitoring stations and sophistication of monitoring equipment necessary will depend on terrain complexity and dispersion conditions particular to a DOE/NNSA site. Techniques are available to determine the appropriate placement of instrumentation to maximize characterization of the complex flows and to minimize the number of instruments required to provide sufficient meteorological data for this comprehensive consequence assessment.

- The increased distance and area involved in a more accurate characterization of atmospheric dispersion to the limits of potentially impacted offsite locations will require sophisticated transport and dispersion models. Models available should be able to provide reasonable estimates for any location of interest within and slightly beyond the limits of the EPZ.

The number of monitoring stations necessary to provide adequate real-time data is influenced by the complexity of the local terrain. Simple terrain is characterized by being generally flat or relatively flat with no capacity to induce complex airflow patterns. Accordingly, one monitoring location can describe a wind field at a DOE/NNSA site located in a flat or relatively flat terrain location. Complex terrain airflow patterns are induced either by mountain-valley (i.e., complex-land) terrain features or by land-water (i.e., complex-water) interfaces.

In addition to spatial variability of meteorological parameters in a complex terrain setting, temporal variability of meteorological parameters occurs concurrently with terrain influences and is addressed by NWS regional forecast information, regardless of terrain complexity. Note that the comprehensive treatment of transport associated with complex-land and complex-water locations is ***only*** needed if the EPHA indicates significant impacts in the region of transport.

Receptors. As used in this guidance, a receptor is defined as a *point or location at which event severity is determined by estimating consequence impacts on safety and/or human health*. Onsite receptors are facility workers or collocated workers that are in the near field and onsite workers in the far field, but within the site boundary. Offsite receptors are located beyond the site boundary to the boundary of the EPZ. For facilities with Operational Emergency Hazardous Material Programs, human health effects are the primary concern. The calculation of consequences at specific receptors helps answer the following important questions:

- Where is the release going?
- Who will be affected?
- Who will have to be notified?
- Who will have to respond?
- When will the consequences occur?
- Where will the consequences be above classification or protective action thresholds?

Estimating consequences at specific receptors provides information that is used in event categorization and classification, protective action decision-making, onsite and offsite notifications, placement of confirmatory field monitoring teams, potentially impacted facility habitability determinations, determination of evacuation routes and assembly areas, reentry planning, termination of emergency response, and recovery planning and activities. Onsite receptors of interest include site facilities, facility and site boundaries, facility workers, collocated workers, assembly areas, evacuation routes, and emergency response facilities. Offsite receptors of interest include population centers, special populations (e.g., hospitals, schools, nursing homes, day care centers, prisons), evacuation routes, relocation centers, environmental monitoring stations, and Ingestion Planning Zone (IPZ)-related locations (e.g., water supply intakes, farms, dairies, vegetable gardens, meat animal locations, food processing plants).

It is recommended that all receptors of interest be identified and documented for each facility requiring an EPHA. This listing, and a map that provides a spatial representation of the receptor locations, should be made part of the documentation provided to the CAT staff. Information for each receptor should identify the wind direction that would affect the receptor, the name of the receptor, distance from facility, and plume travel time for a wind speed that is indicative of a 95% meteorological condition (e.g., generally an F-stability class with a light wind speed). This wind direction-receptor relationship is only valid for straight-line airflows over essentially flat terrain. Wind direction-receptor relationships are much more difficult to ascribe in complex terrain settings.

Field Monitoring Data. Field monitoring data provides event scene and down-wind readings of contamination levels on ground level surfaces or airborne readings of radiation levels or chemical concentrations. This data is integrated with calculation results to obtain best estimates of the consequences. Because of the limitations of each source of consequence information, neither modeling predictions nor monitoring data provide the total assessment of consequences. Field monitoring readings can either validate the calculations or provide the means for adjusting the results. However, since the monitoring cannot be accomplished over the whole region of interest, modeling can fill in some areas where data is absent. During the earliest phase of field monitoring, the primary goal is to determine if a detectable plume was actually released and, if so, to verify the general direction of travel and begin to outline the area of impact.

During monitoring of a hazardous material release, standard radiation protection or industrial hygiene techniques should be employed to ensure the protection of monitoring personnel. This includes the issuance of appropriate personnel protective equipment and the establishment of dose rate or exposure thresholds, where monitoring teams are to turn back. (In practice, this is easier to implement for a radiological release). To accomplish the initial goals of field monitoring, it is not essential to locate the plume centerline or region of highest dose or exposure. Readings that establish the edge(s) of the plume or region of deposited contamination will usually be adequate. This requires the exercise of good judgment and experience when using the field monitoring data, especially when using such data for the back-calculation of the source term.

It should be noted that the source term estimate and transport and dispersion calculations would also provide both preliminary planning and continuing operational support to guide field monitoring efforts throughout the assessment process. In addition, field-monitoring results can also provide data useful for bounding transport and dispersion calculations and modifying input parameter selection. Additional field-monitoring data may be available to support consequence assessment, if environmental radiation effluent monitoring programs are in place using installed air monitors, area radiation monitors, or in-plant surveys. Further discussion of field monitoring can be found in Appendix H.

6.7.2 Analyze and Calculate

The next consequence assessment task is the analysis of the input data and its use in performing various calculations to produce estimates of the source term, transport and dispersion calculations, and determination of health effect estimates. During COA, the CAT should use models or methods to improve the quantitative accuracy of consequence estimates, including all real-time information, as available. Depending on the hazard level, the methods need not be more sophisticated than those used during TIA. For moderate- to high-hazard facilities, computer-based modeling systems are used to increase the accuracy of the estimates. Typical computer-based modeling systems have more features, including: the ability to characterize wind fields in complex regions of transport; more sophisticated, flexible, detailed, or accurate input information; and more sophisticated, detailed, or accurate output products. However, more time, knowledge, skill, and training are required to use them effectively. In general, a facility/site should design and employ the simplest consequence assessment system (manual or computer-based) that will meet its goals for accurately characterizing transport and dispersion conditions in support of emergency response. Calculations associated with estimates of the release of hazardous materials are discussed in more detail in the following sections.

Source Term Estimation. The generic formula for determining a source term is discussed in the DOE G 151.1-2, Chapter 2 and some recommendations for determining source terms during emergency response follow:

- Gather and present information on source terms for a range of events and conditions. Key information should have been developed as a part of the EPHA process. This information should be extracted from the EPHA and other references and placed into a format that can be used as a quick reference by response personnel.

- Correlate the predetermined source terms with observed conditions (i.e., personnel observations, instrument readings, current inventory information, monitoring results, etc.) Users of the documentation should be able to compare available information to the predetermined source terms to select the one that is most appropriate for the event at hand or to apply the best modifying factors. In the absence of any other information, the user may simply identify the affected building and use the most conservative source term listed, based on the known inventory of hazardous materials in the building.

Transport/Dispersion Estimates. Calculation methods and resources should be available for projecting the quantitative impact of an actual or potential release of hazardous materials within the EPZ. Most standard methods/models for calculating consequences focus on airborne release assessments, driven by the inhalation pathway. However, other credible dispersion pathways (e.g., gamma shine, skin absorption, ingestion) may need to be addressed, depending on the hazardous materials present and the results of the EPHA. The airborne release pathway typically represents the most time-urgent situation, requiring a rapid, coordinated response. For elevated releases of gamma-emitting isotopes, the gamma shine dose pathway is more time-urgent, especially near the release point. Ingestion pathway calculations (cf. Appendix E) are of primary interest during recovery after the emergency has been terminated.

Releases to aquatic, ground, and groundwater pathways do not have the same time-urgency since near-term doses are not likely. Therefore, calculation models for these pathways should be developed on a case-by-case basis if applicable to the individual facility.

The level of sophistication of calculation methods and models should be commensurate with facility/site-specific source terms, atmospheric transport and dispersion considerations driven by local terrain characteristics, and the potential severity of the consequences of a release. The following general guidelines should be applied:

- If the EPHA indicates that potential emergencies and releases of material will not be classified more severely than Alert, then consequence assessments can make use of simple calculation methods (e.g., straight-line PC-based Gaussian models) for post-event analysis. Sophisticated calculation methodology and models for consequence projections are usually not needed under these circumstances. Plans and procedures should identify protective actions to be implemented for personnel near the event scene.

- If the EPHA indicates that no accident scenario analyzed will result in an event classification higher than a SAE, then protective actions may be required beyond the facility boundary and throughout the site. The calculation methods and models should yield a quantitative prediction of the impact in a time that is short with respect to the time needed to carry out personnel protective actions. The calculation would typically involve the modeling of the release on a PC. Actual source term and environmental data input to a computer model may be provided by on-line systems or manual entry. The method/model used should be customized, as necessary, to address each major type of radiological or chemical release scenario. Consequence assessment may be based on complex computer (non-PC) calculations for a slower-paced event sequence. Advanced capabilities, such as the ability to perform rapid recalculations to consider changing conditions or information, including back-calculating a source term from field monitoring data, or analyzing a range of hypothetical situations, may be desirable.

- If the EPHA indicates a potential for an emergency classification of a GE, then a release may require personnel protective actions beyond the site boundary, and the consequence assessment methods should be capable of producing estimates to or beyond the limits of the EPZ. In addition to those capabilities discussed above under a SAE, the projection methods and models provided should yield a quantitative prediction of the offsite impact sufficient to allow timely (i.e., approximately 15 minutes) offsite protective action recommendations. Advanced features, such as on-line data entry, may be necessary to meet the time requirements for notification.

Three tiers of calculation methods have been identified to address consequence requirements:

- **Elementary.** Pre-calculated consequences (e.g., tabulated EPHA, Safety Analysis Report (SAR) results, ready reference graphs and figures). The accuracy of these consequence assessment tools is limited, as they usually provide plume centerline results at a single receptor. However, they are easy and quick to use.

- **Intermediate.** Simple consequence calculations (e.g., straight-line Gaussian model) using a PC-based computer model.

- **Advanced.** Advanced computerized methods capable of more realistically modeling atmospheric transport and dispersion when operated and interpreted by a subject matter expert. Plume trajectories and complex footprints are predicted more accurately. Although generally slow and more difficult to use, recent advances in computer technology are reducing the computation times.

Elementary methods are appropriate for low hazard facilities and for TIAs for most moderate hazard facilities. Intermediate methods are sufficient for all facilities with simple meteorological flows in the region of transport. Advanced methods are recommended for COAs at high hazard facilities at sites with complex meteorological flows in the region of transport.

Health Effects Estimates. Consequences are calculated for comparing the results with criteria that relate to acute or short-term human health effects. Relevant human health criteria for radioactive materials are the Environmental Protection Agency (EPA) PAGs, which are expressed in units of radiation dose as Total Effective Dose Equivalent (TEDE). For an atmospheric release, the TEDE is directly proportional to the total amount of the radioactive material released during the period of exposure. Accordingly, variation in release rate over time is of much less concern than the total quantity of a radioactive material released during the period of assumed exposure. For extended release times, the assumed period of exposure is usually taken into account when determining the applicable emergency classification or protective actions.

The relevant human health criteria for most non-radiological hazardous materials are the Level 2 values of the following, listed in order of preference: AEGLs promulgated by the EPA; ERPGs published by the American Industrial Hygiene Association (AIHA); and TEELs developed by DOE. In general, these values are expressed as peak concentrations in air "below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms, which could impair an individual's ability to take protective action." A key consideration in using these values as discriminators for human health evaluations is that exposure to some materials at a concentration exceeding the available Level 2 value for a shorter period than one hour may be enough to produce the health detriment. As a result, it is recommended that these concentration criteria be compared to a calculated maximum **15 minutes** average concentration for purposes of determining appropriate protective actions. In order to accomplish this, the consequence assessment tools should be able to determine non-radiological release rates, as a function of time, which will permit the calculation of maximum **15 minutes** average concentration at receptors of interest. For exposure periods less than 15 minutes, concentrations may be calculated over shorter time period or exposure duration. If the hazardous material is of the type for which short exposure to very high concentrations can produce severe health effects (e.g., hydrazine), it is important to use a consequence assessment tool to evaluate the consequences of a very short-duration or near-instantaneous release, because these scenarios produce the highest instantaneous concentrations. [Cf. DOE G 151.1-4, Appendix F]

The bases for selection of methods and models should be well documented and should include the results of any benchmarking, Software Quality Assurance (SQA), and Verification and Validation (V&V). The Defense Nuclear Facility Safety Board (DNFSB) issued Technical Report Number 25 (DNFSB-25), emphasizing the importance of using a model with an adequate SQA in its pedigree.

Consistency among models used by DOE Headquarters, Tribal, State and local agencies, and other Federal agencies that are likely to provide assistance during an emergency should also be considered in model selection. It is good practice to model a series of representative release scenarios using the site calculation methods and models. The results can then be compared to those from models used by others for the same scenarios. Significant differences in the modeling results should be identified, explained, and documented. These comparisons will assist in understanding and reconciling results during an actual response. In contrast, calculation methods and models used in preparing EPHAs and developing scenarios for drills/exercises should be identical to, or at least very similar to, those used in the consequence assessment process.

6.7.3 Assess and Estimate Consequences

During the COA process, the CAT uses its judgment to integrate the calculations from the previous task and measurement results, as they become available, into the best overall estimate of the consequences. Methodologies should be developed and implementing procedures written to effectively merge and integrate the field monitoring data with transport/dispersion calculations, taking into account any real-time observations of the hazardous material plume (if visible), in order to produce best estimates of the consequences. As shown in Figure 6-2, this basic task involves an integrated assessment of the source term estimate, consequence modeling calculations, and health effects estimates, from the previous task, and combined with field monitoring data and real-time observations or indicators yielding a best estimate of consequences. Each component of the assessment contributes in varying degrees, depending on the nature of the event and the maturity of the response.

The modeling activities from the previous task include source term estimation (i.e., release amount and associated event, source, and substance information) followed by atmospheric transport and dispersion modeling to project the trajectory, timing, and impacts from the release of hazardous materials (e.g., radioactive or chemical). Any direct observations of the nature of the event and its consequences may also provide key information towards confirming or adjusting the results of the modeling analyses, even early in the response. Visual plume observations (e.g., location, color, orientation) and personnel responses to exposures (e.g., location, timing, and symptoms) can be especially useful indicators, when they are available. Field monitoring information is also a key contributor to a confident assessment and should be implemented and incorporated as early as practical in a response, since these results can be used to validate or adjust the earlier results of the modeling analyses.

Direct observations, consequence modeling results, and field monitoring data are used together to provide an estimate of the integrated picture of the consequences of the release in terms of location, timing, and environmental loading (e.g., air concentration, ground deposition). When decisions are required related to health effects rather than environmental loading (such as radiation dose for protective action decisions), the associated health effects are calculated from the consequence estimates resulting from the integrated consequence assessment. The environmental loading or health effects projections are then converted to a form and units appropriate for comparison to PAC [e.g., dose at key receptors in units of rem (Sievert)].

6.7.4 Communicate

In the fourth basic task, the best estimate of the consequences is prepared for communication in a form that can be quickly and unambiguously used in making emergency response decisions by site emergency decision-makers and affected Federal, Tribal, State and local agencies. Plans and procedures should address a protocol for sharing and transmitting information among response organizations. This protocol should address the units of measure for quantities or parameters of interest including concentration, cumulative exposure and dose, and exposure and dose rate. The units of measurement used in communication and documentation should be the same as those commonly used in the emergency management community. To avoid confusion and misinterpretation in the process or results of consequence assessment, coordination of units and measurements should be included in a procedure and agreed upon with interfacing onsite and offsite organizations in advance. Field monitoring and data collection by facility and site teams, State and local teams, and Federal teams [e.g., Radiological Assistance Program (RAP), Federal Radiological Monitoring and Assessment Center (FRMAC)] should be coordinated to facilitate exchanges and correlation of information. Differences in modeling methods should be well understood by onsite and offsite emergency response personnel prior to an emergency to ensure that there is clear and coherent communication of results among all parties.

The results of the COA should be transmitted to decision-makers in the ERO using formal, written worksheets and notification forms. The following provide for effective communication of consequence results:

- Establish a standard protocol for communication of data/information and results to minimize the propagation of errors.

- To effectively communicate and utilize the results, the types and format of information needed by each response element should be pre-determined as part of the emergency plan and implementing procedures.

- Establish a method to compare results and resolve differences between response organizations.

- Include a process to perform a quality assurance check on assessment results and establish the degree of uncertainty prior to distribution.

- Understand the capabilities of DOE radiological emergency response assets [e.g., RAP, FRMAC, Aerial Monitoring System (AMS), National Atmospheric Release Advisory Center (NARAC)] and plan for incorporation into the assessment process.

Plans and procedures should address recording the parameter values and information used in a consequence assessment calculation. These values should be posted as the current status of the data and transmitted to other response organizations. The means for logging, displaying, and analyzing trends in data relevant to consequence assessment should support decision-making processes for both onsite and offsite organizations.

In order to ensure that communication of consequence assessment information will be effective during an emergency, DOE/NNSA planners should meet periodically, or when major changes to key parameters occur, with all planning partners to discuss issues that affect the comprehension and sharing of information, including changes in the following areas:

- Facility/site hazards
- Onsite and offsite notifications
- Calculation models and methods
- Communication methods

- Terminology
- Presentation of results
- Monitoring systems, techniques, or capabilities

6.7.5 Interface

Finally, the basic task involving interfaces with Program Element ERO representatives ensures that key aspects of the emergency response are updated on a continuing basis as the quality and quantity of information related to the event and release parameters increase. As a result of this continuing refinement of information, interfaces with specific Program Element representatives in the ERO related to classification and protective actions ensure that these critical aspects of emergency response remain current and, hence, valid and sufficient to protect the health and safety of the workers and the public. The interface with ERO health and safety personnel ensures that current information is available to plan and maintain adequate protective measures for response personnel. Interfaces with EPI ERO representatives ensure that information and details related to the emergency and associated protective actions that are released to the public and the media are timely, clear and consistent, interpreted correctly, and accurately transmitted. Caveats associated with integrated consequence assessment should be developed carefully to ensure that the information presented is not likely to be misinterpreted.

Pre-planning with EPI staff should include:

- Establishing the format, content, and level of detail of information required to support each interfacing program element within the ERO.
- Identifying and training technical personnel to present results to the media and public.

The interfaces require that consequence assessment results be as reliable and current as can be obtained, based on the status of information and data available at the time. To ensure effective interfaces, calculation models and methods should provide estimates of concentrations, integrated exposures, and exposure rates from released materials at selected receptor points expressed in units or terms that correspond to those used in EALs and for determining protective actions.

6.8 Documentation

Post-emergency knowledge of what was known about the accident, when it was known, and what decisions were made is critical for analyzing the performance of the facility and site emergency response and for providing a legal record of response following an OE, as well as providing a data base for a forensic determination. Also, careful handling of calculations ensures that the most current results are used for discussion, decision-making, and transferring information to outside users, such as DOE Headquarters, offsite authorities, and the media. Details, such as calculation parameters and times, should always be well documented with the associated calculations, and all decisions made should reference the supporting calculations. For these reasons, a formal document control system should be implemented during an emergency to record, sequence, validate, and track the flow and chronology of information and decision-making.

6.9 Quality Assurance

Quality assurance and control of the tools used in consequence assessment, such as the meteorological monitoring system hardware and software and dose modeling hardware and software, should be employed in a manner similar to the control exercised over the procedures used in consequence assessment activities. A quality assurance program is essential since faulty modeling may impact consequence assessment results and personnel protection. A systematic approach should be employed that ensures that consequence assessment tools conform to established functional, operational, and technical requirements. The sophistication of the quality assurance program for consequence assessment tools should be commensurate with facility/site-specific hazards. Several references are provided regarding meteorological systems, computer systems, and quality programs. Quality Assurance requirements for meteorological monitoring programs are addressed in ANSI/ANS-3.11-2000 and revised Chapter 4 of DOE/EH-0173T.

Contractors subject to 10 CFR 830, Subpart A, *Quality Assurance Requirements,* and DOE O 414.1C, *Quality Assurance,* should add quality assurance requirements associated with the emergency management system to the existing quality assurance program and implementing procedures.

Operational considerations relate to reliability and survivability of hardware and software should include such features as uninterruptible power supplies, diesel generator power backup, spare components, back-up methods, and rapid response maintenance. Consequence assessment, computer-based modeling, and meteorological systems need to be available and functional during an emergency. Adverse conditions affecting power continuity, ventilation, etc., are most likely to occur during the time of emergency; thus, adequate planning for contingencies is necessary.

A systematic approach (i.e., SQA) based on a needs analysis should be employed in the development, operation, maintenance, and retirement of software and hardware to ensure that functional requirements are met. Consistency with models used by other facilities that are likely to provide assistance during an emergency; DOE Headquarters; and offsite Tribal, State, and local agencies should be considered in model selection.

Technical requirements should be established that provide for documentation of all software codes, maintenance of hardware components, V&V of the consequence assessment system, and configuration management control of the system after inauguration. Methods and models used in consequence assessment should be documented in such a manner that the analyses and results can be critically reviewed, understood, and, if necessary, reconstructed by independent subject matter experts. Detailed descriptions of the assumptions, methods, and models should be documented in a form that may be referenced (e.g., published technical reports, vendor manuals).

Software subject to 10 CFR 830 software quality assurance (SQA) requirements will find guidance for satisfying the requirements in DOE G 414.1-4, *Safety Software Guide for Use with 10 CFR 830, Subpart A, Quality Assurance Requirements, and DOE O 414.1C, Quality Assurance*.

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APPENDIX E. Ingestion Pathway Calculations for Radioactive Releases

E.1 Introduction

The purpose of consequence assessment during recovery is to provide support for key protective action decisions that occur once the emergency situation is well under control. Planning and supporting consequence assessments following an Operational Emergency (OE) involving the release of radioactive materials will often begin as soon as resources can be made available from the earlier more urgent analyses of the ongoing consequence assessments. Key recovery decisions that may need consequence assessment support include the following:

- Protective actions for workers and the general public from exposure during reentry and recovery activities, including relocation and resettlement
- Relaxation of earlier public protective actions
- Food and water intervention
- Soil and food sampling activities
- Decontamination
- Resumption of normal operations at all affected facilities

The decision-making support required during recovery is an extension of the Continuous Ongoing Assessment (COA) process, but with additional calculations for food and water interdiction actions. Depending on the radioactive material released (e.g., I-131, Ru-106, Sr-90, Cs-137), assessments of impacts on the ingestion pathway can be initiated during emergency response as part of the recovery planning activity.

E.2 Recovery Assessments

At some point in the emergency response, comprehensive and reliable information should be available for consequence projections, and comprehensive consequence projection tools and methods appropriate to recovery decisions have been employed. Moreover, predetermined decision criteria appropriate to the specific recovery actions have already been identified and are documented on worksheets. When the above situation exists and accident mitigation has been essentially accomplished, assessments of the impacts of the radiological release on the ingestion pathway can be initiated, depending on the type of emergency. Planning for the initiation of this latter phase application of consequence assessment generally occurs during recovery. However, for DOE/NNSA sites where ingestion pathway is a sensitive matter to the State and local emergency response organizations, ingestion pathway assessments should be initiated even prior to the implementation of recovery activities.

The length of time for performing the ingestion pathway assessment is strongly dependent upon the type of emergency and other circumstances and requires a graded response. Ingestion pathway consequence assessment is not one-size-fits-all and should be designed for the specific parameters at each DOE/NNSA site location. The ingestion pathway assessment and its associated response are dependent on the type and quantity of radionuclides released, the ingestion pathways specific to the local environment (e.g., locations of potable bodies of water, agricultural and dairy activities), and the consumption characteristics of the local population. The availability of field monitoring equipment and analytical laboratory capabilities also plays a role in the execution of the ingestion pathway assessment.

To perform effective ingestion pathway assessments, the source term should be known with reasonable certainty and a field monitoring and sampling plan should be developed to obtain confirmatory measurements from dispatched field monitoring teams. In cases where a major radiological emergency has been declared and a Federal Radiological Monitoring and Assessment Center (FRMAC) response is already in place, the field monitoring teams will be dispatched from the FRMAC. If all FRMAC assets are called out, this phase of consequence assessment could be quite large and involved, requiring a time-intensive response that could last weeks.

Projected consequences are compared to the decision criteria and consequence-based recommendations are developed. These recommendations are specific to the recovery activities and decisions being evaluated; event classification is no longer within the scope of this phase. In addition, recommendations are no longer focused solely on protective actions, but move towards recovery considerations; information is transmitted to decision-makers in the ERO using formal, written worksheets and notification forms. Notification forms to the Tribal, State, and local emergency response agencies should be modified to include ingestion pathway assessment reporting parameters and ingestion pathway-based protective action recommendations. Moreover, the ability of these response organizations to mobilize interdiction response needs to be considered. The development of the source term, affected ingestion pathway elements, and confirmatory monitoring may take several days.

E.3 Ingestion Phase Assessments

Ingestion phase assessment is a recovery activity. As with other recovery phase assessments, much more will be known about the event and the source term than was available for use in plume exposure (early) phase consequence assessment efforts. However, the plume trajectory, time-integrated air concentrations and ground deposition levels calculated during plume exposure phase assessments can and should be used to identify the geographic areas and specific foodstuffs that may contribute significantly to the ingestion pathway dose.

In the event of a nuclear accident, the limitation on human exposure to radiation may only be achievable by “intervention.” This will probably involve constraints on, or changes in, agriculture, forestry and fisheries practices and upon livestock movement, product harvest, distribution, processing, and trade with implications for the affected communities.

The Food and Drug Administration (FDA) has developed Derived Intervention Levels (DILs) which represent the radionuclide-specific concentration in food present throughout the relevant period of time, that without intervention could lead to an individual receiving a radiation dose equal to the PAG. In the event of an emergency, concentrations in various food types are compared with these levels to make interdiction decisions. The FDA has published guidance and recommended DIL values for ingestion pathway planning and response (FDA, 1998).

The DILs are the specific activity levels at which the introduction of protective measures should be considered. In general, food with concentrations below the DILs has no restrictions on ingestion. Above the DILs, food is not permitted in the food supply. Knowledge of the specific radionuclides that comprise a source term and the characteristics of the ingestion pathway environment (soil-to-crop transfer factors, livestock types, sources of feed and water) can be used to estimate values of air concentration and/or ground deposition during the plume exposure phase that correspond to a DIL in specific agricultural commodities at some later time. The calculated or measured plume concentration (Bq m^{-3}) or surface deposition (Bq m^{-2}) value that suggests a DIL will be exceeded in the future is termed a Derived Response Level (DRL). DRLs are expressed in units of air concentration or surface deposition and can be compared directly with the results of early phase consequence assessment modeling and field measurements to make preliminary ingestion pathway intervention decisions.

As part of the site-specific consequence assessment preparedness effort, each constituent of each source term (i.e., the radionuclides expected to be released in each analyzed event) and its behavior in the environment (i.e., transfer from air to soil to vegetation to animals) need to be evaluated for possible significance to the ingestion pathway dose. By accounting for the deposition on surfaces and vegetation, as well as transfer between soil and plants, plants and animals, etc., site-specific Derived Response Levels (DRLs) can be calculated. When site- and source term-specific DRLs are available, the results of the plume exposure pathway consequence assessment calculations can be interpreted directly to alert responders and authorities to the possibility of significant ingestion pathway doses. This information can be used during the plume exposure phase to:

- Make requests for FRMAC activation or other outside assistance
- Target preliminary sampling of foodstuffs using local response assets
- Advise State and local health authorities regarding the foodstuffs and locations of most concern

For most small releases, this information can also help demonstrate to local authorities and the public the absence of any ingestion pathway dose concerns, thereby avoiding costly and unnecessary boycotting or destruction/loss of foodstuffs.

APPENDIX F. Field Monitoring

F.1 Introduction

Field monitoring is the process of acquiring *in situ* information about the impact of an actual or suspected release of radiological or chemical hazardous material by taking direct measurements in the environment or by sampling environmental media for subsequent laboratory analysis. The resulting data and information are ultimately used to confirm or refine the initial or earlier consequence estimates and, as a body of data is acquired, to characterize the extent and magnitude of the dispersal of hazardous materials in the environment. Types of measured information that can be directly acquired by field monitoring teams include concentrations of contaminants in air, dose rates from radioactive materials deposited on surfaces, and surface contamination levels. Environmental samples, acquired from sampling and subsequent laboratory analysis of soil, water, and vegetation, identify specific contaminants and their concentrations in those media.

Once an event involving the airborne release of a hazardous material is classified as an Operational Emergency (OE) (i.e., Alert, Site Area Emergency, or General Emergency) and the Emergency Response Organization (ERO) is activated, it takes time to assemble, equip, brief and dispatch the field monitoring teams to the desired locations. The time from decision to dispatch until the first data arrives depends on the development of field monitoring plan; assembly and briefing time; the distance that the teams need to travel; the terrain to be encountered and route to be taken; the area to be covered; and the types of measurements and/or sampling activities (e.g., continuous, time-integrated, grab, instantaneous) that are performed.

It requires a period of time to gather a sufficient body of field monitoring data to significantly impact the consequence assessment-protective action decision-making process. Due to the large uncertainties involved with calculating the transport, dispersion and deposition of materials in the environment, especially in regions of complex terrain, a significant number of field measurements are necessary to characterize the impacts from a release to achieve sufficient confidence in the calculations. As a result, field-monitoring data becomes increasingly important to the decision-making process as time progresses. Depending on the nature and magnitude of the release, field-monitoring activities may need to continue well into the recovery phase, including the ingestion phase assessments, in order to gather sufficient data to confidently characterize the contamination in the environment and to support decision making for long-term mitigation (e.g., foodstuff intervention), recovery, and protective actions.

Initial data points can be used to verify that a release has actually occurred, is in progress, or is no longer occurring and can help to determine if the general direction of plume (or surface contamination) travel is consistent with atmospheric transport and dispersion model estimates/predictions. This is especially important at DOE/NNSA facilities/sites located in regions of complex terrain. Field-monitoring information is useful in verifying that current protective actions or protective action recommendations adequately protect those most at risk. This body of information is also useful in confirming the safety and health of the workers and the public associated with the choice of evacuation routes, staging areas, or relocation centers.

As more field-monitoring information becomes available, the monitoring and modeling results can be used to gain confidence in the projected impact area, the projected severity of the impact, and the estimated amount of material released. Thus, a reliable estimate of the general size and shape of the impacted area will start to emerge. This data can be used to develop a systematic plan to subsequently monitor and sample the impacted area in order to ***fully*** characterize the extent of the environmental contamination. The resulting data can be used to support a decision to terminate the emergency response by verifying that the release is no longer occurring, the situation in the affected areas is stable, most areas of contamination have been generally identified, and specific areas are now safe to reoccupy. The resulting data also assists in planning for recovery by identifying and quantifying areas of contamination that may require remediation and long-term protective actions, such as food intervention.

Depending on the extent of the area impacted and the nature of onsite activities and offsite land use (i.e., water supply, dairy production, farming, grazing, etc.), field-monitoring data may be necessary to develop protective actions and/or protective action recommendations for the ingestion pathway. If the area impacted is large, it may take many data points to fully characterize the extent of environmental impact. This effort might require monitoring resources beyond those available at the local DOE/NNSA site. If the extent of contamination is severe enough to require outside assistance from the DOE Assets [e.g., Aerial Monitoring System (AMS), Radiological Assistance Program (RAP), Federal Radiological Monitoring and Assessment Center (FRMAC)], it may take a few days for this assistance to arrive, mobilize, begin to function, and produce useful data. Hence, the DOE/NNSA site Consequence Assessment Team (CAT) should have the ability to use existing data to develop initial protective actions and/or protective action recommendations for the ingestion pathway (see also Appendix E). The FRMAC Assessment Manuals provide assistance in understanding the assessment methodologies and monitoring capabilities necessary to implement this capability.

F.2 Field Monitoring for Radiological Releases

The DOE/NNSA community has been monitoring radioactive materials in the environment for decades and the technologies and methodologies associated with radiological field monitoring are mature. As a result, each DOE/NNSA site that manages radioactive materials has equipment, supplies, procedures, and trained personnel that can be applied to the task of field monitoring for radiological releases. Field monitoring during an emergency response utilizes similar methods, supplies, and equipment to those used during routine environmental and workplace monitoring activities. Additionally, most of the larger DOE/NNSA sites have laboratory facilities equipped to analyze environmental samples, or are near such laboratories.

Much of the available radiation detection equipment is designed for field use, is capable of detecting emissions from a range of isotopes, and has sufficient range of response to be useful under accident conditions. Many DOE/NNSA facilities have installed interior radiation detection equipment (i.e., process monitors in stacks, room area monitors, and room continuous air monitors) that can also be used to help verify and quantify releases of radioactive material. In some cases, a DOE/NNSA site might have permanently-installed environmental radiation detection equipment that can provide continuous field monitoring data.

With the application of proper precautions for team safety and health and development of a field monitoring plan, in addition to employing As Low As Reasonably Achievable (ALARA) principles, it is possible to use field teams to locate, provide a ground level transect of, and track a plume of radioactive materials even while the release is still in progress, or to operate for extended time periods in areas that have surface contamination.

F.3 Field Monitoring for Hazardous Chemical Releases

Field monitoring in response to the release of a hazardous chemical is significantly different than monitoring a radioactive release. Because of the potential immediate lethal consequences to responders from inadvertent exposure to an unknown/uncharacterized concentration of a hazardous chemical, responders should wear personnel protective equipment (PPE), such as clothing that isolates them from the environment (e.g., class “A” or class “B” protective clothing). This equipment greatly reduces personal mobility and the stress and heat generated limit the time that a responder can safely and effectively operate. Under severe circumstances, this equipment is used for search and rescue or to mitigate an ongoing release that is endangering human life. Because of the extreme hazard to response personnel, attempting to characterize a toxic plume while a release is in progress by field monitoring, using methods similar to characterizing a radioactive plume, is generally regarded as impractical and should not be attempted.

Successful use of field monitoring teams during a chemical release usually involves monitoring in locations that require minimal PPE and allow for the use of typical portable industrial hygiene instrumentation. Due to the potentially severe consequences from exposures to hazardous chemicals, one of the first priorities will be to establish whether locations where personnel are sheltered or assembled are safe for continued occupancy (i.e., habitability). Areas in which response personnel operate also need to be verified as safe. As the response progresses, measurements will be necessary to confirm that the release has been terminated, the situation is stable, and areas are safe to reoccupy. Once the emergency response is drawing to a close and recovery planning begins, field measurements and sampling will be necessary to identify areas of contamination that may require remediation and long-term protective actions.

Equipment capable of detecting hazardous chemicals in the environment also has limitations.

- Recent advances in instrumentation have made industrial hygiene equipment more portable and useable in the field. However, in order to equip a monitoring team with the correct equipment, the specific chemical or class of chemical needs to be known before the team's deployment. Decisions related to what monitoring equipment to keep in stock and calibrated should be based on the chemical inventories at the specific facility/site.

- A number of different pieces of equipment may be necessary to detect the types and quantities of hazardous chemicals that could be released. Much of industrial hygiene equipment available is designed for work place monitoring to support health and safety surveys. Often this equipment does not have the upper ranges needed to measure contaminant concentrations that could exist following an accidental release.

- Chemical monitoring equipment is usually not available in large quantities at DOE sites and may be very costly for sites that have numerous hazardous chemicals in their inventories. Also, the number of personnel with the appropriate training and expertise to operate this equipment in the field is somewhat limited. Judgments about chemical field monitoring are needed to ensure that the most cost-effective suite of monitors and supporting equipment are selected and maintained.

F.4 Comparison of Monitoring and Modeling Results

As time progresses, a primary function of COA is to develop a clearer understanding of the characteristics of the release in terms of the actual trajectory of the plume, the doses or concentrations experienced by receptors, and the resulting levels of contamination. Comparing monitoring and modeling results can help to answer some important confirmatory questions related to these issues, such as:

- Did a significant release (i.e., measurable in the environment) actually occur?
- Is the projected direction of the plume correct?
- Is the projected area of impact right?
- Is the estimated amount of material released right?
- Are the estimated consequences correct?

Monitoring data that can be compared with modeling results include real-time air concentrations, air concentrations from an in-place monitoring network, ground deposition measurements, and aerial surveys. Monitoring limitations, however, may impact the nature and quantity of field monitoring data available for comparison. General limitations include personnel safety, logistics, and monitoring techniques and methodologies.

- **Personnel Safety** can limit the ability to send teams into areas of suspected contamination.

  - The unknown nature or magnitude of the hazard may require the maximum level of PPE, which imposes a high degree of physical stress on personnel, limits their mobility, and places a time limit on operations.

  - Available PPE may not be capable of adequate protection (e.g., protection against high levels of gamma-emitting radionuclides).

  - Inability to safely decontaminate response personnel may limit activities.

  - Weather conditions may pose safety concerns.

- **Logistics** can limit the ability to collect field-monitoring data. The number of available trained personnel, quantity of monitoring equipment/supplies, accessibility of terrain, and the availability of transportation and communication may limit the number of teams that can be placed in the field.

- **Monitoring Techniques and Methodologies** can make location of contamination in the environment problematic and can cause delays in the availability of monitoring results (e.g., use of air monitoring techniques).

  - The type/quantity of material may make detection difficult with portable instrumentation, requiring sampling with follow-up laboratory analysis.

  - Material that does not deposit on surfaces cannot be detected once the plume has passed.

  - The timing of data collection before, during, or after plume passage can have an impact on the ability to compare field data with modeling estimates.

To facilitate comparison, specific modeling products should be prepared, including:

- A map of the plume footprint

- A map(s) of atmospheric concentrations

- A map of ground deposition

- A composite map showing where, when and type of measurements taken

- Tabular record of laboratory analysis results of field samples

- Tabular record of analysis results obtained at any pre-designated monitoring/sampling locations

These modeling output products should use measuring units that can be easily compared to those used in field data. Input parameters and assumptions, such as meteorological conditions, duration of release, release height, receptor exposure time, and deposition velocity, should be available and easily associated with the outputs. The monitoring and modeling results should be compatible for a valid comparison. There should be a match (or established basis for comparison) between units, locations, plume-transport time, sampling times, and sampling durations.

The following are types of field measurements and samples that could be obtained:

- Continuous monitoring or a series of samples showing changing concentrations over time
- Time-integrated samples, usually from fixed monitoring sites
- “Grab”/instantaneous samples, usually from sampling teams
- Plume boundary at ground level, if plume or deposition footprint can be measured
- Ground-level transect of plume, if possible and safe to measure
- Vertical transect of plume, but not ordinarily possible
- Environmental samples (e.g., vegetation, soil, and water)

If teams are equipped with field deployable samplers/monitors, they can be placed and left in the anticipated path of the plume to gather measurements of time-integrated concentration, changing concentrations, or exposure/dose rate (depending on instrument capability) over time. This type of data may also be available from fixed monitoring stations that are in the path of the plume.

It is likely that there will be errors in both the monitoring and modeling results. For example, errors may occur in the area/shape of the plume footprint, horizontal placement of plume footprint, vertical distribution of the plume, maximum impact within plume footprint, and timing of plume passage. Early in the field monitoring effort, it may not be possible to differentiate between sources of the errors (e.g., may not be able to separate the error in timing from that in plume placement). As more field-monitoring data becomes available,` the confidence in the data and resulting estimates of consequence results should increase. These differences between calculation and measurement results define an ***envelope of uncertainty*** that bounds the consequence estimates.

When initial field data are received, <u>confirmation</u> of several aspects of the consequences can begin in order to verify that a significant release (i.e., measurable in the environment) has occurred. These include:

- **Impacted Area.** Involves identification of the plume boundary or area of ground contamination and verifies that the predicted plume direction is correct. A practical approach involves the following steps:
  - Begin with the projected plume path.

- Detection techniques will involve:
  - Sample/monitor for air concentration and/or ground deposition; or
  - Retrieve fixed samples or dispatch sampling teams.
- Move from outside projected impact area toward plume, until the plume is detected.
- Move back, away from the plume, and sample toward the plume, either further upwind or downwind, to establish boundaries of the deposition.

- **Severity of the Impacts.** Involves comparison of maximum measured impact to maximum predicted value. A practical approach involves the following steps:
  - Find the plume.
  - If safety allows, conduct at least one ground level transect of the plume (2 or more preferred).
  - Compare maximum observed impact along transect (concentration or deposition) to maximum impact modeled, at same distance along plume trajectory.

- **Amount of the Release.** Involves comparison of the integrated plume content along a transect using measured and modeled values. A usually viable approach involves the following steps:
  - Find the plume.
  - If safety allows, conduct at least one ground level transection of the plume (2 or more preferred).
  - Conduct at least one vertical transection of the plume (if possible), ***OR*** assume that the actual vertical structure matches the modeled vertical structure.
  - Integrate the impact (concentration or deposition) along the transection for both observed and modeled results.
  - Compare integrated impact along the monitored transection to the integrated modeled impact along a transection at the same distance along the plume trajectory.

There are several reasons why the plume or ground deposition may not be immediately found. The quantity released may be too small to be detected using available portable instrumentation; in this case, the plume may be detected/confirmed later using sample results and laboratory analysis. The plume may be in a different location than projected. The plume may not have been transported to the present location of the field monitoring team. If the release point is elevated, the plume may still be overhead. If the plume cannot be found and the release was assumed to be at ground level and not extremely buoyant, the field teams should continue monitoring in a pattern moving across the projected path of the plume, while moving towards the point of release, until a detectable reading is obtained. If the release was elevated or the plume buoyant and the material is expected to deposit on surfaces, it may be necessary to send at least one team in a cross plume search pattern towards the point of release and another team on a down wind search pattern. If the material is not expected to deposit surface contamination, it is possible that the plume could completely dissipate before it is located.

Field data and the modeling results will not agree exactly when compared. Some of the possible reasons for these differences are:

- The amount or release rate may be different then estimated.
- The vertical distribution of the plume may differ from the model assumption.
- The deposition may differ from that estimated.
- The timing of plume passage may be different then expected.
- The model is simply an imperfect representation of reality.

As more data becomes available, it should become easier to identify the condition(s) that contribute to the differences. Re-running the models and adjusting the input parameters and assumptions to try to achieve better agreement with the field data can also provide insights into the reasons for the differences.

Ultimately, it may be difficult or impossible to account for all of the factors which impact the ability to reconcile the differences between the calculation and measurement results. In spite of this possibility, the consequence assessment team should combine the calculation and measurement results into the best overall picture using their judgment of the level of confidence for each piece of information. The amount of field monitoring data to adequately support comparison may not be available until after the emergency response has been terminated, and even then it may be difficult to interpret. However, the body of field monitoring data and comparisons to modeling results will always prove to be useful in reconstructing actual impacts in the investigation that follows any emergency response.

F.5 Field Monitoring Team Equipment and Resources

Equipment and supplies designated for the use by field monitoring teams should be identified prior to an emergency and, if possible, prepared and stored for use only during an emergency. The means of transportation for its use by field teams during an emergency should also be identified. Vehicles should be readily available to support a response at all times and capable of holding all equipment and supplies for easy access and use during monitoring activities. In areas where weather and/or terrain are a significant factor, four-wheel drive vehicles should be considered.

Radio and back-up communication equipment should be available to field teams and CAT personnel responsible for field team direction, control and data transmission. Radio frequencies chosen should not be shared with other high traffic activities.

Laboratory resources for the analysis of field samples (e.g., soil, water, and vegetation) should be identified and a means for sample handling and transporting should be designated. Many DOE/NNSA sites have onsite laboratories for the analysis of environmental samples for radioactive contaminants. It may be necessary to establish a contractual relationship with a commercial laboratory for the analysis of samples containing chemical contaminants.

F.6 Field Monitoring Team Preparations

The process of taking field measurements may be very similar to that used for routine environmental sampling, particularly for radiological measurements, and these procedures can serve as a starting point. Field monitoring teams should have the proper skills and knowledge to accomplish their tasks, including:

- Proper use of instrumentation
- Knowledge of field measurement and sample collection methods
- Familiarity with data forms and data recording
- Knowledge and use of communication protocols
- Experience with data transmittal procedures

CAT members who support and direct field monitoring activities have responsibility for the following:

- Team briefings
- Team health and safety
- Dispatch and control of field teams
- Utilization of radio communication protocols
- Prioritization of monitoring activities and allocation of resources
- Transmission and recording of data
- Data analysis and interpretation
- Dissemination of results within the ERO

Personnel for field monitoring team assignments should be identified, provided with the required training, and assigned to the ERO roster. If both chemical and radiological release hazards are possible, both health physics and industrial hygiene personnel will be necessary. Field monitoring training should be developed for radiological field team members, hazardous chemical field team members and CAT members.

F.7 Field Monitoring Team Recordkeeping

Depending on the length and complexity of the field monitoring effort, a large body of data and information could be generated over several days or weeks. The ability to accurately record all information relevant to each data point is necessary to implement and execute a systematic monitoring process and provide a permanent legal record of the results. Thus, an efficient method should be developed for recording, archiving, assuring quality, and displaying field monitoring data.

7. PROTECTIVE ACTIONS AND REENTRY

7.1 Introduction

The purpose of this chapter is to assist DOE and NNSA field elements in complying with the DOE O 151.1C requirement that protective actions be promptly and effectively implemented or recommended for implementation, as needed, to minimize the consequences of emergencies and to protect the health and safety of workers and the public. Protective actions can be implemented individually or in combination to reduce exposures from a wide range of hazardous material types. Such protective actions can include evacuation, sheltering, decontamination of people, medical care, ad hoc respiratory protection, control of access, shielding, radio-protective prophylaxis (e.g., administration of stable iodine, chelating agents, and diuretics), control of foodstuffs and water, relocation, decontamination of land and equipment, and changes in livestock and agricultural practices. Protective actions should be reassessed throughout an emergency and modified as conditions change. Reentry activities, which involve reentering a facility or affected area that has been evacuated or closed to personnel access during the course of the emergency, should be planned, coordinated, and accomplished properly and safely.

The guidance focuses on emergency management planners responsible for developing pre-planned protective actions and on decision-makers responsible for evaluating conditions during an emergency by assessing current protective actions to ensure that they are sufficient to protect the health and safety of responders, workers, and the public. The guidance also addresses the planning and coordination that should accompany each reentry activity during response.

This chapter is designed primarily for facilities/sites and activities that are required to implement an Operational Emergency Hazardous Material Program and is directed at operations and emergency management staff at Field Elements and operating contractor organizations responsible for DOE/NNSA facilities/sites and activities.

7.2 General Approach

The International Commission on Radiological Protection (ICRP) has issued recommendations and guidance on planning for protective actions. The objectives and principles described by the ICRP and endorsed by the International Atomic Energy Agency (IAEA) are specific to radiological accidents, but are also useful in planning protective actions for hazardous material programs in general. These principles are:

- Severe early health effects should be avoided by taking protective actions to limit individual doses or exposures to levels below the threshold for those effects.

- Risk to individuals should be limited by taking protective actions, which produce a positive net benefit to the individuals involved (i.e., the risk to the individual from taking the protective action is lower than the risk from exposure or dose that is thereby avoided.)

- The overall risk to workers and the public should be limited, to the extent practicable, by reducing the population/collective dose (or exposure). This principle applies to limiting both the dose to emergency workers and to the general public.

The World Health Organization (WHO) and the ICRP have identified protective actions (see Section 7.1) that can be implemented to reduce exposures from a wide range of hazardous material types.

At DOE/NNSA facility/sites and activities, protective actions include measures taken to prevent or minimize potential health and safety impacts on workers, responders, or the public from the release of hazardous materials. Protective Actions (PAs) will be applicable to the workers and public onsite, while Protective Action Recommendations (PARs) apply to the public outside the site boundary. The DOE/NNSA site has the authority to implement PAs onsite to protect workers and other onsite populations, while only local authorities can enforce the implementation of PARs to protect the offsite public.

Evacuation and sheltering (supported by accountability) are typically the primary protective actions that would be implemented during an emergency at DOE/NNSA sites/activities or recommended to offsite authorities for their implementation. The remaining protective actions (e.g., decontamination, medical care, access control, shielding) may also be applicable to onsite or offsite agency plans, depending on the results of the Emergency Planning Hazards Assessments (EPHAs) for the facilities on the site.

Reentry is a planned emergency response activity directed by the Emergency Response Organization (ERO) to accomplish a specific objective. Reentry activities are typically time-urgent, performed during an emergency response, including such activities as hazard mitigation, damage control, and accident assessment. Reentry for search and rescue is by necessity time-urgent; its use and urgency will be based on the incident, usually determined by the Incident Commander (IC). Some activities performed during reentry may involve entering a facility or affected area in which hazardous materials may have been released. For this reason, reentry has been included with protective actions, since the protection of the emergency workers involved in the activities is an essential component of reentry planning. Hazardous material exposure limits will guide planning for these potentially dangerous activities by determination of stay-times, exposure criteria, and guidelines for controlling exposures in various types of emergencies.

The protective action process applicable to DOE/NNSA sites and activities includes: developing criteria for initiating protective actions; determining the affected area; onsite and offsite protective actions; determining Emergency Action Level (EAL)-specific pre-planned initial protective actions; actions taken in support of or subsequent to initial protective actions, such as accountability, decontamination, and record keeping; and other protective actions available during the initial response and as part of the later longer-term recovery phase. Finally, planning for and conduct of reentry activities is discussed, focusing on the protection of emergency responders.

7.3 Protective Actions

7.3.1 General Concepts

The bases for planning protective actions are the results and analysis of the facility/site- and activity-specific hazards contained in the EPHA. The potential consequences and health effects are determined from the EPHA and compared with Protective Action Criteria (PACs). Once the level of hazard and the consequences of a release are identified, the actions necessary to protect the health and safety of the workers and the public can be established. Determining when protective actions are necessary and where those actions should be implemented is the primary concern when planning protective actions.

The planning process begins with development of preplanned initial protective actions. This includes establishing a PAC that determines when protective actions should be initiated, specific protective actions to implement or recommend, and the specific geographic area, facilities, and offsite populations affected. These initial protective actions should be directly linked to the categorization/classification process so that the issuance of protective actions is automatic upon declaration of an Operational Emergency (OE) (i.e., Alert, Site Area Emergency, or General Emergency). Such preplanned protective actions should be located in the facility Emergency Plan Implementing Procedures (EPIPs) associated with EALs. The development of protective actions is followed by the determination of those to be notified and provided information in order to implement protective actions and respond safely. The next step in planning for protective actions involves the development of plans and procedures for determining, implementing, and recommending protective actions. Finally, as the last step of the planning process for protective actions, ERO positions responsible for determining, recommending, and implementing protective actions are established.

Preplanned initial protective actions will be implemented very early in the response, when little information is known and what is known may be confusing, contradictory, and uncertain, especially information concerning the severity of the incident. Actions need to be taken quickly to protect workers and/or the public. Experience shows that preplanned initial protective actions are most effectively implemented when planning includes specific information on how evacuation will be accomplished, such as where workers are expected to relocate and how accountability is to be accomplished. Evacuation of affected facilities and sheltering in collocated facilities is often implemented early during an event and can be reassessed as results of consequences assessment activities become available.

During emergency response, the selection of the specific protective actions to be implemented onsite or recommended for the offsite public is integrated with the consequence assessment process discussed in Chapter 6 of DOE G 151.1-4. The primary objective of the consequence assessment process is to provide timely and useful information to assist emergency response decision-makers in making informed decisions to protect people (e.g., workers, the public, and responders) from the potential consequences of a release of hazardous materials.

During the Timely Initial Assessment (TIA) phase of consequence assessment, the emphasis is on confirming that the initial protective actions were accurate, appropriate, and conservative. Once Continuous Ongoing Assessment (COA) is activated and additional information is acquired about the event, including the actual release and status of mitigation of the event, reevaluation of protective actions will begin. The reevaluation of protective actions/recommendations is a product of COA and is performed throughout the emergency response. Evaluation of the habitability of areas being used by responders and sheltered personnel is part of the continuing evaluation for protective actions. This evaluation of habitability can also include allowing personnel to reenter facilities that had been evacuated.

The following sections provide guidance for planning the implementation and recommendation of protective actions. First, criteria for the initiation of protective actions are discussed generally, and specifically for radioactive and chemical toxic materials. The determination of the area to which the protective actions will be applicable follows. The most effective protective actions for onsite workers, evacuation and sheltering, are presented, followed by a section devoted to offsite PARs. The complex and dynamic environment that will likely exist during an emergency is described in terms of its influence on protective action decision-making. The development of EAL-specific preplanned initial protective actions, based on the results of the EPHA analyses of scenarios, is addressed. The protective actions section ends with a description of follow-up activities, accountability and decontamination, and a brief introduction to other protective actions.

7.3.2 Protective Action Initiation

PACs are predetermined concentrations, doses, or exposures of airborne hazardous materials at which protective actions will be initiated or recommended for initiation. Planning for emergencies at DOE/NNSA facilities/sites and activities includes selecting or developing these criteria for protective action decision-making. Emergency procedures for classifying OEs and for implementing or recommending protective actions should also incorporate these criteria.

For each specific hazardous material identified during the EPHA process, the associated PAC should be expressed in units that can be readily correlated with both the potential for health impact (e.g., peak concentration, cumulative dose or exposure) and information that will be available to onsite and offsite decision makers during an emergency event, such as observable event indicators, results of consequence calculations, or measurements.

- All facilities and activities on a given DOE/NNSA site should use the same PAC for a particular hazard and that PAC should be applied to both onsite and offsite personnel.

- Facility indicators and operating parameter values corresponding to hazardous material releases that will exceed PAC should be identified. They should be incorporated into facility response criteria and/or EALs to ensure that the person responsible for determining the emergency class and initiating the emergency response recognizes the need for prompt protective action.

- Two or more PAC may apply to a particular event or condition (e.g., a mixture of several chemicals or a chemical agent and a radioactive material released together). Unless a mixture of chemicals has been characterized and the health effects of the components of the mixture are determined to be independent of one another, the Chemical Mixtures Methodology (Craig, 1999) or the Automated Chemical Mixtures Methodology available from the Subcommittee on Consequence Assessment and Protective Actions (SCAPA) Web Page can be utilized. (Cf. www.orau.gov/emi/scapa/WorkingGroups/chemmixtures.htm and www.orau.gov/emi/scapa/healthcodenumbers.htm).

- The same PAC should be used for onsite transportation activities as for fixed facilities. However, it should be recognized that for transportation events occurring offsite, local authorities might take action independent of DOE/NNSA, based on other criteria. Many offsite authorities rely on the Department of Transportation (DOT) *Emergency Response Guidebook (ERG2004)* for determining protective actions for transportation events involving hazardous materials.

A complete discussion of the definition and use of PACs is presented in DOE G 151.1-2, Appendix F.

Radioactive Materials. The PACs for releases of radioactive material are contained in the Protective Action Guides (PAG) promulgated by the Environmental Protection Agency (EPA), in *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents*. DOE O151.1C specifies that these PAGs be used at DOE/NNSA sites for comparison with exposures resulting from radioactive hazardous material releases to determine the appropriate emergency class and associated protective actions.

Chemical Hazardous Materials. In accordance with the requirements of the Order, the following PACs for chemicals are listed in ***order of preference***:

- **A**cute **E**xposure **G**uideline **L**evels (AEGLs), promulgated by the EPA

- **E**mergency **R**esponse **P**lanning **G**uidelines (ERPGs), published by the American Industrial Hygiene Association (AIHA)

- **T**emporary **E**mergency **E**xposure **L**imits (TEELs), developed by DOE for use until AEGLs or ERPGs are available

Since a Federal Advisory Committee approves AEGL values, they are preferred over ERPG values for several reasons. First, EPA issues more exposure duration information for each chemical. For example, ERPG values are based on a one-hour exposure, while

AEGL values provide exposure guidelines for 8 hr., 4 hr., 1 hr., 30 minutes, and in some cases a 10-minute exposure for especially toxic chemicals. Secondly, AEGL values are reviewed and approved by consensus of a large number of Federal and state organizations, private industry, and other public and private organizations. Lastly, the AEGL values are peer-reviewed with final recommendation and approval by the National Academy of Sciences.

Since AEGL or ERPG values have been developed for only a limited number of chemicals, the DOE has developed TEEL values for use as temporary alternatives. The TEEL database, listing TEEL values calculated to date, can be found at http://www.hss.energy.gov/HealthSafety/WSHP/chem_safety/teel.html. TEEL values for chemicals not listed in the database can be requested through links found at http://orise.orau.gov/emi/scapa/teels.htm or obtained by utilizing the methodology documented in *Derivation of Temporary Emergency Exposure Limits* (Craig, 2000).

7.3.3 Determination of Affected Area

Planning and implementing protective actions requires the determination of the potential area affected by the release of hazardous material. The distance that a PAC can be exceeded should be established for each scenario from the EPHA. Plume transit time, expected duration of the release, and the time required to warn workers are all factors to be considered in developing preplanned initial protective actions. Knowledge of the geographic area within which PAC has been (or will be) exceeded is necessary for decision makers to effectively apply those criteria.

During an event and after preplanned initial protective actions have been implemented, consequence calculations and field measurements should be used to refine the area affected by a hazardous material release. Real-time consequence projections may be calculated during a release event, or calculations may be performed in advance for various combinations of release magnitude and dispersion conditions, and the results tabulated for easy reference.

Field measurements should be used to confirm the results of calculations and to refine estimates of the affected area. Reliance on field measurement results as the primary basis for protective action decisions should be limited to those materials and exposure pathways for which PAC are not likely to be approached in the time necessary to take measurements and analyze the results (such as food pathways).

The facility/site emergency plan for determining the affected area should be coordinated with the plans of offsite officials to ensure mutual understanding of the methods to be used, the type of results likely to be obtained, and the bases for any protective action recommendations that DOE/NNSA may issue. If the DOE/NNSA activity and the offsite authorities use different calculation models or measurement methods, differences should be examined and understood during the planning process to ensure that they do not cause confusion or delay in selecting or executing protective actions.

7.3.4 Evacuation and Sheltering of Workers

Facility plans and procedures should include criteria for evacuation or sheltering of workers and return of workers to facilities if it is determined that no hazard exists. These criteria, when associated with initial protective actions, should be related to event categorization or the declaration of certain emergency classes based on specific EALs. The effectiveness of sheltering-in-place versus evacuation for different types of events should be considered in establishing criteria.

Facilities should ensure that their communications systems allow rapid communication of protective actions to all affected workers. A method should be employed that ensures emergency managers that affected workers have been warned and are implementing protective actions.

Evacuation is the removal of people from a geographic area that is either being impacted or is expected to be impacted during the early (plume exposure) phase of a hazardous material emergency. (*Relocation* is the term generally applied to the removal of people from affected areas in later phases of an emergency, due to residual hazardous material on surfaces or elsewhere in the environment).

Evacuation can generally be considered 100% effective for reducing hazardous material exposures and resulting health impacts, but only if it can be accomplished before the hazard is actually present in the location being evacuated and only if the people can exit the affected area without encountering the hazard while they are in transit. Accordingly, there are several important aspects to the decision to select evacuation:

1. Since evacuation is fully effective only if it can be accomplished before plume arrival, the decision to evacuate usually hinges not on its effectiveness but on the following:

    - Whether it can be accomplished before plume arrival, and
    - The health impacts that might occur if the plume arrives during the evacuation when people are completely unprotected.

    Balancing a potential short-duration unprotected exposure while evacuating against the potential longer-duration exposure that might be incurred in sheltering are the trade-offs. The protection afforded by sheltering goes down with increasing duration of the release.

2. Except for emergencies that affect very small areas and distances (i.e., a few hundreds of meters), evacuation nearly always requires some type of transportation resources. Thus, any decision to evacuate should take into account whether the transportation resources:

    - Will be available where needed in the required time,

- Can accommodate the number of people expected at each location, including persons with special needs, and
- Can move them out of the affected area in time to avoid exposure to the plume.

Because cars, vans and buses provide little or no protection from airborne hazards, evacuation can only be effective if people can be removed to a safe location without exposure to the plume, either at their point of origin or en route.

3. Based on the first two considerations, evacuation nearly always requires detailed planning and preparation to be effective. Moving people from an area where they may be harmed to a safe haven without subjecting them to exposure or additional hazards along the way is not a simple matter, particularly when it should be done on a time scale of minutes to a few hours. ***Ad hoc*** evacuation conducted without detailed planning and designated transportation resources, routes, destinations, and accountability procedures can entail greater risks to the evacuees.

Evacuation itself carries some monetary and social cost, as well as a degree of additional health risk to the evacuees from traffic accidents or other causes. While generally small, the risk to populations may be much higher when the hazardous material emergency is caused by or happens to be concurrent with a natural disaster (for example, adverse weather conditions that cause reduced visibility, flying debris, slick roads, and downed power lines). The increased risk to evacuees under a variety of possible evacuation conditions should be considered in planning for protective actions. The risk to emergency workers (drivers, area wardens) who will facilitate the evacuation should also be considered.

Evacuation may be the ***only viable protective action choice*** if no structures suitable for shelter are available in the affected area or if sheltering will not be effective for other reasons (e.g., a lengthy or recurring release is anticipated). When the planning process indicates that this may be the case for a particular hazard, detailed planning for evacuation is indicated. Assembly areas, modes of transportation, evacuation routes, and reception centers should be identified in facility plans and procedures and should be clearly identifiable to users. Plans should also describe how evacuation instructions will be provided to onsite personnel and describe how evacuation will be implemented.

If private vehicles are to be used in evacuation, plans and procedures should make the operation as efficient as possible. Planning should include subjects such as: selecting vehicles with the largest passenger capacity, ensuring that all available passenger seats are filled, ensuring that each vehicle being used has sufficient fuel to complete the trip to the reception area, and organizing vehicles into groups of manageable size (generally not to exceed 20 vehicles in a group). There should be plans to allow sufficient space between groups to allow for other uses of evacuation routes.

Directionally separated facility egress points, assembly areas, evacuation routes and reception areas should be established to provide alternatives to routing evacuees through a plume. Egress routes should be clearly marked within and between facilities, as well as routes leading offsite. Procedures should contain guidelines for determining the optimum choice of egress and destination and concise, oral announcements for use by emergency managers. Reception areas should be equipped to monitor evacuated personnel for contamination.

Evacuation plans should be closely coordinated with offsite transportation and law enforcement officials because those officials will be expected to establish controls over roads surrounding the facility/site. Such officials would also be the primary source of information on current road conditions created by inclement weather, range fires, earthquake damage, or traffic congestion.

Sheltering (or shelter-in-place) protective action strategy reduces exposure to airborne hazardous materials by having people go (or stay) indoors while the plume is passing, thereby taking advantage of the radiation shielding provided by the structure and/or the lower concentration of airborne contaminants inside the structure. However, the effectiveness of sheltering can vary greatly depending on the nature of the hazardous material, weather conditions, type of structure, duration of the release, and the ability of the sheltered people to take additional measures to reduce infiltration of outside air into the structure.

The following provides some typical infiltration rates for modern, energy-efficient houses, older more leaky houses, and industrial-type buildings and office buildings with ventilation intakes secured:

Infiltration Rates – Air changes/hr		
	Low-Wind	***High-Wind***
Tight house	0.1	0.8
Older house	0.5	4.0
Industrial building	0.3	2.4
Office building	0.7	5.5
Motor vehicle	0.5	15+

The Low-Wind values represent a wind speed of ~1 m/s and the High-Wind values ~8 m/s. Infiltration will typically approximate a linear function of wind speed. However, for a given release rate (source), the concentration in the plume will be inversely proportional to the wind speed.

The values given in the table below represent estimated concentrations inside the building expressed as a fraction of the concentration in the outside air. Note that even for relatively tight shelters, the benefit of sheltering (i.e., reduction in the air concentration) is only about 50% after an hour or two. For a radiological release expected to last for a couple of hours or more, consider early evacuation of people sheltered in the plume path because the integrated exposure (and committed dose) may be lower for a short duration unprotected transit of the plume than for breathing the reduced, but steadily increasing concentration inside a building for several hours. If a toxic chemical release is expected to last more than a couple of hours and the outside concentration is estimated to be in the

AEGL-2 (or equivalent) range or below, the same approach should be considered. However, if the outside plume concentration of a chemical is estimated to approach the level where permanent or lethal affects are expected even from a brief exposure, personnel should remain sheltered. Sheltered personnel should be provided instructions on increasing shelter effectiveness (e.g., turn off ventilation, place wet towels under doors and window sills, fashion ad hoc respiratory protection, etc.) and directed to remain in shelter until outside concentrations fall below harmful levels. For both radiological and chemical releases, personnel should leave shelter as soon as it is confirmed that the plume has passed, in order to avoid continuing exposure from contaminants trapped within the shelter.

Release Duration (hr)	***Air Changes per hour***			
	0.3	***0.5***	***1***	***2***
0.25	0.07	0.12	0.22	0.39
0.5	0.14	0.22	0.39	0.63
1.0	0.26	0.39	0.63	0.86
2.0	0.45	0.63	0.86	0.98

For a radiation exposure, the parameter of concern is the total integrated exposure (or dose). The information given below shows a large spread between the levels at which we seek to prevent or mitigate further exposure (the PAC) and the level at which acute health effects are expected [i.e., Threshold for Early Lethality (TEL)]. For radiation, the ratio of TEL to PAC is at least 100 and probably more like 1000 for inhaled Pu. On the other hand, the ratio of the TEL to PAC for most chemicals is on the order of 3 to 10.

Concentration vs. Dose			
Hazard	***PAC***	***TEL***	***TEL/PAC***
Radiation	1 rem	100 rem	100+
Chlorine	3 ppm	20 ppm	~7
Ammonia	150 ppm	750 ppm	5
HF	20 ppm	50 ppm	2.5
NO_2	15 ppm	30 ppm	2

These ratios represent estimates of the slopes of dose-response curves or, effectively, the "margin of error" for making decisions related to protecting people both in distance and in time. If a person exceeds the PAC for Pu by a factor of 100, there will be no acute health effect. If the same person exceeds the PAC for chlorine by that same factor of 100 ***for even a few minutes***, they could experience a lethal health effect.

Key considerations for selecting sheltering as a protective action include:

- Compared to evacuation, sheltering, in its most basic form, requires little special planning or preparation. The affected population needs only to be notified that they should stay inside or go into nearby structures suitable for sheltering.

- Even without special preparations, sheltering in "ordinary" structures, such as homes and office buildings, can be very effective in reducing exposures ***but only for releases of short duration***.

- By having people take shelter, emergency management officials can communicate with them more readily and provide instructions on how to increase shelter effectiveness and take other measures to reduce their exposure.

Sheltering is generally considered the only practical protective action, when there is not sufficient time to evacuate a population before the plume arrives at their location.

Sheltering is the protective action of choice for most toxic chemical release scenarios due to:

- The possible severe health consequences from even brief exposures to high concentrations of some substances, and

- The large uncertainties associated with predicting the concentration of an airborne contaminant at any given time and location.

For substances that are hazardous through inhalation, the maximum reduction of dose/exposure from sheltering will normally be achieved if people move out of the structure promptly after passage of the plume. People who remain inside a shelter where the air is contaminated by infiltration from the passing plume will ultimately receive about the same cumulative inhalation dose or exposure as would an unprotected person exposed to the same plume.

Exposure to hazardous contamination deposited by a passing plume should be taken into account when deciding how and when to terminate sheltering. The potential exists for people to receive significant additional dose or exposure after they emerge from shelter following plume passage. The potential is greatest if the deposited contaminants produce high levels of direct (external) radiation or if the material can become resuspended from contaminated surfaces and subsequently inhaled.

During an emergency, people who are directed to shelter-in-place can take several measures to enhance the protection provided by a structure. These include:

- Closing windows and doors
- Securing ventilation systems
- Sealing penetrations with tape or plastic
- Sheltering in interior rooms

The effectiveness and dependability of these measures can be increased significantly by simple planning/preparedness actions. Examples include:

- Selecting the rooms that will provide the most protection

- Identifying and labeling Heating, Ventilation, and Air Conditioning (HVAC) controls
- Positioning necessary materials (plastic sheeting, sealants and tape) in the designated shelter rooms
- Providing written instructions for use by shelter occupants

7.3.5 Offsite Protective Action Recommendations (PARs)

Emergency plans for DOE/NNSA sites and facilities should provide for the health and safety of the offsite public through coordinated planning with State and local government authorities. Facility and site plans should provide for timely notification accompanied by recommendations to Tribal, State, or local authorities regarding protective actions for the general public during the plume passage phase and for the ingestion pathway.

- The recommendations should be made to the designated, responsible authorities as soon as possible, but within 15 minutes of recognition that a PAC has been or will be exceeded offsite, ***or*** that a General Emergency has been declared. Default criteria based on facility conditions should be prepared so that protective action recommendations to offsite authorities can be made in a timely manner, even though consequence projections have not been completed.
- The recommendation may be considered delivered when the content of the message is received and acknowledged by the emergency operations center, communications center, or central warning points serving the offsite agencies.
- Each notification message to offsite authorities concerning the declaration of an OE or change in emergency condition should restate the protective actions being recommended, even if the recommendation is “no protective action.”

The PARs to offsite authorities should be formulated using the same types of criteria developed for decisions on evacuation or sheltering of site workers. The following information should be provided to offsite authorities for their consideration in implementing the recommendations:

- The time available for carrying out the protective action before the onset of the impact (i.e., plume arrival)
- The specific offsite areas within which PAC may be exceeded, as determined from the quantity of material released, the event type, and the meteorological conditions, or as determined from environmental sampling and monitoring results
- The relative effectiveness of the different possible protective actions, considering the material and the release type. For example, sheltering-in-place may be as effective as evacuation for a short-duration gaseous release. For acutely toxic materials in high concentration, sheltering may be the only practical alternative unless evacuation can be completed before plume arrival

- If Tribal, State and local authority guidelines (e.g., values for PACs) differ from the facility's PAC, the facility should also provide offsite authorities with the equivalent information (e.g., PARs) using the Tribal/State/local guidelines

7.3.6 The Decision Environment

The decision to shelter or evacuate a given area or population is typically carried out in a complex and dynamic emergency response environment. The decision is usually linked to an emergency declaration and the resulting ERO activation. Immediately upon determining that an EAL has been exceeded, the classification authority is expected to declare the appropriate class of emergency and initiate the response, including predetermined initial (default) protective actions.

The initial (default) protective actions associated with an EAL will normally be initiated concurrently with emergency notifications and call-out of support staff. Later, upon their arrival, the consequence assessment staff is expected to evaluate the situation and determine whether the default protective actions should be modified. As time progresses, the consequence assessment staff and the rest of the ERO makes a continuing assessment of the emergency classification and the protective actions.

Given the above conditions, emergency managers and technical staff should consider the following:

- When consequence assessment and other technical staff arrive to evaluate the situation, ***the initial protective actions will probably already have been initiated***. The initial decision to classify an event and activate the ERO will usually cause the default PAs to be initiated immediately.

- Even if the initial protective actions are found to ***not*** be the ideal choice or too conservative, ordering changes to the protective response after it has been started may cause confusion, delay, and serious negative consequences.

- Finally, the initial protective actions selected by the planning staff, based on EPHA results and various other factors, will usually be the most effective of the several possible choices for the situation indicated by the EAL. **HOWEVER**, the technical bases and reasoning behind the default PA ***may not be entirely clear to initial responders at the time of an emergency***.

Based on the considerations expressed above, the initial responders ***should not modify the initial PAs unless there is convincing evidence that they are inadequate for the specific situation at hand***. By reacting precipitously based on initial reports and indications (that are often fragmentary or just wrong), initial responders need to know that they may be discarding products of the EPHA and planning effort without fully understanding why they were selected in the first place. The initial protective action should be considered as the point of departure for a more refined decision that is taken based on consideration of all the information available to the consequence assessment staff and which might impact a larger area and number of people (to include offsite PARs).

The decision process can be most focused if it is structured to respond to a particular hazard type, magnitude, location, population and set of expected consequences. The goal of the protective action decision may vary with situation. If lethal exposures were possible, the overriding goal would likely be to avoid fatalities, perhaps at the cost of lower exposures to a large number of people; this may be the same as “reducing exposure below a threshold level,” where the threshold is the level at which fatalities are expected to occur (i.e., the TEL). Minimizing population exposure and risk is a typical goal for events involving radioactive material releases when life-threatening doses are not expected.

A decision aid can be developed which attempts to capture, usually in the form of a checklist, matrix, table or decision/logic tree, the most important attributes of a situation and guide the decision-maker systematically through the various considerations to the decision that comes closest to achieving the goal. The decision checklist approach gives the various attributes of a situation and indicates whether shelter or evacuation is indicated. This approach is suited to situations in which the conditions may vary widely and an automatic or default set of actions will (normally) already have been initiated by the time the ERO begins the confirmatory assessment. The example checklist below demonstrates how the value or quality assigned to each attribute of a situation points to shelter or evacuation as the preferred protective action.

Decision Aid – Checklist		
***Attribute**	***Sheltering***	***Evacuation***
Infiltration (shelter quality)	Tight	Leaky
Release Duration	Short	Long
Time of day	Night	Day
Population Density	High	Low
Road Geometry	Closed	Open
Road Conditions	Poor	Good
Population Mobility	Immobile	Mobile
Release Status	Ongoing	In future
Hazard Type	Chemical	Radiological
Population Location	Current affected sectors	Outside current affected sectors
Transport Means	Not available	Available
Evacuation Route	Through plume	Away from plume

Each protective action decision (or attempt to confirm/refine a decision already reached) needs to be made with a clear understanding of the goal of the action. The goal will vary depending on the type of hazard, the expected consequences of exposure, the number of people who may be exposed, whether the offsite public is included among those who may be affected, and other factors.

7.3.7 Development of EAL-Specific Pre-Planned Initial Protective Actions

To assure the most rapid and effective implementation of protective actions following an emergency declaration, a predetermined set of initial protective actions should be associated with each facility/site or activity-specific EAL. Each of the factors discussed in this section should be considered before selecting the initial protective actions that are best for the event or condition as implied by a particular EAL.

In general, use of real-time meteorological conditions, as a factor in determining event classification and initial protective actions, is not encouraged. Doing so requires a sophisticated understanding of the local atmospheric transport/dispersion environment, as well as accurate information on current meteorological conditions and a high degree of confidence in the forecast. It also complicates, and potentially lengthens, the decision processes. The need for reliable real-time weather information and on-call meteorological expertise, together with the added complexity of the decision process make such an approach unsuitable for reaching timely, conservative, and anticipatory classification and associated predetermined protective action decision as required by DOE emergency management policy.

The following factors should be considered before a decision is made on the most appropriate initial protective actions associated with a specific scenario:

- **Hazard**. Any planned protective action may entail some unavoidable exposure to the hazard. Therefore, the effects of that unavoidable exposure need to be considered when selecting a set of protective actions that will be implemented automatically upon exceeding a particular EAL. If the hazardous material is a radioactive substance or a chemical for which the total integrated exposure or dose is of concern, the impact from the limited unavoidable exposures associated with a particular protective action may be acceptable when weighed against the potential health or risk benefit of preventing larger exposures. However, if the primary concern is the concentration of the hazardous material to which people will be exposed, the unavoidable exposure associated with a particular protective action may be unacceptable because it carries a high risk of serious injury or death (e.g., ratio TEL/PAC for chemicals versus radioactive materials).

- **Release**. If the EAL is stated in terms of an actual release or the event that causes a release, the hazardous material will probably be in the environment and affecting some people by the time the emergency declaration is made. However, if the EAL suggests a degrading safety condition that may end in a release, there may be some time within which to carry out protective actions before the release actually starts. If the EAL suggests a release of short duration, it may be impossible to implement any protective action before the release stops. If the release were from an elevated release point, the predicted point of maximum impact may be some distance from the point of release, which means that people very near the release point may be of less immediate concern than those at a greater distance.

- **Affected Area and Population**. The analysis on which the EAL is based will provide a conservative estimate of the actual affected areas and the time from start of the release until it begins to affect the population. The available time to take action (before plume arrival) may be very short and the time required to implement a warning might make it impractical to do anything before the plume arrives. If, however, the EAL is stated in terms of precursors or early symptoms of a condition that will or may end in release, the warning of the population before the plume arrives may well be possible. Whether the affected population is onsite (workers) or offsite (public) will affect how they are notified and how they can be expected to respond. Onsite protective action plans usually assume that the affected population is trained in the proper response to emergencies, and that a trained response cadre will provide direction. Neither of these assumptions is likely to be valid for the offsite public.

- **Available Protective Actions**. The protective actions that are actually feasible and effective for the particular hazard and conditions suggested by the EAL will need to be considered. Evacuation of large numbers of people usually will require some sort of mass transportation. Availability of buses, vans, drivers, and traffic control personnel may vary depending on the time of day and the specific emergency conditions. For example, the EAL may suggest a natural phenomenon that would also inhibit orderly and rapid evacuation.

The availability and effectiveness of shelters for reducing the impact of the hazardous material will be an important determinant of planned actions. However, when the outdoor population is large and no suitable shelter is available nearby (as, for example, on a construction site), evacuation may be the only workable option.

7.3.8 Accountability

Regulations, such as 29 CFR 1910.38, require employee emergency response plans that include procedures to account for all employees after an emergency evacuation has been completed. All DOE facilities/sites are subject to this basic workplace safety requirement, which is generally considered satisfied if designated persons (e.g., zone wardens) verify that no one remains inside an evacuated building and all evacuees meet at staging areas outside the building for an informal head count. DOE O 151.1C states that provisions should be in place to account for employees after emergency evacuation has been completed. Each facility should establish a goal for time required to do this, consistent with the facility hazards. A time frame of 30 to 45 minutes is an accepted industry practice. To satisfy the intent of the Order requirement for accountability, facility emergency response staff should be able to identify any missing persons ***or*** establish that no persons in the facility are in need of assistance or rescue within 30 to 45 minutes from the recognition and categorization/classification of an emergency. Accountability of response workers should be maintained, once established.

The objective of accountability procedures is to ensure that search, rescue, and assistance efforts can be initiated promptly to provide for the safety of facility personnel who may be injured, trapped, or unaware of the emergency condition.

Whether all facility personnel have or have not been accounted for should be a major consideration in an incident commander's sizing up a situation [National Fire Protection Association Standard (NFPA) 1021, Section 2-10] and, also, one basis for the decision to risk the lives of rescue personnel in a hostile environment to search for victims. In keeping with the principles of protective action, the risk to search and rescue personnel should be weighed against the risk to missing workers. Positive accounting of facility personnel helps minimize the risk to search and rescue personnel.

In high hazard areas, a positive control system, such as a log or badge/card reader that records the entry and exit of employees, is often employed during routine operations and should be considered as a means of assisting with accountability during emergency response. Where the potential for exposure to high levels of hazardous materials is low, such as in an office building, a less formal accountability system may suffice. A procedure whereby designated individuals search each work area upon evacuation to ensure that no persons remain should be sufficient for such low-hazard areas.

A goal of 30 minutes for full accountability should be met in areas where workers might be subject to risk of death or serious injury and where search and rescue operations might pose a significant risk to emergency personnel. Use of a positive control system can help achieve this goal. Specific examples of facilities where a positive control system should be applied are:

- The nature of the facility operation is such that people might become quickly trapped or incapacitated by the event so they cannot take action to protect themselves (explosions, rapid release of incapacitating materials, nuclear criticality).

- There is substantial risk of personnel being out of communication and thereby unaware of the hazard and the need to evacuate (remote areas with poor alarm/public address coverage, high-noise areas).

A short duration accountability time standard, or a positive accountability system, need not necessarily be applied to an entire “facility” but may be applied to that part of a facility or complex that contains the hazard.

7.3.9 Decontamination

Personnel, vehicles, and equipment evacuated from the area affected by a hazardous material release may be contaminated. Decontamination can reduce the health hazard to the evacuees and to others who might later encounter contaminated people or articles.

Facility/site plans and procedures should provide for monitoring of personnel, vehicles, and equipment leaving areas potentially affected by a hazardous material release. Monitoring should be done before the personnel or equipment leaves the DOE/NNSA site. Contaminated personnel and vehicles should be directed to pre-determined decontamination stations and decontaminated to established levels prior to release. Decontamination stations should be stocked with adequate supplies, equipment, and procedures to support all decontamination activities. Intervention criteria should be included in procedures. Antidotes and Material Safety Data Sheets (MSDSs) should be available. Provisions should be made for collecting, documenting, transporting, and analyzing all samples, including biological samples.

For personnel who have been severely injured (i.e., life-threatening injuries), medical treatment should take priority over decontamination for radioactive materials (cf. NCRP Report No. 138). In the case of toxic chemicals, the priority should be determined on a case-by-case basis, preferably during pre-planning. Procedures should also address the monitoring and decontamination of vehicles used to transport injured and contaminated victims. Memoranda of Understanding (MOUs) with local hospitals and ambulance services should address transport, receipt, and treatment of contaminated victims and decontamination of equipment, facilities, and the disposal of wastes.

Procedures should address methods used to limit the spread of contamination from the victim to their surroundings during transportation to pre-designated facilities for treatment and later decontamination of injured personnel (cf. Chapter 8 DOE G 151.1-4.)

Decontamination should occur in existing facilities, if possible. If decontamination facilities of the appropriate type do not exist onsite, would not have the necessary capacity, or would be unusable because of the emergency, then procedures should identify alternate methods or provide for establishing temporary facilities. Decontamination methods to be employed will depend on the types of contamination and the type of work activities performed during the response. Monitoring of individuals and equipment should be performed at appropriate stages during decontamination to ensure that decontamination has been successful. Decontamination plans and procedures should provide for disposal of contaminated wash and rinse solutions and contaminated articles in compliance with all applicable regulations.

7.3.10 Other Protective Actions

WHO, ICRP, and IAEA have identified a number of other protective actions in addition to sheltering and evacuation. Some of these may be useful in certain circumstances and should be considered in developing onsite response plans. Others will be primarily, or exclusively, the concern of offsite authorities but are discussed briefly here as background for DOE/NNSA and contractor personnel who will carry on a planning dialogue with those responsible for offsite protective actions. DOE/NNSA and their contractors should coordinate with responsible offsite agencies to plan for the recommendation and implementation of these protective actions for the facility and hazards of concern.

- Medical Care. Several regulatory requirements and directives state criteria for medical support that should be in place for workers, including those with radiological and/or hazardous material contamination. Planning for and identifying resources to provide fundamental medical care in the event of an accident should be carried out as part of the protective actions element. When evaluating medical care as a protective action, consideration should be given to the treatment and documentation of injuries and illness and to reducing patient anxiety by explaining the potential benefits of treatment. Additional guidance on this subject is found in DOE G 151.1-4, Chapter 8.

- Ad Hoc Respiratory Protection. Ad hoc respiratory protection is a cost-effective protective action that can significantly reduce inhalation of some hazardous materials by both workers and the general public. Ad hoc respiratory protection is especially useful in rapidly occurring events. Effective protection against the inhalation of particulates and some gases can be provided through using readily available materials such as handkerchiefs, towels, and cloth. Wetting a cloth can increase its efficiency as a breathing filter for some materials.

- Control of Access. Control of personnel access to affected areas can prevent unnecessary exposures and minimize the spread of contamination. It also minimizes interference with emergency response activities. Access control is most effective when implemented immediately upon recognizing that an area has been, or will be, affected by a hazardous material release.

- Shielding. An attenuating material between the source and potentially exposed people can provide protection from radiation. The shielding provided by a structure is one factor that determines whether people can be effectively sheltered in that structure. For most radioactive releases, the ability of a structure to limit infiltration of outside air, thereby reducing inhalation exposure, is far more important than the shielding it can provide and will largely determine its suitability for sheltering personnel.

- Radio-protective Prophylaxis. To be effective, iodine prophylaxis requires both considerable planning and warning of the potential exposure. For greatest effectiveness, stable iodine should be taken before or shortly after exposure. Because reliable radiological measurement information may be lacking during the initial stages of an event, the decision to administer stable iodine should be based on planned estimates of exposures and risk. Use of stable iodine as a protective action should be based on a careful evaluation of net benefit. Problems with administering stable iodine include identifying the affected population, distribution, and adverse health affects on a small percentage of the population.

  The Food and Drug Administration (FDA) has determined that potassium iodide (KI) is a safe and effective means to prevent radiological uptake by the thyroid gland. The Federal Emergency Management Agency (FEMA) supports a Federal policy on the use of KI as a thyroidal blocking agent by emergency workers, institutionalized persons and the general public in the vicinity of a nuclear power plant. For DOE and NNSA facilities/sites that have sufficient quantities of radioiodine for release, as determined by the EPHA, use of KI to protect workers, responders and collocated workers should be considered. Responsibility for administration of KI offsite is the responsibility of the offsite local authorities.

  For optimal protection against inhaled radioiodines, KI should be administered before or immediately coincident with passage of the radioactive plume. Studies show that

KI may still have substantial protective effect even if taken 3 or 4 hours after exposure. Plans should be in place for timely decision-making and administration of KI if deemed appropriate. For sites located in the vicinity of a nuclear power plant, or for sites that include research reactors or other equipment capable of producing radioiodine, plans for use of KI for workers in the event of an accidental release of radioiodine should be considered.

Other prophylactic measures include the administration of chelating agents or diuretics to speed the removal of specific radionuclides from the bodies of exposed individuals. In addition, there are pharmacological strategies for reducing the sensitivity of exposed individuals to the deleterious effects of radiation. The use of such measures is part of the medical response to a release or accident and not considered as a typical protective measure for workers or emergency responders.

- Control of Foodstuffs and Water. An event with offsite environmental consequences may require implementing controls on the distribution of contaminated food and water. Although implementation of these actions offsite will be the responsibility of State and Federal health officials, DOE/NNSA and their contractors may need to assist those agencies in developing intervention levels for specific hazardous materials and to manage onsite potable water supplies. Banning the sale of and preventing the consumption of contaminated foodstuffs imposes minimal risk but may have significant costs. Selection of protective actions for control of foodstuffs and water may initially be based on the predicted or measured ground deposition. At later stages, measurement of the concentrations of hazardous materials in foodstuffs and water should be available to refine decisions. Contamination of water supplies because of an airborne release is not likely to be a source of significant exposure. However, special consideration should be given to people who may consume rainwater or untreated water supplies. Long-term control of foodstuffs and water requires consideration of several factors. These include the availability, quality, and cost of alternative food sources; costs and resources associated with monitoring, control, and disposal; and rate at which the hazardous material is introduced to the foodstuffs.

- Relocation. Relocation of individuals can be implemented when emergency response is terminated. Relocation can be an extension of an evacuation, or it can be initiated in the later stages to facilitate decontamination efforts. The duration of the relocation depends on the natural and remediation activities eliminating the hazard. Procedures to determine the advantages and disadvantages of relocation and its net benefit are different from those of evacuation. The costs and impact of relocation will depend upon the number of individuals affected and the social and economic disruption created.

- Decontamination of Land and Equipment. Decontamination of land and equipment can prevent the spread of contamination and reduce or eliminate exposures. The projected dose to decontamination workers should be weighed against the dose to the public that will be averted. Decontamination efforts will generate large volumes of waste requiring disposal. While decontamination of small areas may be practical and cost effective, decontamination of large areas may be very difficult and costly. Detailed planning for decontamination is conducted during the recovery phase of response.

- Changes in Livestock and Agricultural Practices. The contamination of pastures and agricultural areas due to the deposition of released materials can require specific protective actions to minimize introduction of the contamination into the human food chain. Actions could include putting livestock on stored feed, delaying slaughter of animals until the hazardous material has been removed from their systems, and treating the soil with fertilizers to minimize the uptake of the hazardous material into foodstuffs. The use of severely contaminated land for agricultural purposes may have to be prohibited.

7.4 Reentry

Reentry involves reentering a facility or affected area that has been evacuated or closed to personnel access during the course of the emergency. In order to protect the personnel involved in reentry, the activity should be well planned, coordinated, and accomplished properly and safely. This section will cover the preplanning necessary to ensure that personnel are prepared for reentry activities that may be encountered at the specific facility/site. This includes the availability of the appropriate support materials and resources to perform the reentry activities. The remainder of the section focuses on the protection of personnel involved in reentry. Decision-making and operational aspects of reentry are addressed, as well as the management of personnel exposures that depends on the specific reentry activity being attempted.

7.4.1 Reentry Planning

The identification and screening of facility hazards will identify the material hazards that may be encountered during reentry activities. Review of the event scenarios developed during the EPHA analyses will provide the planner with information concerning the type and nature of possible failures; possible mitigative activities; areas likely to be accessed during reentry; degree and nature of facility damage; and, systems, indicators, or controls that may be non-functional. EPHA consequence calculations will provide source term information for each analyzed event scenario that will help the planner determine the range of hazardous environments that may be encountered by personnel during reentry activities.

Using information developed in the EPHA, facility operations personnel should consider the following: special damage control equipment, provisions for spare parts, availability of back-ups for critical equipment, pre-arranged service contracts, and accessibility of critical items (e.g., controls, indicators, systems, tools and equipment) under emergency conditions.

7.4.2 Protection of Response Personnel during Reentry Activities Planning and actual conduct of reentry activities should recognize that each emergency event is unique.

Therefore, the response structure for conducting reentry activities should be flexible and capable of responding to a wide range of conditions.

Reentry Decision Making. Reentry activities will often involve high risk, time-urgent actions. ERO management may be called upon to make rapid risk versus benefit type decisions and then to establish priorities for selected activities. Therefore, it is important that emergency plans and accompanying implementing procedures provide the necessary structure and guidance, including:

- The emergency plan should identify the position within the ERO with the authority and responsibility to authorize reentry activities and approve doses/exposures that may exceed occupational or administrative limits.

- The implementation of selected reentry activities should be carried out by elements of the ERO closely associated with the facility, located at the event scene or affected area.

- To assist with the decision-making process, training and procedures should address the following:

  - Criteria and guidance to assist in prioritizing reentry activities should be provided. Consideration should be given to the benefit achieved as well as the availability of qualified personnel and resources to carry out any given activity. Information and requests regarding reentry activities should be forwarded to the ERO position having decision-making authority. A means to record and indicate the priority of proposed activities and track progress on authorized activities should be provided.

  - Criteria and guidance to assist in making risk versus benefit determinations should be provided. Consideration should be given to protecting the health and safety of workers and the general public, minimizing damage to the facility, and limiting environmental impact or damage. A means for estimating exposure to hazardous material during the reentry activity should be provided. The possibility that the reentry activity could cause a release or worsen an existing release of hazardous material should be considered. Means to estimate consequences of a potential release on workers, the public, and the environment resulting from reentry activity should be provided.

  - Criteria and guidance to assist in making decisions concerning the authorization of emergency dose or exposure should be provided.

  - A mechanism for coordinating reentry activities within the site ERO and with state, local and other Federal agencies, as necessary, should be provided. As a minimum, information regarding reentry activities planned and in progress should be provided to these agencies. Priority should be given to communication of any pertinent information acquired during reentry activities (e.g., source term information, release duration, facility status.)

Reentry Operations. Once the decision has been made to perform a reentry activity, personnel responsible for managing the on-scene response should develop a plan. They should have direct access to the most current information, be familiar with the facility or event area, and have knowledge of the personnel and resource requirements of the task.

One position at the facility or incident scene level should be vested with the responsibility to coordinate the reentry planning process. Responsibilities of this position might include identification of personnel and equipment needs, determination of personnel protection requirements, assignment of personnel to reentry teams, job planning, team briefing/ training, monitoring progress of activities, de-briefing teams, and collecting data upon completion. During both planning and preparation, this position may require the support of several other disciplines such as: health physics, industrial hygiene, industrial safety, facility operations, engineering, medical, security, and others.

The following items should be considered when planning reentry activities and preparing reentry teams:

- Reentry planning should make use of all available information regarding interior configurations, locations of hazards, etc. Pre-fire plans are particularly well suited for use in such planning.

- Reentry planning should include security considerations. The planning effort should consider the possibility that an insider or outsider threat initiated the event and that additional security related hazards are yet unrecognized. Reentry teams should understand the importance of safeguarding national defense materials and information.

- Reentry preparation should include contingency planning to ensure the safety of reentry personnel, such as planning for the rescue of reentry teams.

- Provide guidance on selection of reentry team members. Teams should consist of the minimum number required to perform the job but should not be less than two persons, one of whom has first aid training. Team members should be chosen based upon: job qualifications; training; proficiency in the use of protective equipment; exposure history (radiological); and sensitivity to toxic materials. For very high-risk tasks, volunteers should be used. Criteria should be developed to determine what constitutes a "high-risk" task and how to select the most appropriate volunteer for a given task. Criteria for selection of volunteers may differ for radiological versus toxic material events. If feasible, volunteers should be evaluated with respect to age, health, and previous exposure history (for radiation exposure). Each volunteer should be advised of the known or anticipated hazards prior to participation.

- Under some circumstances, the control of contamination may be a concern. Reentry planning should address methods for reducing the spread of contamination and ensuring that reentry activities do not inadvertently increase the actual or potential release of hazardous material.

The following items should be considered when preparing reentry teams for reentry activities:

- Provide procedures and/or checklists to ensure that all factors are considered prior to dispatching reentry teams. Reentry planning should use current status information; provisions should exist for modifications as new information is received. All individuals involved in a reentry should receive a hazards/safety briefing, prior to emergency response activities, consistent with Federal, Tribal, State, and local laws and regulations, that will address all safety and job specific aspects of their assignments.

- Provide personnel performing reentry planning with training and guidance on the selection of appropriate protective clothing and equipment. Identify ERO positions (or other personnel) with the technical expertise and the responsibility to determine what protective equipment and clothing is appropriate for the situation at hand.

- Ensure that adequate job planning is performed prior to team dispatch. Even the simplest jobs may become much more complex under accident conditions. Thorough team preparation for the job is critical for the safety of the team members and the success of the task. Make sure that each team understands the job to be performed and team members understand their role. Some job preparation items to be considered include procedures, checklists, parts, tools, test equipment, use of "dry-run" or mock-up training, and appropriate monitoring equipment (health physics and/or industrial hygiene).

- Each reentry team should be provided with a primary and back-up means of communication. Prompt reliable communications are necessary to notify teams of changing conditions, monitoring job progress, providing additional instructions, and keeping in contact with those responsible for reentry control activities.

- When teams are to enter areas contaminated with hazardous materials, procedures, equipment, and supplies necessary to perform monitoring and decontamination of personnel and equipment should be provided. If decontamination cannot be performed in a facility/area designated and equipped for decontamination activities, plans and procedures should address where and how to establish a field decontamination station. The proper collection, packaging and disposal of waste generated during decontamination should also be addressed.

- Immediately upon return from completing a reentry assignment, teams should be de-briefed. The de-briefing should be designed to collect information relating to the job performed, facility status, conditions encountered, and exposure received. Information should be recorded and passed on to appropriate ERO positions.

- Provide access to records and documents necessary for reentry planning. Training, job qualification, and dosimetry records may be necessary for team selection and assignment. Engineering drawings, procedures, and technical references may be necessary for job planning.

7.4.3 Reentry for "Rescue and Recovery"

This section provides guidance for determining appropriate actions for the rescue and recovery of persons and the protection of health and property during emergency response. The *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents,* EPA 400-R-92-001 (May 1992) contains guidance for conducting these operations in response to a radiological hazard.

Although they are designed for response to radioactive releases, three basic principles apply to any type of hazardous material response, especially "rescue and recovery" activities:

- ***The risk of injury to those individuals involved in rescue and recovery operations should be minimized.***

- ***Operating management should weigh actual and potential risks to rescue and recovery individuals against the benefits to be gained.***

- ***Volunteers should perform rescue actions that might involve substantial risk.***

General Considerations. The risk of injury to persons involved in rescue and recovery activities should be minimized, to the extent practical. Control of exposures should be consistent with the immediate objectives of saving human life; recovering deceased victims; and/or protection of health, property, and the environment.

- Personnel managing response activities should exercise judgment in evaluating any proposed action involving exposure. Evaluation should consider risk versus benefit [e.g., weighing the risks of health impacts, actual or potential, against the benefits (i.e., social, economic, etc.)].

- Decisions governing rescue and recovery activities often have to be made on a time urgent basis. Emergency Planners should develop guidance and a methodology to assist decision makers in rapidly evaluating risk versus benefit. Guidance should also recognize that accident situations involving the saving of human lives would require different evaluation bases than those required to recover deceased victims or to protect property.

- Before dispatching any reentry teams, the Emergency Director (ED) or the Incident Commander (IC) should ensure that the activities have been coordinated with the head of the organization providing the reentry team members (e.g., if the fire department is providing the reentry personnel, the ED/IC will coordinate with the responsible fire department officer on the scene.) This discussion should ensure that all operational and safety concerns are resolved prior to team dispatch.

- For controlling exposures to radiological hazards, the EPA has prepared guidance and criteria that is presented in *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents*. EPA limits for workers performing emergency services apply only to doses incurred during an emergency. In accordance with 10 CFR 835.202, exposures received in emergency exposure situations are not included in meeting the occupational exposure limits to general employees resulting from DOE activities. The EPA Manual also provides tables with general information that may be useful in advising workers of risks of acute and delayed health affects associated with large doses of radiation.

– Due to the uncertainties, the general approach taken by hazardous material responders has been to perform entries only while using the maximum protective equipment for the most severe hazards present. For extraordinary circumstances (e.g., life saving activities, protection of large populations), guidance and criteria should be provided for determining the minimum acceptable level of worker protection. Guidance and criteria should be consistent with that governing hazardous material response for private industry. Guidance, criteria, and technical information concerning response to hazardous materials have been published by a number of organizations and Federal agencies including the Occupational Health and Safety Administration (OSHA), EPA, the DOT, the FEMA, NFPA, AIHA, and others.

Emergencies. This section presents dose criteria and judgment factors for three types of emergency action: saving of human life; recovery of deceased victims; and protection of health and property. The guidelines for controlling exposures in emergencies were provided in Table 7-1.

- Saving of Human Life (or Protection of Large Populations). If the victim is considered alive, the individual in charge of the on scene response activity should determine the course of action. The potential exposure to rescue personnel should be evaluated, and an exposure objective should be established for the rescue mission. The evaluation of the inherent risks should consider:

  – The reliability of the prediction of injury from measured/estimated exposure rates. In this context, consideration should be given to the uncertainties associated with the specific instruments and techniques used to estimate the exposure rate. This is especially crucial for exposure to radiation when the estimated dose approximates 100 rad (1 gray) or more.

  – The effects of acute external and/or internal exposure.

  – The capability to reduce risk through physical mechanisms, such as the use of protective equipment, remote manipulation equipment, or similar means.

  – The progress of any mitigative efforts that would decrease or increase risk.

  – The probability of success of the rescue action.

Recovery of Deceased Victims. The recovery of deceased victims should be well planned. Except as provided below, the amount of exposure received by persons in recovery operations should be controlled within existing occupational exposure limits.

- When fatalities are located in inaccessible areas due to high risk, and when the recovery mission would result in exposure in excess of occupational exposure limits, special remote recovery devices should be considered for use in retrieving bodies.

- When it is not feasible to recover bodies without personnel entering the area, the official in charge may approve personnel to exceed occupational exposure limits. This approval, for an individual, should not exceed 10 rem (0.1 Sievert) in any year.

Protection of Health and Property. When the risk (probability and magnitude) of the hazard either bears significantly on the state of health of people or may result in loss of property so that immediate remedial action is needed, the following criteria should be considered:

- When it is deemed essential to reduce a potential hazard to protect health or prevent a substantial loss of property, a planned exposure objective for volunteers should be established not to exceed 10 rem (0.1 sievert) for an individual in a year. Under special circumstances, an exposure objective for volunteers not to exceed 25 rem (0.25 sievert) in any one year may be set.

- When the risk of exposure following the incident is such that life might be in jeopardy, or there might be severe effects on health or loss of property resulting in an adverse effect on public safety, the criteria for saving of human life should apply.

7.4.4 Management of Personnel Exposures

Careful management of personnel exposures and appropriate follow-up to reentry activities can minimize the risk of adverse health effects. If possible, exposures should be maintained within existing occupational (or administrative) exposure limits. Procedures should establish methods of controlling access to areas where hazardous material contamination might be encountered. The responsibility for controlling access to and activities within such areas should be assigned by the ERO.

Methods should be established for managing personnel exposures, including: determining allowable exposures and establishing limits on exposure or stay time; issuing appropriate protective clothing and equipment; providing devices or instruments with which to monitor exposures to the hazard; recording the movement of personnel in and out of the controlled area and the exposure, dose, or level of contamination encountered; recording and tracking accumulated emergency exposure; and, if necessary, decontaminating personnel after they exit the controlled area.

Records of emergency worker exposure to hazardous materials should be controlled, monitored, and maintained during and following emergency events. Records of contamination surveys and results of any decontamination performed should be recorded and maintained during and following emergency events. Applicable requirements for maintaining hazardous material exposure records are found in 29 CFR 1910.1020. Requirements for medical programs are found in 29 CFR 1910.120 and in 10 CFR 851 Appendix A, Section 8, *Occupational Medicine*. [The Contractor Requirements Document (CRD), which previously addressed medical requirements, will be eliminated from DOE O 440.1A].

Additional items should be considered for managing personnel exposures during reentry activities, such as the following:

- A policy governing the use of prophylactic drugs for dose reduction purposes should be created. Specific guidance on implementing that policy should be incorporated into procedures.

- The risks from entering an environment containing unknown quantities of chemical toxins are very different from the risk stemming from exposure to radiological material. The availability of installed instrumentation or portable monitoring equipment capable of detecting levels of toxic chemicals that could cause severe health effects or death may be limited. The lack of instrumentation, coupled with the uncertainty of projecting transport in a facility or the environment, makes it very difficult or impossible to calculate estimated exposures to reentry personnel that represent an acceptable risk.

- Although the concept of "As Low As Reasonably Achievable" (ALARA) was created as a general goal for reducing normal occupational exposure to radiation, it is also a useful guide for controlling emergency exposures to hazardous materials during emergency response.

8. EMERGENCY MEDICAL SUPPORT

8.1 Introduction

The purpose of this chapter is to assist DOE and NNSA field elements in complying with the DOE O 151.1C requirement to ensure that medical support for contaminated or injured personnel is planned and promptly and effectively implemented. In addition, the Order requires that arrangements with offsite medical facilities providing the support to transport, accept, and treat contaminated, injured personnel be documented.

Requirements for emergency medical support given in DOE O 151.1C are not unique, but reinforce the requirements of DOE O 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees." DOE O 440.1A addresses the responsibility for the medical portion of the site emergency plan; DOE G 440.1-4, "Contractor Occupational Medical Program Guide," provides further details on the medical input for site emergency plans. The purpose of this chapter of the EMG is to provide specific supplemental guidance on the implementation of DOE O 440.1A requirements in the context of a DOE/NNSA Operational Emergency Hazardous Material Program.

This chapter is designed primarily for facilities/sites and activities that are required to implement an Operational Emergency Hazardous Material Program and is directed at operations and emergency management staff at Field Elements and operating contractor organizations responsible for DOE and NNSA facilities/sites/activities.

8.2 General Approach

Emergency medical response is an essential element in the development and implementation of a site emergency management program. This chapter of the EMG is intended to serve as a management-level guide that addresses those aspects of emergency medical support that apply to Operational Emergencies (OEs) at DOE and NNSA facilities/sites. It emphasizes the management systems and interfaces that should be in place to ensure that emergency medical support will be provided for injured and/or injured and contaminated personnel. This document is not intended to be a technical guide for providing detailed emergency medical support but is focused on providing an emergency management framework for such support.

It is essential that cooperation and coordination characterize the interactions between medical professionals responsible for medical emergency response and the emergency planners responsible for the overall facility/site emergency management program. Each group possesses information and skills essential for the success of an emergency response. Hence, emergency plans should be developed in concert to ensure an effective and integrated approach.

DOE/NNSA sites do not normally maintain the full range of medical capabilities usually available in the surrounding community. Therefore, injured employees will typically be transferred to offsite facilities when medical conditions necessitate. The availability of medical capabilities and resources within the surrounding community should be closely examined. The surrounding community may provide capabilities and resources that reinforce onsite capabilities. Where advantageous and effective, agreements should be developed to use offsite capabilities rather than duplicate the same capability at the DOE or NNSA facility/site. Whatever situation exists at a particular site, a close working relationship among response partners, onsite and offsite, is essential to ensure that medical support is provided seamlessly and effectively during an emergency.

Medical professionals and emergency planners should develop an emergency medical program that is commensurate with the hazards on the site to protect the health and safety of DOE workers and the public. The program should be based on the medical capabilities of the site and/or surrounding community, specialized medical capabilities available outside the local area, site-specific characteristics (e.g., remoteness and terrain of site), and the site-specific results of the Hazards Surveys and Emergency Planning Hazards Assessments (EPHAs) for facilities and activities on the site.

8.3 Site Emergency Medical Support

The purpose of this chapter is to focus on the specific requirements of emergency medical support during an OE at a DOE/NNSA site. According to DOE O 151.1C, emergency medical support should provide medical treatment and planning for mass casualty situations. Medical support should also be planned for workers contaminated by hazardous material; arrangements with onsite and offsite medical facilities to accept and treat contaminated, injured personnel needs to be documented. In the following sections, these aspects of the emergency medical program that support the DOE/NNSA Operational Emergency Hazardous Material Program will be discussed.

8.3.1 DOE/NNSA Requirements and Related Standards

Emergency medical requirements for contractors are contained in 10 CFR 851, Appendix A, Section 8, *Occupational Medicine*. [The Contractors Requirement Document (CRD), which previously addressed medical requirements, will be eliminated from DOE O 440.1A]. 10 CFR 851 requires the establishment, maintenance, review, and update of a formal written contractor occupational medical program consisting of methods and procedures used to implement the occupational medical requirements necessary for worker protection and for the promotion of a healthful work environment. The primary goal of the program is to provide health services to its employees to ensure the earliest possible detection and mitigation of occupational illness and injury.

10 CFR 851 also establishes requirements for facility and site programs for providing emergency medical treatment for injured personnel. The rule requires that the physician (e.g., Site Medical Director) responsible for the delivery of medical services is also responsible for the medical portion of the site emergency and disaster plan. This rule also requires that the medical portion of the site emergency plan be integrated with the overall site plan and with the surrounding community emergency and disaster plan.

DOE G 440.1-4, Section 4.7, “Emergency and Disaster Preparedness,” provides additional specific guidance related to the medical portion of site emergency plans, as follows:

- Capabilities for medical aid, triage, and personnel decontamination by trained, qualified medical staff members
- Capabilities for cardiopulmonary resuscitation, cardiac defibrillation, and advanced cardiac life support
- Services of health physicists and industrial hygienists to evaluate any associated radiological or chemical hazards affecting the casualties, the general public, or the environment, and to assist rescue and medical personnel
- Arrangements for adequate offsite treatment of injuries and illnesses resulting from exposure to radiation and/or toxic materials
- Services of medical specialists and consultants
- Services of rescue squads, ambulances, and helicopters with the capability of handling radioactively contaminated casualties
- Medical aid coverage during evacuation operations from facilities and the site
- Communication links between medical aid and triage teams, fire and rescue units, hospitals and hospital teams, local and state police and the DOE Emergency Operations Center

Other standards used to define facility/site medical programs may include:

- Accreditation Association for Ambulatory Health Care
- Federal Ambulance Specifications
- 29 CFR 1910.151 (OSHA regulations for medical services and first aid)
- NFPA 1710 Chapter 4, Section 4.1.2.1, which establishes response time objectives for first responders. For example, this standard calls for a minimum 90 percent achievement of the following objectives:
  - Four minutes or less for the arrival of a unit with first responder or higher level capability at an emergency medical incident
  - Eight minutes or less for the arrival of an advanced life support unit at an emergency medical incident, where this services is provided by the fire department

- NFPA 99 and 473 (National Fire Protection Association standards for healthcare facilities and for professional competency for EMS personnel)

- NCRP Report No. 65, "Management of Persons Contaminated with Radionuclides"

8.3.2 Medical Support for DOE/NNSA Operational Emergency Hazardous Material Programs

The medical component of the DOE/NNSA facility/site Operational Emergency Hazardous Material Program needs to include the following capabilities:

- Plan for handling mass casualty situations

- Capability to provide medical treatment for onsite workers, personnel, and public for potential emergencies that include exposure to and/or contamination by a release of hazardous materials (i.e., radiological, chemical, and biological/ etiological)

- Documented arrangements with offsite medical services and facilities (e.g., ambulance services and hospitals) to accept and treat contaminated, injured personnel

Planners should recognize that although facilities may not have the potential to reach an OE classified as an Alert, they might have sufficient hazardous materials to contaminate individuals in an emergency. Such a contamination event may be categorized as a mass casualty OE, if it effectively meets the criteria given above in terms of decontamination and treatment capabilities.

Mass Casualty. For purposes of DOE/NNSA emergency management, a mass casualty OE event is characterized by the following:

- The number of patients and nature of their injuries make the normal level of stabilization and care unachievable; **AND/OR**

- The number of Emergency Medical Service (EMS) personnel that can be brought to the site within the time allowed is not enough; **AND/OR**

- The stabilization capabilities of the hospitals that can be reached within the time allowed are insufficient to handle all patients.

The definition is based on A.M. Butman, *Responding to the Mass Casualty Incident: A Guide for EMS Personnel*, 1982. In general, the quantity of personnel and resources <u>ultimately</u> available is insufficient in a mass casualty situation. Only those personnel and resources that are available within the time allowed by standard medical treatment protocols are of value. The pools of available personnel and resources are limited by the time available. In the case of a mass casualty event, the insufficiency of personnel and/or resources is reflected in the employment of the triage principle to prioritize the application of medical care to patients in most immediate need. Triage is the standard method, using a series of color tabs (i.e., red, yellow, green, and black, representing, respectively, ***immediate***, ***delayed***, ***minor***, and ***deceased***), to help on scene medical personnel prioritize individuals for medical attention. Additional information on triage can be found at: www.miemss.umaryland.edu/triage.htm and www.start-triage.com.

Hazardous Material Events. The medical portion of the site emergency plan should provide the capability for treatment of workers, personnel, and the public during emergencies that include exposure to and/or contamination by a hazardous material. The development of site emergency medical programs should identify the specific hazardous materials at the site and characterize them as follows: quantities, storage, and use locations; the magnitude and impact of potential release consequences; and the characteristic health effects of each hazardous material. These factors that are addressed in the Hazard Surveys and EPHAs should be incorporated in site emergency medical planning, resource assignment and maintenance, training/drills, provisions for onsite and offsite medical support, and interfaces between onsite and offsite medical and other response capabilities. Arrangements with offsite medical services and facilities (e.g., ambulance services and hospitals) to accept and treat contaminated, injured personnel should be documented. Integration and coordination with offsite capabilities are discussed further in Section 8.3.

The planning for a hazardous materials release emergency should ensure that appropriate recognition and emphasis is focused on medical treatment versus radioactive or chemical contamination for contaminated/injured personnel. Immediate, effective onsite first aid and emergency medical treatment should be provided for injured workers, including those with hazardous material contamination. Onsite radiation protection and industrial hygiene personnel should be properly equipped to assist medical personnel in performing patient survey, decontamination, contamination and exposure control, urine and fecal analysis, and in-vivo counting methods. Proper contamination control procedures should be implemented in handling injured and contaminated personnel. Decontamination facilities should be available, adequately equipped, and staffed by trained personnel.

In the development of the medical portion of the site emergency plan, the Site Medical Director should review the results of Hazards Surveys and EPHAs (especially potential scenarios and consequences), chemical inventories, Material Safety Data Sheets (MSDS), and Job Hazard Analyses. The Medical Director can determine medical support requirements based on the above considerations and the following:

- Size of site and number of workers
- Location of the work being performed (e.g., laboratory vs. remote field locations)
- Response and evacuation times for various site locations
- Levels of qualification of emergency medical responders onsite [i.e., Emergency Medical Technicians (EMTs) or Paramedics]
- Capabilities of offsite medical response organizations

- Distance to and capabilities of local hospitals

Other considerations for developing the medical program will reflect the nature of the work being performed and its inherent safety problems. This facility/site-specific information can be obtained from:

- Industrial/workplace event history and lessons learned
- Occurrence report history
- Employee safety surveys

8.3.3 Resources for the Emergency Medical Program

No prescribed list of resources needed to support emergency medical response exists for facilities/sites that maintain Operational Emergency Hazardous Material Programs. In order to ensure that interfaces with offsite response capabilities are effective, site standards for medical facilities and equipment should be compatible with offsite standards. The necessary site resources will be based on the hazards associated with the facilities onsite and factors discussed in Section 8.2.2, above. As hazards change, and other onsite and offsite factors change, emergency management programs, including the emergency medical portion, should be reviewed and updated.

Onsite and offsite medical facilities should be outfitted and staffed to utilize specialized equipment and supplies specific to onsite hazards. Resources associated with the emergency medical programs may include the following:

- Medical response and treatment equipment and materials such as:
  - Ambulances and helicopters to transport patients
  - Onsite medical treatment facility
  - Stocked first aid lockers
  - Triage kit
  - Defibrillators and advanced cardiac life support equipment
  - Blankets and stretchers
  - Antidotes
  - Chemical burn treatments
  - Urine and fecal analysis equipment
  - Capability to perform chelation therapy treatment, as appropriate
  - Compatible communication systems and equipment for medical responders

  - Procedures that address contamination control, equipment operation, organizational interfaces

- Rescue teams that include medically trained and qualified individuals

- Health physics and industrial hygiene personnel to assist medical responders

- Personal protective equipment for medical responders

- Hazards monitoring equipment

- Personnel decontamination facilities, supplies and equipment

- Means to control and collect contamination associated with injured/contaminated patients

- Offsite medical facilities (e.g., hospital, trauma unit, burn center)

- Accessible employee medical records and history

8.4 Interfaces and Coordination

In order to provide for an effective, integrated response, site medical support personnel should plan and practice in advance how they will interact with other elements of a response. This includes interactions with other types of onsite response capabilities as well as coordination with offsite medical resources. The following sections address issues related to these interactions.

8.4.1 Interfaces with Onsite Resources

Internal planning and response interfaces needed to support the emergency medical program are based primarily on site characteristics, nature of site hazards, onsite capabilities, and organizational framework and responsibilities. Internal organizational interfaces may be challenging when groups have differing response priorities, when procedures differ, and when resources come into conflict. Areas of conflict or challenge between internal organizations should be identified during exercises and evaluations and resolved with appropriate corrective actions.

Typical interfaces in support of emergency medical programs include the following:

- Emergency management and medical departments should interface to ensure that planning for medical resources considers Hazards Survey and EPHA information, to maintain the emergency plan, and to ensure that medical professionals participate in training, drills, and exercises.

- Response and resource planning between medical and hazardous material (HAZMAT)/fire organizations is important regarding medical training and qualification of responders.

- Coordination between medical and Emergency Response Organization (ERO) reentry and rescue planners may also be needed to ensure that rescue teams have at least one medically trained individual per team. The primary responsibilities of rescue teams are to provide immediate life saving aid; remove victims from dangerous scenes (e.g., fires, accidents) or contaminated areas; remove gross contamination, if present and possible; and transfer the victim to medical personnel.

- Interface of medical professionals with industrial hygiene and health physics teams is necessary to ensure coordination of procedures for decontamination of the injured. Radiation/health protection and industrial hygiene personnel assist medical personnel and should have the necessary equipment for surveying patients, providing decontamination advice, assisting in contamination and exposure control, and assisting medical personnel in accomplishing urine analysis, fecal analysis, in-vivo counting and radiochemical analysis for contaminated patients. Life-saving medical care should always take precedence over decontamination. If patient conditions do not permit time for decontamination, the patient should be encapsulated for contamination control.

- Issues of access and escorts for offsite medical responders necessitate interface of medical with site security and operations. Security actions at a site could impact the rapid provision of emergency medical services. Rapid treatment is especially critical in trauma or cardiac situations. Sites should evaluate security systems and procedures for ingress/egress to allow for rapid access of emergency medical responders, their vehicles, and equipment to critically injured or ill patients. Medical first responders should coordinate activities at the incident scene with security personnel to ensure that potential evidence is not disturbed in the case of a security incident.

- Medical interface with human resource organizations may be needed to help ensure the availability of personnel medical records during an emergency as well as identification of victims.

8.4.2 Interfaces with Offsite Resources

Use of offsite emergency medical resources will be determined by many factors involving the site as well as offsite capabilities. Formal planning is needed to ensure that offsite medical resources are used effectively. Formal arrangements through Memoranda of Understanding (MOUs) or Memoranda of Agreements (MOAs) for site support are important to ensure effective working relationships and to avoid problems involving communications, security access, receipt of contaminated injured, medical certifications, removal of contaminated waste, release of information to the news media, and legal liabilities. These arrangements should be reviewed annually to ensure continued applicability. The following are examples of organizations for which formal arrangements may be required:

- Hospitals (including burn centers and trauma units)
- Emergency medical response teams
- Ambulance services
- Life flight helicopter service
- Fire departments
- Hazardous Material teams
- Coroner's Office

The use of helicopter services requires that the site develop protocols for arrival on site, special landing zones, security, and safety procedures. The utilization of the services of an offsite Coroner on a DOE/NNSA site requires an MOA that addresses the identity of the Coroner, procedures to be followed, and issues of jurisdictional authority.

Sites should consider addressing the following types of issues within MOUs or MOAs with offsite emergency medical service providers:

- Roles, responsibilities, authorities, chain of command
- Compatibility of communications systems and protocols
- Expectations for response times of offsite ambulance services
- Procedures for communication between ambulance and receiving medical facility while en route (e.g., ambulance crews will initiate communications with receiving medical facilities while en route)
- Provisions for timely communication to receiving hospital regarding victim exposure and contamination (e.g., exposure and contamination information is sent with victims)
- Provisions to outfit and train offsite medical facilities to use any special equipment or supplies (i.e., protective clothing) related to protection from onsite hazards and contamination control
- Receipt of contaminated patients for transport (via ambulance and lifeflight helicopter) and treatment
- Security clearances and site access for offsite medical response personnel expected to respond onsite
- Site hazards training for offsite emergency medical response personnel
- Training for hospital emergency room staffs on handling contaminated injured, and expert technical support provided to the receiving hospitals

- Removal of contaminated waste from offsite medical facilities and vehicles
- Certifications of medical facilities. For example, a hospital with trauma center status would be expected to maintain that certification
- Assignment of primary and backup facilities equipped to provide appropriate level of care for patients, including contaminated injured
- Offsite medical facility or ambulance service participation in site medical exercises or drills
- Procedures (site and hospital) for coordinating and communicating information related to events or medical conditions to the public
- Routine review and renewal of MOUs or MOAs

8.5 Medical Records and Treatment History

During a medical emergency, certain essential patient records will be created, maintained, and preserved. These include records of emergency medical treatment, bio-samples and tests, offsite medical treatment, records of exposures to hazardous materials and contamination. A mechanism or protocol for identifying the patients and recording essential information related to medical treatment and patient movement is essential. Mass casualty incidents in particular are likely to require the coordinated efforts of several organizations and, hence, a reliable system of maintaining medical records is a critical element of the medical support program.

Health care providers can provide the information needed to complete work-related injury and illness reports with employers (or their representatives) without authorization in accordance with the implementation of the Health Insurance Portability and Accountability Act of 1996 (HIPAA). However, sites need to establish a procedure with the local hospital to ensure that casualty information during an emergency can be shared by health providers to DOE /NNSA and their contractors.

Additionally, there may be a need for rapid access to records of personnel in order to ensure that field and hospital medical providers provide proper treatment. These could include records of general physicals, dosimetry and bioassay, offsite medical records, records of allergies, etc. Such records should be handled with confidentiality to ensure that patient privacy is respected and protected.

8.6 Emergency Medical Response Preparedness Activities

8.6.1 Training and Drills

Site emergency medical response personnel are typically associated with the site fire department or occupational medicine department. In some cases, the security or protective force department will provide emergency medical service personnel.

Regardless of how the organization is structured, the Site Medical Director specifies minimum standards for training for all emergency medical personnel. Site standards for emergency medical training should be compatible with offsite standards. State certification requirements should be met. Onsite and offsite medical personnel should be provided information and training on facility/site-specific hazardous materials.

Emergency medical service providers should be trained to work within the defined incident command system. Where there are differences in agency and organizational approaches to incident command, there should be a coordinated effort to ensure that response personnel are able to communicate and work together under a unified incident command structure that supports critical decision-making, effective emergency medical response, and scene safety.

Participation of the onsite and offsite medical support organizations in the facility and site drill programs should also be encouraged.

8.6.2 Exercises

Onsite and offsite medical emergency response personnel should be offered the opportunity for participation in exercises in advance of emergencies. Exercises that include the medical response element should focus on realism and involve experienced medical personnel in scenario preparation and evaluation to test proficiency, equipment, interfaces, and communications critical for effective emergency medical response. In developing the yearly site exercise, offsite medical response participation and receiving patients at offsite facilities should be included in the scenarios when possible. Compatibility of all communications should be tested, including both onsite and offsite systems.

Medical Subject Matter Experts (SMEs) should also participate in exercises as controllers and evaluators. Corrective actions related to medical response should be developed by the medical professionals and used to improve emergency medical support.

8.7 Federal Medical Assistance

8.7.1 Radiological Emergency Assistance Center/Training Site (REAC/TS)

The Radiological Emergency Assistance Center/Training Site (REAC/TS) is a DOE/NNSA response asset that provides radiation exposure treatment consultation services on a 24-hour basis as part of the Federal Radiological Assistance Program. The services of REAC/TS are focused on radiological medical emergencies and are available to all private medical and governmental bodies. They can provide advice to health care providers in the first few hours of an emergency and can deploy experts to a site in a few hours. Training is provided to emergency department physicians and nurses and focuses on information and skills needed in the first few hours and for long-term care. REAC/TS also provides training for Health Physics personnel on working with medical professionals during a response.

8.7.2 Other Federal Medical Response Resources

Additional Federal resource groups that are designed and available to support emergency medical response include the following:

Chemical-Biological Incident Response Force. This arm of the U.S. Marine Corps consists of trained medical personnel and equipment capabilities for detecting and identifying chemical and biological agents. They provide casualty search, rescue, personnel decontamination, emergency medical care and stability of contaminated personnel. This specialized unit is located 26 miles from Washington DC. Additional information is available through the web site: http://www.cbirf.usmc.mil/.

Weapons of Mass Destruction Civil Support Teams. Members of these teams are members of the U.S. Army and National Guard who are experts in Weapons of Mass Destruction (WMD) and nuclear, biological, chemical defense operations. Teams located throughout the country are federally resourced, trained and evaluated, but perform their mission primarily under the command and control of the Governors of States in which they are located. They have the capability to monitor, detect and identify chemical and biological agents and ability to deploy rapidly to provide medical and technical advice to local first responders.

Disaster Medical Assistance Team (DMAT). Part of the National Disaster Medical System (NDMS) of the U.S. Department of Homeland Security (DHS), a DMAT is a group of medical and support personnel designed to provide emergency medical care during a disaster or other unusual event. DMATs are deployed to provide care for victims of any incident that exceeds the medical care capability of the affected local and State resources.

Disaster Mortuary Operational Response Team (DMORT). DMORTs are directed by the NNMS of DHS. DMORTs work under the guidance of local authorities by providing technical assistance and personnel to recover, identify and process deceased victims. This includes temporary morgue facilities, victim identification, forensic pathology and anthropology, preparation and disposition of remains.

CRITICAL INCIDENT STRESS MANAGEMENT. A variety of non-governmental organizations provide assistance with Critical Incident Stress Management (CISM) programs, designed to help responders and employees cope with traumatic events by caring for the emergency responder's and victim's mental health. CISM interventions are especially directed towards the mitigation of post-traumatic stress reactions..

9. EMERGENCY PUBLIC INFORMATION

9.1 Introduction

The purpose of this chapter is to assist DOE and NNSA facilities/sites and activities in complying with the DOE O 151.1C requirement to ensure that accurate, candid and timely information is provided to workers, the news media, and the public during an emergency to establish facts and avoid speculation. The Order requires that Emergency Public Information (EPI) efforts be coordinated with DOE and NNSA (if appropriate); Tribal, State, and local governments; and Federal emergency response organizations, as appropriate. An additional responsibility of the EPI program is to inform workers and the public of emergency plans and planned protective actions before emergencies.

This chapter is designed primarily for facilities/sites and activities that are required to implement an Operational Emergency Hazardous Material Program and is directed at operations and emergency management staff at Field Elements and operating contractor organizations responsible for DOE and NNSA facilities/sites and activities. This chapter may also provide useful ***general*** guidance in the development of DOE/NNSA Cognizant Field Element or Headquarters EPI Plans.

9.2 General Approach

The ability to provide the public, media and DOE/NNSA employees with accurate, candid, and timely information is based on an effective EPI program. The EPI program provides the means for a facility/site or activity to coordinate the timely exchange of information among representatives from DOE/NNSA and other organizations. To be effective, EPI should be coordinated with onsite and offsite Federal, Tribal, State, and local emergency response organizations. Timely information flow will help keep workers and the public informed, dispel rumors, and provide essential health and safety information. Coordination is critical for preventing the dissemination of confusing, conflicting, and erroneous information.

An effective EPI program ensures that information, distributed to workers, site personnel, and the public during an Operational Emergency (OE), is:

- Accurate, candid, understandable, and consistent
- Current and timely
- Provided to ensure the health and safety of workers and the public
- Provided to establish facts, and avoid rumors and speculation
- Responsive to public concern and information needs
- Consistent with the requirements of the Freedom of Information Act and the Privacy Act

The credibility of DOE/NNSA during an emergency is enhanced through an effective EPI program. The program should be based on day-to-day public information relationships that are expanded for an emergency response. This capability to expand during an emergency is developed in cooperation with onsite and offsite organizations through detailed planning and coordination of plans, procedures, education, and training. EPI functions and the number of EPI staff required to respond effectively to an OE will vary with the nature, severity, duration, and public and media perception of the emergency.

Each DOE/NNSA facility/site and activity needs to prepare an EPI plan that is coordinated with the Emergency Plan and procedures. This coordination is necessary to ensure that emergency management and EPI interactions involving assignment of resources, operations at command centers/Emergency Operations Centers (EOCs), callout of Emergency Response Organizations (EROs), release of emergency information, and other activities are handled effectively and without confusion. EPI staff should be proactive in obtaining emergency information from the facility command center/EOC and monitoring public perception and media reports. This is particularly important in order to detect, control, and correct rumors and misinformation. Accurate information disclaiming rumors and correcting misinformation should be incorporated in media briefings and press releases.

The information released to the public and media should be subject to close coordination among DOE and NNSA, local, State, and Tribal governments, and Federal response organizations. The DOE/NNSA Cognizant Field Element official responsible for emergency public information review and dissemination should be the final and only approval authority necessary for news releases or public statements. The DOE/NNSA Headquarters (HQ) Emergency Management Team (EMT) is kept informed of all EPI actions, as soon as practicable, and is provided with copies of all releases or statements. All updates of news releases or public statements should be coordinated with the DOE/NNSA HQ public affairs director and HQ Emergency Manager to avoid disseminating contradictory information regarding the emergency.

In situations involving classified or unclassified controlled information, the appropriate authorized official [e.g., Derivative Classifier (DC)] needs to review news releases and public statements to ensure that no information is included that presents a security risk. Any emergency response and protective actions required for the health and safety of workers and the public should be adequately explained with unclassified information.

Finally, advance education of the public concerning the emergency plans, notification methods, and potential protective actions in the event of an OE is critical for public protection and effective management.

9.3 EPI Functions and Staffing

All DOE/NNSA facilities are responsible for developing and implementing EPI plans in coordination with the site Emergency Plan. According to DOE O 151.1C, the EPI plan, which can cover multiple facilities on a site, should address the following:

- Identification of personnel, resources, facilities, and coordination procedures necessary to provide emergency public information

- Training and exercises for personnel who will interact with the media

- Methodology for informing workers and the public of DOE/NNSA emergency plans and protective actions, before and during emergencies

- Coordination of public information efforts with local, State, and Tribal governments, and Federal emergency response organizations, as appropriate

The EPI Plan should specify roles and identify individuals within the EPI organization by position and responsibility. Typical contents of an EPI Plan are presented in **Table 9-1**.

The EPI organizational functions include: collection, coordination, production, and dissemination of information; and monitoring and analysis of media coverage, public concerns/perceptions, and information needs. These functions should be staffed consistent with the ***nature, severity, duration,*** and ***public/media perception*** of the event or condition. Trained spokespersons should provide support in media interface and technical subject matter experts (SMEs) should be made available to provide a clear understanding of the event, if necessary. A news writer and other trained personnel can provide support in media services, media monitoring, public inquiry, media inquiry, and management and administrative services.

Personnel are normally assigned to the EPI response organization from the site DOE/NNSA public affairs organization and the site contractor public affairs organization. However, other parts of site organizations can also be assigned to support EPI functions. For example, Human Resources and Information Center staff may answer phones or support employee communications; Information Technology and Audio-Visual Support groups may help operate EPI facilities and equipment; and Hazards Control and medical personnel may provide technical expertise for message development.

Position descriptions should describe the principal functions of each EPI position and include checklists. A checklist can be used to itemize the duties relevant to each emergency response position, beginning with notification and continuing with the tasks to be performed throughout an emergency until normal operations resume. At a minimum, each position should be staffed with a primary and one alternate. If possible, a third person should be assigned to serve as a second alternate.

The titles assigned to various EPI positions are generally facility/site-specific. For this reason, the guidance presented in this EMG chapter will, with a few exceptions, only use a descriptive title (i.e., in lower case) in addressing an EPI position’s functions and responsibilities.

Table 9-1. Typical Contents of an Emergency Public Information Plan

EMERGENCY PUBLIC INFORMATION (EPI) PLAN

Table of Contents

Appendices

9.4 EPI Response

9.4.1 Commensurate Response

EPI functions and the number of EPI staff required to respond effectively to an OE will vary with the nature, severity, duration, and public and media perception of the emergency. For DOE/NNSA Hazardous Material Program facilities, there are two tiers of EPI response and associated staff activation, depending on the level of offsite involvement and/or media attention to an OE. First, the EPI plan for any DOE/NNSA facility/site needs to have provisions for public information personnel to interface directly with the EOC and to establish an emergency news center function that includes a media center. A *media center* is a designated location where the Cognizant Field Element and facility contractor personnel can conduct the necessary briefings and press conferences regarding an OE. The initial EPI organization contains support functions and staffing levels that, at a minimum, provide for coordination between the DOE/NNSA and the facility/site contractor in responding to the public and media and in keeping local, State, Tribal, and Federal authorities informed. This initial EPI organization will generally be sufficient for OE Alerts, Site Area Emergencies, and for many unclassified OEs that are *not expected* to produce consequences offsite.

An EPI plan needs to also have provisions to establish a Joint Information Center (JIC), which is a working location where multiple jurisdictions gather, process, and disseminate public information during an OE. The JIC will have a *media center* and sufficient staff to support the **full** EPI organization. A **full** EPI organization activated in a JIC would be necessary during an OE General Emergency involving the airborne release of a hazardous material (i.e., radioactive or chemical), since offsite jurisdictions could be affected and involved in the response. The support functions and staffing for a **full** EPI organization, representing an enhancement of functions of the **initial** EPI organization, should be sufficient to coordinate the EPI activities among DOE/NNSA, the facility/site, and local, State, Tribal, and Federal response organizations. Some OEs not requiring classification or classified OEs less than General Emergencies, may also require the **full** JIC response if the level of media interest is high (e.g., high profile security events; mass casualty events). JIC capabilities may be needed in these cases to provide a coordinated EPI response. If a need arises to activate a JIC, the location and phone number will be immediately made available to the response organizations, the media, and the public.

Each person representing a responding entity in the JIC should function in at least two capacities: 1) Representing their parent organization in carrying out its public affairs mission; and 2) Providing and/or contributing public affairs services/expertise in support of the various JIC activities. This dual role provides the benefits of having access to coordinated information and the expertise from other responding organizations

The key personnel involved in the initial EPI organization can locate in or adjacent to the facility command center/EOC, or in a near-by area. The JIC location can also be utilized, if convenient or necessary. If the event escalates in severity and/or media attention, the initial EPI organization can be moved to the JIC location, if not already established in the JIC. Two important criteria for choosing the location for the media center and the JIC are the availability of space sufficient to accommodate the EPI staffs and expected media representation and the accessibility of the facility to the media during an emergency event.

9.4.2 Initial EPI Organization

The nature and severity of an OE will generally dictate the EPI response. EPI organizations should be able to perform effectively in worst-case conditions and during lower severity OE events. For an OE with no potential for offsite impact, the EPI response functions may be reduced and may take place at a pre-designated location near the site or onsite. If safety and security conditions permit, it may also be appropriate to arrange for briefings of the news media at a pre-designated *media center* near the site or at an onsite location. When there is no potential for offsite impact, offsite agencies will not usually participate in the EPI response, and hence activation of a JIC may not be necessary. However, agencies will want to be kept informed. It is necessary to establish communication with key government officials and the local media immediately after declaration of an emergency. The key to initial success is to obtain all necessary information promptly and to activate personnel quickly enough to handle telephone notifications and inquiries.

Position titles may vary slightly from site to site, but the functions of information coordination, production, dissemination, and monitoring and analysis of media coverage and public perceptions should be incorporated into the EPI organization. Internal and external organizational relationships should be depicted in both the Emergency Plan and the EPI Plan. When a facility command center/EOC is initially activated for emergency response, at a minimum, the following general organizational EPI positions/functions are representative of those typically staffed:

- Public affairs director, a DOE/NNSA Cognizant Field Element representative, is usually located in the facility command center/EOC and reports to the DOE/NNSA Cognizant Field Element Emergency Director (ED). The *public affairs director* directs and coordinates all EPI activities; coordinates the preparation and release of all emergency public information directly with the ED; communicates directly with the facility established by the contractor to disseminate emergency information; and should be the final and only approval authority necessary for news releases or public statements. The *public affairs director* is responsible for informing the DOE/NNSA HQ public affairs director and HQ Emergency Manager of all EPI actions, as soon as practicable. The *public affairs director* provides copies of **all** news releases or public statements to the DOE/NNSA HQ public affairs director and the HQ Emergency Manager. The *public affairs director* should coordinate all updated news releases or public statements with the DOE/NNSA HQ public affairs director and HQ Emergency Manager to avoid disseminating contradictory information regarding the emergency.

- Public information manager (a contractor position) coordinates preparation and release of all emergency public information with the *public affairs director* and communicates directly with the facility established by the contractor to disseminate emergency information.

- Public information officer is assigned to the local EPI response team involved in an offsite response deployment to provide information regarding DOE/NNSA roles and capabilities.

- Spokesperson briefs the media and/or the public on event status and site response and recovery activities. A senior-level DOE/NNSA manager or designated contractor representative with technical understanding of the emergency and training in crisis/risk communications should be a credible spokesperson who represents site management.

- News release writer works directly with the *public information manager* to gather confirmed information on the event and prepare news releases or public statements.

- Technical SME/briefer ensures that information to be publicly disseminated is technically accurate and performs an advisory role for the *news release writer* and *public information manager*. Interprets technical information provided to the media and public in lay terms (including pertinent information on radiological, chemical, other hazards, and operational implications of the incident, as needed). Technical support may be provided to the *spokesperson* and other EPI staff.

- Authorized official (e.g., DC) reviews news releases for classified or unclassified controlled information.

- Employee relations coordinator informs employees of event status and emergency response and recovery activities. Responds to employee inquiries. Should be assigned responsibility for liaison with employee families; may communicate with employee families concerning special situations.

- Rumor control coordinator ensures that personnel answering inquiries from the public and monitoring the media have access to current and accurate information. Identifies problems in media reporting (incorrect information, false statements) to the *public information manager*. (Depending on the facility/site, this activity may be accomplished by the *media monitoring coordinator* and/or the *media/public relations coordinator*).

- Media monitoring coordinator tracks broadcast and print coverage of the emergency and keeps the *public information manager* informed of what is being reported.

- Media/public relations coordinator responds to media and public inquiries.

- Government coordinator ensures authorized representatives of all local, State, Tribal, and Federal government organizations receive emergency information and updates.

9.4.3 Transition to a Full EPI Organization - JIC Activation

EPI organizations should have the capability for a phased-in response from a lower severity event, to a full-scale response, and to recovery after a significant accident. In a full EPI response, a JIC is a focal point for multiple EROs to release information concerning emergency conditions, activities, and decisions. Important considerations to ensure smooth transition from the initial EPI operations to a full EPI/JIC activation include:

- Planning the movement of EPI personnel to an offsite JIC when site protective actions or lockdowns are underway;

- Ensuring continued flow of emergency information (i.e. response to media and public callers) until a JIC can actually be activated; and

- Need for satellite EPI response to deal with news media at locations such as a site gate or local hospital, while retaining the JIC as the source of new information.

9.4.4 Full EPI Organization - JIC

A JIC should be established, directed, and coordinated by the senior DOE/NNSA Cognizant Field Element *public affairs director* or a designee in the event of an OE with offsite implications and/or significant news media interest. When necessary or desirable to evolve EPI from the **initial** organization to its full activation, the JIC management team, including the *JIC manager*, the *JIC news manager*, *spokesperson*, and *outside agency representatives*, should be deployed (if not already at the JIC location) to the pre-designated JIC facility where they can share and coordinate information. The *public affairs director* and the DOE/NNSA ED should determine if the nature of the event would require 24/7 hours of operation for the JIC.

All questions from the public and the media should be directed to the JIC to ensure that the information that is disseminated is consistent and accurate. Under no circumstances, should a field or program office answer any calls or emails from the public or media. These requests for information should immediately be referred to the JIC to ensure consistency and accuracy in Departmental responses for information.

The **full** EPI/JIC organization will include the general positions/functions of the ***initial*** EPI organization presented in Section 9.4.2, but replacing/supplementing the *rumor control*, *media monitoring*, *media/public relations*, and *government coordinator* positions with the following representative positions and teams:

- Media monitoring team monitors broadcast and print media coverage of the emergency; records broadcast coverage; retains a record of print media coverage; reviews all media coverage for inaccuracies and rumors; provides the *JIC manager* with reports; and periodically, or upon request, provides to the *JIC news manager* an updated analysis of issues, including perceptions of the public and media.

- Media relations team contacts the media upon activation of the JIC; ensures that approved news releases are provided to the media; updates media not present at the JIC; receives and assimilates incoming data from media monitoring team and others; and responds to incoming telephone queries and requests. Usually reports to the *JIC news manager* through a team leader. Information for response to media calls may be obtained from status boards, news releases, chronologies, fact sheets, supervisor's notes from news conferences, resource books, and other approved written materials.

- Public relations team answers inquiries from the general public with accurate, up-to-date information to prevent the spread of misinformation and dispel rumors. Information for response to public calls may be obtained from status boards, news releases, chronologies, fact sheets, supervisor's notes from news conferences, resource books, and other approved written materials.

- Offsite agency representatives, representing local governments, State, Tribal, and Federal agencies, coordinate information from their agencies to be released to the media with EPI representatives of other agencies and DOE/NNSA; provide accurate, timely, and applicable information to the public about emergency operations within their jurisdictions; participate, as appropriate, in news conferences.

- JIC manager is responsible for the timely release of clear and accurate information to the public and media. The *JIC manager* remains in direct communication with the DOE/NNSA Cognizant Field Element *public affairs director,* ensures coordination with and among, local, State, Tribal, and Federal designated representatives at the JIC and other locations. The *JIC manager* is responsible for the overall management of the JIC, oversight of the JIC facility and JIC staff, and accommodating JIC administrative support needs.

- JIC news manager accommodates the news media; coordinates news conferences; provides media kits and news releases to the media; and assists the *JIC manager* in all matters pertaining to interaction with the media. Serves as an extension of the *JIC manager* by tracking inquiries between the EOC and the JIC; keeping the public and media inquiry teams updated on emergency events; ensuring that the *JIC manager* has adequate review of information prior to media briefings; ensuring that communications are maintained with the EOC; ensuring that rumors and misinformation are corrected; and remaining in direct communication with the *JIC manager*.

- JIC support team provides administrative and logistical support, audio-visual support, computer and communications support and associated equipment needed. Administrative support may include, but is not limited to, distribution (JIC facility and external) of news releases to a designated list of emergency response staff and news media; receipt of incoming information and distribution to JIC management and staff; messenger services; and registration of news media. Staff providing audio-visual support may help provide visual aids for briefing news media and ensure that equipment to support and record briefings is functioning. Computer and communications support includes ensuring that necessary equipment is available, functional, and advising JIC staff on equipment use.

9.4.5 EPI Role in the Incident Command System

Under the Incident Command System (ICS), the public information officer is a key staff member supporting the incident command structure, in accordance with the National Incident Management System (NIMS)/ICS. The public information officer represents and keeps the Emergency Director (ED) informed on all public information matters relating to the OE at the facility/site or activity. The public information officer is responsible for:

- Media and public inquiries

- Emergency public information and warnings

- Rumor monitoring and response

- Media monitoring

- Coordinating, clearing with appropriate authorities, and disseminating accurate and timely information related to the incident (especially information on public health and safety, and protection)

The public information officer serves as the on-scene link to the EPI organization/JIC, providing the means for keeping the ED informed of all EPI activities.

9.5 Media Relations

News media is the major conduit through which the public perceives how DOE/NNSA and its contractors respond to an emergency. Within the constraints of the emergency and available resources, every effort should be made to accommodate the needs of the media. Cooperation should result in balanced and accurate information dissemination. Senior DOE/NNSA management should be accessible, prompt, and forthright in dealing with the media prior to, during, and after emergency events. Credibility and empathy are imperative. Effective and prompt interface with the media and the public before, during, and after an event builds such credibility.

Prior to emergencies, the media should be considered a partner. The media should be invited to tour the facility, meet facility/site management, familiarize themselves with emergency plans, receive DOE/NNSA EPI/JIC organizational structure and points-of-contact, and be invited to participate in emergency response training, drills, and exercises. In addition, the media and public should have access to pre-written materials, such as fact sheets and Frequently Asked Questions (FAQs), describing the facility/site and HQ mission. Pre-prepared materials will serve the purpose of answering many of the questions that may arise during an emergency event and should be part of every EPI Plan.

9.5.1 Guidelines

The following guidelines are recommended for interacting with the news media in emergencies at DOE/NNSA facilities/sites or offsite events involving DOE assets:

- During an emergency, or as other events warrant, a single authoritative source of information should be established for release of information regarding the event response, protective actions implemented onsite, interface with offsite authorities, and recovery. That single source should be the media center established by the EPI organization or the JIC, if activated.

- If the health and safety of the public and/or facility/site personnel are in jeopardy, it should be addressed immediately and candidly. Communication between the command center or EOC and EPI/JIC should include sharing with the EPI/JIC the offsite emergency notification forms that have been released to local and State emergency management agencies.

- Response to public perception should be addressed immediately and candidly. ***Perception is reality***.

- Avoid use of technical jargon during news conferences. While it is important to have available technical details of an incident or accident, it is imperative that an explanation in lay terms is made as quickly as possible.

- Continuing education should be provided to the news media. Media should be invited and encouraged to participate in emergency response training, including drills and exercises, and to acquaint themselves with the facility management, emergency plans, and emergency points-of-contact. This education could be accomplished through special events at the site, editorial board visits, tours, or similar activities.

9.5.2 News Releases

The following recommendations address the preparation, approval, and dissemination of news releases:

- Timely response to public/media is imperative to establish credibility. "Fill-in-the-blank," pre-formatted news releases should be prepared and approved in advance. News writers and managers who will approve news releases should be familiar with this system in advance. An initial announcement may state: ***"There has been a (nature of emergency) at X facility; details will be available at a news conference at X location. A Joint Information Center has been established and the media inquiry phone number is (number). The public inquiry phone number is (number)."***

- ***The approval process should not be a hindrance***. In order to provide urgent health and safety information to the public in an emergency, the DOE/NNSA Cognizant Field Element *public affairs director* should be the <u>final and only approval</u> necessary for initial and subsequent news releases or public statements. All subsequent news releases or public statements should be coordinated with the DOE/NNSA HQ public affairs director and HQ Emergency Manager to avoid disseminating contradictory information regarding the emergency. Copies of all news releases should be provided to the DOE/NNSA Headquarters public affairs director.

- Procedures for the approval of news releases should be streamlined, established, and involve a minimum number of key individuals in review and approval. These should include procedures for verbal and/or written acknowledgment of review of news releases. All individuals and alternates who are responsible for such approvals should be designated responders within the emergency organization and fully aware of the mission of emergency public information.

- Knowledgeable staff members should review news releases for technical accuracy to ensure that information contained in the release is correct and appropriate for public dissemination. This needs to be achieved in a timely manner to ensure that health and safety messages are disseminated quickly and that DOE/NNSA is sensitive to the public's need for frequent updates in a developing situation.

- If the health and safety of workers and the public is at risk, it is imperative to release information as quickly as possible. Information that has been provided to offsite agencies via emergency notification forms should be considered as having been approved and spokespersons are authorized to present this information to the news media.

- While the DOE Order does not stipulate that news releases and other associated notifications or news conferences occur in a specific time frame, DOE/NNSA should adhere to the standards of other Federal agencies and private industry by releasing information within one (1) hour of the declaration of the event. EPI/JIC organizations should also be sensitive to news media deadline schedules.

- Chronological files of news releases, pending releases, media inquiries, and rumor control should be maintained for reference. Printed material supplied to the media should be numbered for easy reference.

- Photographs, maps, charts, and other visual aids should be prepared in advance. Materials should be easy to read and of print and broadcast quality.

9.5.3 News Conferences

News conferences should be held as emergency events or public and media interest warrant. However, there should be a minimum of two news conferences a day for the duration of the emergency. They should be scheduled with media deadlines in mind. News conferences should be announced in advance to maximize attendance

News media at the *media center*/JIC should be made aware of those in authority and be provided with the ground rules that govern the news conference activities. A moderator should manage question and answer sessions to effectively field questions to speakers as well as to start and end the news conferences.

Information provided at news conferences should be coordinated with and monitored by each organization represented in the *media center*/JIC to ensure consistency. To anticipate questions during the news conference, coordination should include participation in meetings prior to news conferences to determine the spokesperson and the subjects to be addressed.

9.6 EPI/JIC Facilities and Equipment

Provisions for an EPI facility that is of adequate size, design, and location, and equipped to support the EPI functions and communications described in Section 9.4 needs to be planned. The EPI facility should include space and equipment to accomplish the functions previously addressed and should be designed and equipped to support coordination of emergency information among onsite and offsite organizations that may gather at that location to release emergency information. An effective and reliable EPI communications system should be established among DOE/NNSA HQ, the Cognizant Field Element, and on-scene locations at the affected facility/site or activity.

For lower severity OEs, a facility should be available to accomplish the functions described in Section 9.4.2, which describes an **initial** EPI organization that utilizes a *media center* for the dissemination of information. A full-scale JIC, capable of supporting the functions described in Section 9.4.4, should be planned for DOE/NNSA facilities/sites that are required to implement an Operational Emergency Hazardous Material Program. While the following descriptions focus on the JIC, the EPI facility for events of lesser severity can be scaled down from the JIC requirements, based on actual media needs.

JIC plans should provide workspace (i.e., *media center*) for reporters and camera crews. This space could be an auditorium or other area within the proximity of the JIC, where press conferences and associated media activities might be accomplished (i.e., phones, electrical connections, work space, podium, lighting, microphones, etc.). Requirements should be established on the basis of a media needs analysis.

The EPI plan and facility/site emergency plan should specify the exact location of the JIC by building name, street address, city, and state, as well as driving instructions from airport(s), major cities, and alternate routes. For hazardous material OEs, if the JIC is near the site, an alternate JIC should also be identified in case the primary JIC is threatened or uninhabitable.

The EPI Plan and facility/site emergency plan should also address the following topics related to the JIC:

- **Physical Security.** Security is imperative in all aspects of an EPI program. Security personnel should be on call to control access to the JIC by restricting entrance to pre-designated response personnel. Security should also control access by the media as required by procedure (e.g., pre-approved list, pre-issued credentials). (The DOE/NNSA Cognizant Field Element ED or designated representative should approve exceptions to the procedure.)

- **JIC Identification/Media Sign-in.** Procedures for media arrival and sign-in to the JIC should be established. Badges or nametags to identify media representatives and staff should be available.

- **Other Tools for the JIC**

  – List of 24-hour media and agency public information officer points-of-contact that is maintained and regularly updated

  – Position procedures, checklists and forms for positions assigned to the facility/site

  – Internet and intranet access as appropriate

  – Pre-formatted news releases on computer disk and saved to a shared drive, as appropriate

- Large area and site maps for reference and use in media briefings
- Other visual aids (drawings, photographs, schematics, emergency planning zones, etc.) of adequate size to support media briefings
- Reference materials on the emergency plan, site hazards, etc.

- **Equipment and Supplies.** Equipment associated with the functions addressed above should be based on a media needs analysis, be readily accessible, and include items such as:
  - Adequate phones and phone lines for JIC staff, agencies represented and news media if deemed necessary
  - Backup communication methods for JIC staff
  - Cable-ready television and radios for media monitoring
  - Recording equipment for media monitoring and recording media briefings
  - Computers, necessary software and printer to support information exchange and preparation of news releases and event chronology
  - Facsimile machines and copiers
  - Media kits or information pamphlets, which include information on the site, emergency plan, JIC ground rules and layout, and pre-approved site general schematics/photographs
  - Status boards
  - Clocks
  - Tables, chairs
  - Identification badges
  - Office supplies

9.7 EPI Preparedness Activities

9.7.1 Training and Drills

A successful EPI program requires specialized training and participation in the site/ facility drill program. Emergency responders should understand how to effectively deal with the public, employees, and media. A successful EPI training program should incorporate the following concepts:

- All EPI program team members should receive initial training prior to participation in an event, drill, or exercise. Training should include an overview of EPI emergency preparedness and response; DOE/NNSA policy on emergency management, site plans, and procedures; facility/site operations; hazardous materials risks; and facility/site-specific orientation training. Training should be position-specific and include cross-training to understand and support other positions.

- Emergency spokespersons and technical briefers should receive specialized training on crisis communications with the public and news media, coordination with offsite agencies, translation of technical information, message development and use of visual aids.

- Drills should be conducted to help train EPI/JIC personnel on the practical application of the public information functions that should be performed in an emergency, how to interface with other positions, and how to implement new ideas and procedures.

- Team members should receive annual re-qualification training in their respective functions, EPI organization operations, and the EPI relationship to the site emergency response effort. Re-qualification training should include:

  - Summary of “key topics” covered in the initial training

  - Changes in EPI plan/procedures

  - Demonstration of functional capabilities through tabletops, stop-action drills, and other related activities

  - Detailed review of findings and lessons learned from drills and exercises

- EPI/JIC operations training should be made available for appropriate DOE/NNSA personnel, offsite emergency management representatives, government officials, state emergency management personnel, county commissioners, Tribal representatives, county health officials, and the media.

- Records of training and drill participation should be maintained for EPI personnel.

9.7.2 Exercises

Exercises provide a means for evaluating EPI/JIC plans and procedures and, during full-participation exercises, provide experience in working with offsite emergency response organizations. Exercises should evaluate personnel in areas identified as deficient during past exercises or actual events. The exercise program should include sufficient scenarios that test the response roles of EPI personnel. The EPI organization should always provide a representative to the scenario development team for exercises involving EPI to ensure that the objectives of the EPI organization are incorporated. The EPI program should ensure that lessons learned from the exercise program are incorporated into the plans and procedures for EPI/JIC operation.

Every EPI team member should participate in at least one exercise annually. During an exercise, attention should be focused on the EPI team's overall performance and in its effectiveness in information coordination, production, dissemination, monitoring and analysis functions, and in timely dissemination of accurate and candid information to the public and media.

9.7.3 Offsite Interfaces

EPI plans and preparedness activities should provide for cooperative interface and coordination of public education and information activities with Federal, Tribal, State, and local response organizations. During an emergency, there should be continual interface with Federal, Tribal, State, and local representatives, local executives, and the Governor's office to ensure accuracy of information. These interfaces should be arranged and documented in formal plans, memoranda of agreement or understanding, and/or other arrangements.

Tribal, State, and local governments should be encouraged to prepare their own public information response plans in conjunction with the facility/site EPI planning effort. However, all participants should subscribe to procedures for JIC operation. All official elements should be equal partners in operation of the JIC and in securing information disseminated by the JIC. However, a single individual should be in charge of JIC operation at all times. This should be arranged, discussed, and agreed to in advance by all parties.

Local government participation in a JIC is important if an emergency involves local government response. If the local government’s public information officer is unable to relocate to the JIC, they should still be part of the information sharing process using available technology.

Local, State, and Tribal governments should be encouraged to participate in EPI training and drills/exercises conducted by the site.

9.7.4 Public and Media Education

A program to educate the public and the media is the foundation of an effective, accurate, and reliable EPI program. Pre-planning can ensure that the public understands the messages given during an emergency that explain the risks posed to them and the protective actions they may need to take. The public education program, therefore, should be based on the actual risks posed by the facility/site or activity as identified by the Hazards Survey/Emergency Planning Hazards Assessment (EPHA) process. The Local Emergency Planning Committee (LEPC) or local emergency management agency should also be involved in communicating this information to the community and planning offsite response.

Education of the public and media should include notification procedures and possible protective actions, both onsite and offsite. Information may be disseminated in lectures, television and radio programs, or written materials, such as calendars, brochures, websites, telephone books, refrigerator magnets etc., to residences, offices, hotels, and other public locations. If appropriate, information should be provided on sheltering-in-place, evacuation routes, relocation centers, risks and hazards onsite, and radio/television/cable stations used for emergency public information and Emergency Alert System announcements. A 24-hour general public information phone number for public inquiry should be publicized. A media kit should be available for all radio, television and print news media.

Other information to be addressed may include traffic routes and transportation for the handicapped and general public, hospital information, respiratory protection methods, and use of "radio-protective" drugs, where applicable. Issues concerning special facilities, such as schools, prisons, nursing homes, senior citizen or childcare facilities, shopping centers, and businesses within the Emergency Planning Zone (EPZ), should be addressed. Agricultural information is also important. State and local representatives will provide educational material to farmers, market vendors, milk producers and others dependent on land within the EPZ or potentially affected areas.

The local media should be seen as a partner in EPI. If the media is educated in the facility/site and activity risks and emergency plans, they can communicate emergency information to the public more effectively and accurately. An annual media day is an excellent time to implement the public education program. A site tour in conjunction with media day, and invitations to observe an emergency exercise or participate in emergency response training programs, are excellent ways to involve the media in public education and improve communication with the community.

10. TERMINATION AND RECOVERY

10.1 Introduction

The purpose of this chapter is to assist DOE and NNSA field elements in complying with the DOE O 151.1C requirements on emergency termination and recovery. The Order requires that Operational Emergencies (OEs) be terminated only after predetermined criteria have been met and formal termination of the response phase has been coordinated with DOE/NNSA Headquarters and offsite agencies. Depending on the nature and severity of the emergency, recovery may involve a variety of activities directed at restoring the facility and area affected by the emergency to a safe, stable pre-incident condition. Recovery should include: communication and coordination with Tribal, State, and local government and other Federal agencies; planning, management, and organization of the associated recovery activities; and ensuring the health and safety of the workers and public.

This chapter is designed primarily for facilities/sites and activities that are required to implement an Operational Emergency Hazardous Material Program and is directed at operations and emergency management staff at Field Elements and operating contractor organizations responsible for DOE and NNSA facilities/sites and activities.

10.2 General Approach

Termination is the declared conclusion of an OE. Formal termination of emergency response should be considered when conditions at the incident scene and other impacted areas are sufficiently well defined and stable that the capabilities of the entire Emergency Response Organization (ERO) are no longer needed to manage the situation. The decision to terminate emergency response and the subsequent <u>notification</u> of all involved Federal, Tribal, State, and local organizations mark the beginning of recovery.

Termination criteria differ between OEs that require classification (i.e., as Alert, Site Area Emergency, and General Emergency) and those that do not. The decision to terminate a classified OE will be based on the perceived need for the ERO to remain fully active to monitor and manage the situation. In this case, termination is essentially a declaration that a decision has been reached that the <u>full ERO is no longer needed</u> and the ERO may now begin to reduce its support. The decision to terminate an OE not requiring classification is a formal ***announcement*** or ***acknowledgment*** that the situation is stabilized and that the response activity <u>is ending or has been substantially scaled back</u>. In the former case, the criteria will represent decision criteria to be satisfied, while the later criteria will be observables associated with the emergency event or condition.

Before an OE is terminated, any recovery actions necessary to restore the facility and site to normal operations should be identified and a plan to accomplish those actions should be developed. Depending on the nature of the emergency, the recovery plan may vary from a simple listing of follow-up activities and assignments to a <u>formal</u>, detailed plan that includes specific objectives, schedules, and assigned responsibilities. The need for a formal Recovery Plan will depend on the complexity and expected duration of any actions necessary to deal with after-effects of the event. A formal Recovery Plan should always be approved and a responsible executive (Recovery Manager) assigned before termination of:

- Any OE classified as an Alert or higher that involved actual release of hazardous materials to the environment.

- Any OE that will require follow-up actions extending well beyond the time period when the full capabilities of the ERO are needed to manage the event. Such follow-up actions may include, but are not limited to: monitoring of affected facility status or environmental conditions; mitigation measures to reduce impacts of the emergency on property, the environment or human health; restoration of damaged facilities/equipment; or replenishment of emergency response supplies/equipment depleted during the response.

Recovery is the phase of activity that follows termination of an emergency. During recovery, actions are taken to restore a facility, site or activity to normal operation or to otherwise deal with the aftereffects of an emergency. The recovery period begins when emergency response is declared terminated and continues until the objectives of the recovery effort have been met. Recovery objectives may include meeting specific criteria for resuming normal operations and activities in facilities/areas affected by the incident or for cessation of particular remediation efforts.

The types of activities that could be conducted during the recovery phase include (but are not limited to):

- Accident investigation
- Damage assessment
- Security assessments
- Environmental consequence assessments
- Long-term protective action determinations
- Facility repair and restoration
- Environmental restoration of the facility and/or incident scene
- Dissemination of information to workers and the public

Some recovery activities may be similar to (or a continuation of) actions performed during the response phase, such as entering a facility or affected incident area in (or from) which hazardous materials have been released.

10.3 Termination

Once declared, an OE will almost certainly become known throughout DOE/NNSA, the news media, and the public. Because of the attention focused on the facility/site, the reasoning behind any termination decision may receive as much outside interest and scrutiny as the emergency declaration itself. To reduce the prospect of controversial and contentious termination decisions, emergency plans and procedures should provide the Emergency Director (ED) with a decision process and criteria for terminating the response phase, releasing the ERO, and beginning recovery.

A basic difference exists between the termination of an OE that involves the release of hazardous materials to the environment (classified OE) and one that does not.

- In the case of the classified OE, the decision to terminate ***causes*** or ***allows*** some or all of the ERO components to suspend or reduce their activities. Accordingly, the decision to terminate will be based on the perceived ***need for the ERO*** to remain fully active to monitor and manage the situation.

- In general, the decision to terminate an OE not requiring classification formally ***acknowledges*** that the situation is stabilized and ***announces*** that the response activity is being ended or substantially scaled back. In contrast to termination of an OE requiring classification, this termination decision does not ***cause*** suspension or reduction in the response activity; rather it is a formal notification of the change in response activity.

10.3.1 Operational Emergencies - Not Requiring Classification

The declaration of an OE will ensure that notifications are expedited and that the magnitude and significance of the event are recognized and highlighted through the occurrence reporting process. Thus, an OE declaration will have fulfilled most of its purpose as soon as the required notifications and reports are completed. The decision to terminate an OE will not impact the subsequent collection, analysis and dissemination of data through the occurrence reporting process.

The following provisions should be made for the termination of an OE that does not require classification:

- Authority and lines of communication for making the termination decision should be clearly defined in emergency plans and procedures. Response to an event categorized as OE may be similar in nature and magnitude to “ordinary” fire, hazardous materials (HAZMAT), or environmental spill responses that have been conducted in the past at the site or facility. To avoid confusion and indecision, the relationship between Incident Command, Emergency Management and Occurrence Reporting functions with regard to terminating an OE should be explicit.

- Formal termination of an OE should be considered when the local response authorities (such as the Incident Commander in charge of firefighting, rescue, spill cleanup, etc.) determine that the response effort can be suspended or substantially scaled down. Criteria for terminating each of the various types of OEs identified in the Hazards Survey should be documented in emergency plans and procedures. Examples of termination criteria include:

- The affected facility, site, or incident scene is in a stable condition, and there is a high probability that it can be maintained in that condition.
- Fire, flood, earthquake, or similar emergency conditions and/or security considerations no longer constitute a hazard to critical systems/equipment or to personnel.
- Existing conditions no longer meet the established emergency categorization criteria and it appears unlikely that conditions will deteriorate.
- All contaminated and/or injured personnel have been treated and/or transported to medical facilities.
- All initial emergency notifications have been completed.
- Accountability of personnel is complete.

- Termination of response to a declared OE needs to involve coordination with Tribal, State, and local agencies and organizations responsible for offsite emergency response and notification. As a minimum, all parties that were notified of the OE declaration or participated in the response should be advised of the intent to terminate. The advisory should state the justification for terminating, give the date/time that the termination will be effective, and be issued sufficiently in advance of the effective date/time that recipients have the opportunity to discuss the decision and its bases with DOE before it becomes effective.

- The need for a formal Recovery Plan will depend on the complexity and expected duration of any actions to deal with after-effects of the event. Examples of situations that may indicate the need for a formal Recovery Plan and designation of a responsible executive (Recovery Manager) include:
  - Technical criteria for resumption of operations/occupancy at affected facilities will need to be developed.
  - Investigation and fact-finding activities are expected to be lengthy or involve multiple contractors and/or jurisdictions.
  - Substantial and prolonged coordination and communications will be required with offsite governments, agencies and/or response organizations to assess the extent of area or property damage and/or contamination.
  - The event resulted in a large number of personnel injuries or illnesses requiring protracted follow-up treatment, analysis, and public information.

10.3.2 Operational Emergencies – Requiring Classification

Response to an emergency involving actual or potential release of hazardous materials to the environment can be terminated only when capabilities and resources of the ERO are no longer needed to manage the event. Provisions should be made for termination of classified OEs (e.g., Alert, Site Area Emergency or General Emergency). General criteria for termination should be documented in the emergency plan/procedures. The criteria should be used by emergency managers to decide when to end the emergency response phase and initiate recovery. A formal Recovery Plan is needed for OEs requiring classification.

The following are selected examples (not all-inclusive) of event termination criteria:

- Security measures have been reviewed and it has been determined that operational levels of security can be maintained.
- Protective actions have been reviewed and adjusted (as needed) for extended recovery operations.
- Radiation or hazardous material exposure levels within the affected facility or areas are stable or decreasing with time.
- The affected facility, site, or incident scene is in a stable condition, and there is a high probability that it can be maintained in that condition.
- Fire, flood, earthquake, or similar emergency conditions and/or security considerations no longer constitute a hazard to critical systems/equipment or to personnel.
- Releases of hazardous material to the environment have ceased or are controlled within permissible regulatory limits, and the potential for an uncontrolled release is low.
- Contaminated areas are identified, isolated and secured.
- Existing conditions no longer meet the established emergency categorization or classification criteria, and it appears unlikely that conditions will deteriorate.
- No surveillance relative to protective actions is needed, except for ingestion pathway concerns and contamination and/or environmental assessment activities.
- All contaminated and/or injured personnel have been treated and/or transported to medical facilities.
- All initial emergency notifications have been completed.
- Access to affected areas necessary for conducting recovery operations has been obtained.
- Accountability of personnel is complete.

- The incident scene can be preserved until the responsible investigative authority agrees that recovery operations may begin.
- Concurrence of all principal participating response organizations (i.e., Tribal, State, local, DOE Headquarters, and other Federal agencies) has been received. Internal and external communications associated with termination have occurred.
- The facility/site and DOE/NNSA management, in consultation with appropriate offsite agencies, are unable to identify a sufficient rationale for continuing to operate in the emergency response mode.
- Initial recovery activities have been clearly identified and prioritized.
- The recovery staffing plan has been developed, approved, and can be implemented.
- Recovery Manager and staff have been fully briefed by the Emergency Director.
- All principal participating response organizations have agreed to the key elements of a Recovery Plan.

10.4 Recovery

The goal of any recovery effort is to restore affected facilities and areas (onsite and offsite) to normal conditions following the termination of emergency response. Recovery activities and the level of effort required will be determined by the nature and magnitude of the emergency event. Emergency plans and procedures will need to address a wide range of possible circumstances and, as a result, will be general in nature.

As noted previously, a formal Recovery Plan may or may not be needed when terminating an OE not requiring classification, while, for OEs requiring classification, a formal Recovery Plan is needed. If a determination is made that a Recovery Plan is needed, the specific objectives of the recovery activity should be established at the time of termination and documented in the Recovery Plan. If the emergency produced offsite impacts, the recovery organization should include a liaison position for offsite interface with the state and local agencies for development and implementation of the recovery actions. Depending on the nature and severity of the event requiring a formal recovery plan, some or all of the considerations addressed in the following sections may be applicable.

Preparation for recovery from an OE requiring classification should address the following general areas: recovery organizations, recovery plans, recovery planning and scheduling, accident assessment and investigation, and repair and restoration.

10.4.1 Recovery Organization

Prior to terminating the emergency, the ERO should establish the recovery organization and determine that resources are available to begin recovery operations. The recovery organization is responsible for coordinating all recovery activities. Responsibilities include, but are not limited to:

- Prioritization and scheduling of activities
- Protection of worker and general public health and safety
- Dissemination of information
- Coordination of site and offsite activities
- Collection of data and assessment of long-term effects associated with the release of hazardous materials
- Formulation and implementation of long-term protective actions for the affected areas
- Providing assistance as requested to state and local agencies in the formulation of long-term protective actions for affected offsite areas

If negative effects to facilities and/or the environment are minimal, normal operations and maintenance organizations may be able to perform all necessary recovery actions. At a minimum, a Recovery Manager should be appointed to coordinate planning and authorize recovery operations. When a dedicated recovery organization is necessary, it should parallel the normal facility or site operating organization, when possible. To the extent possible, recovery activities should be carried out through normal facility and site operations. This arrangement provides the recovery management and staff with established and recognized channels of communication, authority, and control to facilitate the accomplishment of their mission.

The composition of the recovery organization should be based on the extent and nature of the emergency. Functional elements in a recovery organization should include, at a minimum, the following:

- A Recovery Manager who has the responsibility and authority to coordinate onsite recovery planning; authorize recovery activities; protect the health and safety of workers and the public; and initiate, change, or recommend protective actions. This position should have management authority commensurate with the requirements of the recovery activities.
- An offsite liaison who has the responsibility and authority to coordinate offsite recovery planning; protect the health and safety of workers and the public; recommend protective actions to the local, State and other agencies. This position should have management authority commensurate with the requirements of the recovery activities.

- Personnel with the technical expertise to direct post-accident assessment activities, to analyze the results and to identify/conduct repair and restoration activities. (Maintenance and operations personnel and engineers normally staff these positions).

- A public information specialist to deal with inquiries or concerns from employees, the public, and the news media. A Public Information Specialist may expect to address accident investigation results, the extent of onsite and offsite impacts, and the status of recovery operations.

10.4.2 Recovery Plan

If a recovery plan to return the affected facility/area to normal operations following the termination of the OE is required, it should at a minimum address the following areas:

- Dissemination of information to Federal, State, local and Tribal organizations regarding the emergency and possible relaxation of protective actions
- Notifications associated with termination
- Accident assessment and investigation
- Recovery planning and scheduling
- Repair and restoration
- Planning for decontamination
- Environmental compliance
- Waste management
- Security
- Communication and notifications
- Development and approval of recovery procedures
- Replenish, repair or replace emergency equipment or consumables
- Health and safety
- Reporting requirements
- Criteria for the resumption of normal operations

Recovery planning and implementation will start with assessment of facility, site, and environmental conditions. Some recovery activities may be conducted under conditions similar to those of the reentry activities. Therefore, the reentry considerations discussed in DOE G 151.1-4, Chapter 7, may be applicable to recovery operations. There are three general areas of recovery operations: recovery planning and scheduling, accident assessment and investigation, and repair and restoration.

10.4.3 Recovery Planning and Scheduling

The following types of recovery activities should be planned and scheduled:

- Notification of the establishment of the recovery organization and the name of the person in charge to persons and agencies involved in the emergency response.
- Evaluation of Emergency Plans to determine if adequate emergency preparedness status can be maintained, while the incident scene and/or facility conditions are degraded (i.e., critical infrastructure protection, inaccessibility of assembly areas, inoperative emergency/safety instrumentation and equipment, etc.).
- Establishment of specific criteria to be met prior to the resumption of normal site operations and/or facility use.
- Preparation of plans for the establishment of safe long-term conditions when the assessment indicates that a facility or affected incident area cannot be safely returned to normal operation or use.
- Identification of required repair and restoration work based on the assessment results.
- Plan for the proper handling and disposal of all hazardous waste generated during recovery activities.
- Establishment of a Tracking Group to monitor all assigned tasks, including developing work packages, scheduling activities, and estimating costs.
- Formation of a Procedures Review Group to determine if specialized procedures are required and should be developed and to review and approve all special procedures.
- Continued evaluation of site or facility hazards and contamination levels as well as estimating exposures to workers.

10.4.4 Accident Assessment and Investigation

Prior to the start of repair and restoration, the accident scene should be preserved so critical evidence will not be lost. This evidence is needed to determine what caused the incident and to determine responsibility. The following types of activities should be considered for accident assessment and investigation:

- The facility/site management, in coordination with DOE/NNSA management, should establish an Investigation Board to determine the root cause of the event and prepare a formal accident report in accordance with DOE O 225.1A, *Accident Investigations*.

- All documentation produced during the emergency response that is potentially useful to accident investigation should be collected and organized.

- An assessment and investigation of the incident scene and/or facility/site conditions should be consistent with the event severity. Engineering/ Maintenance/Operations personnel should assess the condition of the facility including structural integrity, equipment status, hazardous material containment/confinement barriers, and safety systems. Health Physics, Industrial Hygiene, environmental compliance, security, law enforcement and medical personnel should assess the impacts/consequences of the event.

10.4.5 Repair and Restoration Activities

The following items should be considered during repair and restoration activities:

- Ensure that occupational exposure limits are followed as indicated in 10 CFR 835.202 or 10 CFR 835.204.

- Ensure that any discharges from recovery activity are controlled within regulatory and environmental compliance limits. If discharges are necessary beyond these limits, ensure that all necessary documentation is prepared, approvals obtained, and notifications made.

- Conduct recovery activities through normal facility/site work organizations, practices, limitations, and procedures to the extent practical.

- Replenish, repair, or replace any emergency equipment or consumable materials used during emergency response.

- A comprehensive assessment of contamination in all affected areas should be performed. As soon as sufficient information is available, consideration should be given to modification or termination of facility/site protective actions instituted during emergency response. Monitoring and laboratory analysis results should be used as the bases for determining long-term protective actions for affected areas (e.g., ingestion pathway). [More information on long-term protective actions is contained in the Environmental Protection Agency (EPA) manual EPA 400-R-92-001, *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents*.] Local and State governments, and Tribal authorities, should be notified of recommendations for long-term protective actions and modifications or termination of existing protective actions.

10.5 Resumption of Normal Operations

Affected facilities and areas should be returned to normal operations or use only when all criteria established by the recovery organization have been met and all approvals have been granted by cognizant organizations and agencies. At a minimum, compliance should be required with Technical Specifications, Technical Safety Requirements, health and safety regulations, and environmental regulations. Federal, Tribal, State, and local, organizations should be consulted prior to terminating recovery operations, if required by regulation or Memorandum of Agreement/Understanding. Otherwise, notifications to these organizations should be made prior to the resumption of normal operations. As required, all documentation of recovery operations should be collected and processed for permanent storage as part of the record management program. A final report should be written related to the emergency, in accordance with DOE O 231.1A Chg 1.