# Independent Oversight Targeted Review of Site Preparedness for Severe Natural Phenomena Events at the Y-12 National Security Complex


**February 2012**

**Office of Safety and Emergency Management Evaluations**
**Office of Enforcement and Oversight**
**Office of Health, Safety and Security**
**U.S. Department of Energy**

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## Acronyms

| | |
|---|---|
| AECC | Alternate Emergency Control Center |
| AEOC | Alternate Emergency Operations Center |
| B&W Y-12 | Babcock & Wilcox Technical Services Y-12, LLC |
| BDBE | Beyond Design Basis Event |
| B/FEP | Building/Facility Emergency Plan |
| CAAS | Criticality Accident Alarm System |
| CAT | Consequence Assessment Team |
| DOE | U.S. Department of Energy |
| DSA | Documented Safety Analysis |
| EAL | Emergency Action Level |
| EAP | Emergency Action Plan |
| ECC | Emergency Control Center |
| ECN | Emergency Communications Network |
| ED | Emergency Director |
| EMInS | Emergency Management Information System |
| EMPO | Emergency Management Program Organization |
| ENS | Emergency Notification System |
| EOC | Emergency Operations Center |
| EPHA | Emergency Planning Hazards Assessment |
| ERO | Emergency Response Organization |
| ETTP | East Tennessee Technology Park |
| EUO | Enriched Uranium Operations |
| FBI | Federal Bureau of Investigation |
| FDAR | Fire Department Alarm Room |
| FMT | Field Monitoring Team |
| FPO | Fire Protection Operations |
| FY | Fiscal Year |
| GIS | Geographic Information System |
| GPS | Global Positioning System |
| HEUMF | Highly Enriched Uranium Materials Facility |
| HSS | Office of Health, Safety and Security |
| IC | Incident Commander |
| kW | Kilowatt |
| LEPC | Local Emergency Planning Committee |
| LFM | Lead Federal Manager |
| MJERP | Multi-Jurisdictional Emergency Response Plan |
| MMC | Methodist Medical Center |
| MSA | Mine Safety Appliances |
| NARAC | National Atmospheric Release Advisory Center |
| NFPA | National Fire Protection Association |
| NMSZ | New Madrid Seismic Zone |
| NNSA | National Nuclear Security Administration |
| OFI | Opportunity for Improvement |
| OMT | Onsite Monitoring Team |
| ORNL | Oak Ridge National Laboratory |
| ORO | Oak Ridge Operations |
| ORWTP | Oak Ridge Water Treatment Plant |
| OST | Office of Secure Transportation |
| PA | Public Address |

| | |
|---|---|
| PC | Performance Category |
| PPE | Personal Protective Equipment |
| PSD | Personnel Survey Depot |
| PSS | Plant Shift Superintendent |
| PSTE | Personnel Survey Team East |
| PWSS | Public Warning Siren System |
| RAP | Radiological Assistance Program |
| RMCC | Regional Medical Communications Center |
| SCBA | Self-Contained Breathing Apparatus |
| SEOC | State of Tennessee Emergency Operations Center |
| TEMA | Tennessee Emergency Management Agency |
| TEMP | Tennessee Emergency Management Plan |
| TSC | Technical Support Center |
| UPS | Uninterruptible Power Supply |
| UT | University of Tennessee |
| WARS | Wide Area Radio System |
| WSI | Wackenhut Services, Inc. – Oak Ridge |
| Y-12 | Y-12 National Security Complex |
| YSO | Y-12 Site Office |

**Independent Oversight Targeted Review of**
**Site Preparedness for**
**Severe Natural Phenomena Events at the**
**Y-12 National Security Complex**

## 1.0 PURPOSE

This report documents the independent targeted review of the Y-12 National Security Complex (Y-12) preparedness for severe natural phenomena events, conducted by the Office of Enforcement and Oversight (Independent Oversight) within the Office of Health, Safety and Security (HSS). The review was performed by the HSS Office of Safety and Emergency Management Evaluations and was carried out as the pilot for similar reviews at other U.S. Department of Energy (DOE) sites. The purpose of the targeted review was to evaluate the processes for identifying emergency response capabilities and maintaining them in a state of readiness in the event of a severe natural phenomena event.

This report discusses the scope, background, results, and conclusions of the review and identifies opportunities for improvement.

## 2.0 SCOPE

The scope of this review included the aspects of the emergency management program that relate to emergency preparedness for a severe natural phenomena event. The primary areas of interest were the identification of needed site response capabilities and their state of readiness, along with validation of the associated lines of inquiry for use at other sites. The Y-12 facilities of interest were the emergency response command centers, the Highly Enriched Uranium Materials Facility (HEUMF), and the Enriched Uranium Operations (EUO) facility (Building 9212), and the Y-12 emergency response functions of interest were fire response, security response, personnel decontamination, and field monitoring.

Therefore, the scope of this review included portions of the following emergency management program elements:

- Technical planning basis
- Plans and procedures
- Emergency response organization (ERO)
- Emergency facilities and equipment
- Offsite response interfaces.

The National Nuclear Security Administration (NNSA) Y-12 Site Office (YSO) provides direction and oversight for ensuring the safe, secure, and cost-effective operation of Y-12. The Y-12 site is the nation's only source of enriched uranium nuclear weapons components and serves as the main storage facility for enriched uranium. It also provides enriched uranium for the U.S. Navy. The main site contractor, Babcock & Wilcox Technical Services Y-12, LLC (B&W Y-12), is a leader in materials science and precision manufacturing. B&W Y-12 also supports efforts to reduce the risk of nuclear proliferation and performs complementary work for other government agencies.

The Y-12 site uses a "lead-event contractor" concept of operations for the emergency management program. B&W Y-12 is the lead contractor, while other onsite contractors are event contractors. As lead contractor, B&W Y-12 is responsible for the overall emergency response and staffs most ERO positions.

The lead contractor is also responsible for providing a 24-hour notification capability and for developing and implementing the EMPO-500, *Y-12 Emergency Plan*. In addition, B&W Y-12 obtains and maintains response resources (e.g., trained personnel and support equipment) based on hazards identified in emergency planning hazards assessments (EPHAs). Conversely, event contractors operate facilities or perform functions at Y-12. For the purposes of this review, the event contractor of interest was Wackenhut Services, Inc. – Oak Ridge (WSI), who provides protective services and related security functions at Y-12.

For this review, Independent Oversight assessed both the comprehensiveness of the response capabilities identified by the site's analyses and the site's level of preparedness in terms of attaining and maintaining the needed response capabilities. Of particular interest was the site's preparedness for responding to plausible severe natural phenomena events. The scope of the review was consistent with Objectives 1 through 4 of HSS Criteria, Review, and Approach Document 45-51, *Emergency Management Program Inspection Criteria, Approach, and Lines of Inquiry, Targeted Review of Site Preparedness for Severe Natural Phenomena Events*. The purpose was to determine whether:

1) The site analyzes plausible scenarios representing severe natural phenomena events to determine capabilities needed for an effective emergency response.
2) The site has a means for determining quickly whether an event results in the loss of a significant quantity of hazardous material and is beyond the site's capability to respond.
3) The site's emergency response capabilities are in a state of readiness to perform its required emergency response functions during plausible natural phenomena events.
4) The site's planning is adequate for obtaining and integrating offsite response assets for events beyond the site's response capability.

This assessment was accomplished by reviewing the documentation that establishes and governs the Y-12 emergency management program processes (i.e., emergency plans, procedures, safety basis documents, checklists, records, memoranda of understanding, and mutual aid agreements), interviewing key personnel, and performing walkdowns of facilities and equipment.

## 3.0 BACKGROUND

Numerous examples of severe and catastrophic events, such as earthquakes, tornadoes, floods, wildland fires, and man-made disasters, have emphasized the need to adequately plan and prepare for a large-scale event that could degrade or overwhelm a site's emergency response capability. DOE Order 151.1C, *Comprehensive Emergency Management System*, identifies the functional emergency response requirements for a DOE/NNSA site, and the emergency management guides associated with DOE Order 151.1C provide guidance for implementing the requirements. Emergency planners at DOE sites determine needed site emergency response capabilities based on site-specific attributes, such as types and forms of hazardous materials, demographics, and geography, using a variety of deterministic analyses. If the site has hazardous materials, the primary means for determining needed response capabilities is through an EPHA; however, other site response capability needs are further analyzed in the fire department's baseline needs assessments and security vulnerability assessments. The analysis contained in the EPHA should represent a spectrum of events that represent plausible hazardous material release scenarios, such as operator errors, mechanical failures, fires, and explosions from unintentional or intentional initiators. Many of these scenarios are also analyzed in the site's documented safety analysis (DSA) and used to reduce the risk from a nuclear facility's operations to acceptable levels; these scenarios are known as design basis events. However, when establishing a facility design, DSAs do not analyze events that exceed in severity the parameters defined for the design basis event. Such "beyond design basis events" (BDBEs) include severe natural phenomena events that represent the upper end of the

consequence spectrum that DOE facilities are required to prepare for in accordance with DOE Order 151.1C. To prepare for the small possibility that a BDBE might occur, emergency response staff must plan a means to provide for immediately protecting personnel, mitigating the consequences of a potential hazardous material release, and establishing appropriate short-term recovery actions. Preparations include alternate emergency response facilities, redundant and diverse communications systems in case an event renders the primary facilities and equipment unavailable, and other site-specific planning and response capabilities needed for a comprehensive emergency management program.

Some response capabilities that emergency planners may identify as necessary for the most severe and low-probability events would be a financial burden to maintain on site or could be rendered unavailable if such an event occurred. Emergency planners must therefore pre-plan a means to acquire these necessary capabilities from external sources, such as surrounding communities, state authorities, and offsite DOE and national assets. Consequently, preparation for such an event requires the site to establish documented agreements with offsite entities that identify the necessary capabilities, pre-plan mechanisms to bring those capabilities to bear when and where they are needed, and procedures to receive and integrate them into the emergency response.

## 4.0 RESULTS

The following sections discuss the observations made by Independent Oversight during this review, keyed to the objectives in HSS Criteria, Review, and Approach Document 45-51.

**Objective 1: The site analyzes plausible scenarios representing severe natural phenomena events to determine capabilities needed for an effective emergency response.**

Independent Oversight reviewed the B&W Y-12 process documents that were used to develop the hazards surveys and EPHAs, as well as the hazards surveys, EPHAs, and DSA reports for the HEUMF and the EUO facility. The hazards surveys and EPHAs were reviewed to determine the accuracy and adequacy of analyses conducted for severe natural phenomena events. The DSA reports were reviewed to determine the consistency of the BDBEs identified and analyzed in both the DSA reports and the EPHAs for each facility. Additionally, the EPHAs and the B&W Y-12 *Fire Protection Operations (FPO) Baseline Needs Assessment* (IA-02-084) were reviewed to determine whether these documents identified the needed emergency response capabilities for severe natural phenomena events.

B&W Y-12 has developed a formal, clearly defined, and well-documented process for developing the site hazards surveys and EPHAs. The process provides detailed instructions on the methodology, content, and format for developing the hazards surveys and EPHAs and ensures that the analysis of natural phenomena events includes BDBEs. The process document also includes technical documentation and justification for the site's identification of initiating events for hazardous material releases resulting from severe natural phenomena events.

The B&W Y-12 Emergency Management Program Organization (EMPO) has developed hazards surveys that include descriptions of generic emergency events and conditions. The hazards surveys adequately identify site threats that could result from natural phenomena events (i.e., earthquakes, high winds/tornadoes, lightning strikes, floods, snowstorms, and wildfires) and that could lead to hazardous material releases that affect the facilities. The hazards surveys also indicate the need for further analyses of hazardous materials in an EPHA for the facilities of interest. The EPHAs consider a wide range of accident scenarios, including severe natural phenomena events. EMPO analyzed the natural phenomena events as initiating events and derived the natural phenomena events from historical data correlated with the events identified in the sitewide and facility-specific DSA reports.

The EPHAs and the DSA reports address earthquakes, high winds (including tornadoes), lightning strikes, floods, and snow loading as severe natural phenomena events. These documents also include accurate and adequate analyses for each of the identified severe natural phenomena events. The EPHAs consider both "severe" events (natural phenomena and external) and malevolent acts as BDBEs and consider complete loss of facility containment, explosion, fire, and inadvertent nuclear criticality. These analyses appropriately reflect the impact of potential hazardous material releases from BDBEs and measures to ensure the health and safety of the site workers and the public. In addition, EMPO used the EPHA consequence analysis results to determine needed emergency response capabilities. The planned ERO capability is based on the bounding events analyzed in the EPHAs. Further, FPO used the baseline needs assessment to identify the minimum number of qualified emergency response FPO personnel required for both day and off-shift staffing.

With the exception of earthquake analyses, the events analyzed in the EPHAs are consistent with those in the sitewide and facility-specific DSA reports. The DSA reports incorporate data from the *Update of the Seismic Hazard at DOE NNSA Y-12* (RT-ST-921200-A001) and describe the earthquake events by noting the peak ground acceleration ranges for each level of earthquake events (1 to 8 Richter scale order of magnitude) for rock and soil foundations and identifying the appropriate performance categories (PCs) for the facilities of interest. For example, the HEUMF is identified as a PC-3 facility (can withstand a 7 to 8 Richter scale order of magnitude earthquake), and the EUO facility is identified as a PC-2 facility (can withstand a 6 to 7 Richter scale order of magnitude earthquake). In the EPHAs, the earthquake analyses do not incorporate the updated seismic analysis; however, the EPHA analyses conservatively ensure the health and safety of the public and the site workers. Discussions with the EPHA developers indicate that they are aware of the updated seismic analysis and will be incorporating the data in future revisions of the EPHAs. (See Opportunities for Improvement, **OFI-1**.)

To summarize, B&W Y-12 analyzes plausible scenarios representing severe natural phenomena events (i.e., earthquakes, high winds/tornadoes, lightning strikes, floods, snowstorms, and wildfires) in their hazards surveys and EPHAs. With the exception of seismic events, the same severe natural phenomena events are also considered in the DSA reports. B&W Y-12 uses the *FPO Baseline Needs Assessment* and the bounding events analyzed in the EPHAs to determine the capabilities needed for an effective emergency response. Despite the inconsistency in the seismic event analyses, B&W Y-12 adequately ensures the health and safety of the site workers and the public.

**Objective 2: The site has a means for determining quickly whether an event results in the loss of a significant quantity of hazardous material and is beyond the site's capability to respond.**

Independent Oversight reviewed the B&W Y-12 emergency action levels (EALs) for the HEUMF and the EUO facility to ensure that they are based on the technical analyses contained in the EPHAs. The Prompt Categorization/Classification Matrix was also reviewed to determine its usability during plausible severe events (e.g., tornado destroying multiple facilities on site) where the analysis concludes that such events would overwhelm or incapacitate the site's response capability.

For the events analyzed in the EPHAs, EMPO developed a comprehensive set of EALs that are based on facility- or activity-specific symptoms or event initiators. EALs for the HEUMF and the EUO facility provide adequate protective actions and protective action recommendations for all BDBEs considered in the respective EPHA. The EPHA analyses of BDBEs correlate with the analyses that were already conducted for other operational emergency events (i.e., complete loss of facility containment, explosion, fire, and inadvertent nuclear criticality). Therefore, EMPO referenced the EALs already developed from these operational emergency analyses for use in case of a severe natural phenomena event. For example:

- Earthquake and tornado/wind event EALs direct the user to refer to the EALs for loss of containment, fire, explosion, or inadvertent nuclear criticality, depending on the severity of the event.
- Flood and winter storm event EALs state that no release is expected.
- Lightning and hail event EALs direct the user to refer to the fire EALs.

EMPO also developed sitewide EALs that consider the consequences from the following offsite hazards that could have an impact on the site:

- Propane tanks located to the east of Y-12 at the Oak Ridge Utility District Peak Shaving Plant
- Chlorine tanks located on a ridge above Y-12 at the Oak Ridge Water Treatment Plant (ORWTP) complex
- Hazardous materials transported to the site and between facilities and during delivery operations
- Office of Secure Transportation (OST) shipments.

In addition, EMPO identified that some initiating conditions result from factors external to a specific facility and thus may not be identified through facility-specific EPHAs. These include:

- Incidents affecting multiple operating areas or facilities
- Challenges to security or safety at hazardous material facilities that may require heightened readiness
- Impacts that are measured or calculated by a sitewide response organization
- Transportation accidents involving facility-generated hazardous material that occur on site, but away from the facility.

Severe natural phenomena events are also examples of the initiating conditions mentioned above. EMPO developed a Prompt Categorization/Classification Matrix to ensure the health and safety of the site workers and the public during events where the site's capability to respond is rendered ineffective. During a catastrophic event, the Plant Shift Superintendent (PSS) uses this matrix, which provides protective actions and protective action recommendations and contains the same verbiage as the Contractor Requirements Document in DOE Order 151.1C for operational emergencies not further classified and for operational emergencies requiring classification as an Alert, Site Area Emergency, or General Emergency.

To summarize, B&W Y-12 can quickly determine whether an event involves a significant quantity of hazardous material and surpasses the site's capability to respond by using EALs and the Prompt Categorization/Classification Matrix, which provide pre-determined protective actions for onsite and offsite populations.

**Objective 3: The site's emergency response capabilities are in a state of readiness to perform its required emergency response functions during plausible natural phenomena events.**

Independent Oversight reviewed the systems and equipment associated with the three Y-12 emergency response command centers – the Emergency Control Center (ECC), the Technical Support Center (TSC), and the Emergency Operations Center (EOC) – and three key emergency response functions (fire response, personnel decontamination, and field monitoring) that are among the critical functions needed for response to an emergency caused by a severe natural phenomena event. These systems and equipment include:

- Normal and backup power systems
- Communication systems
- Consequence assessment systems
- Habitability equipment
- Personal protective equipment (PPE)
- Radiation survey equipment
- Hazardous material detection equipment
- Decontamination equipment.

In addition, Independent Oversight reviewed the response capabilities at two Y-12 nuclear facilities (HEUMF and EUO facility) and the Y-12 protective force's planning for responding to a catastrophic event.

B&W Y-12 relies on three emergency response command centers to coordinate and manage the response to an emergency. The ECC serves as the initial emergency response center for Y-12 emergencies. The PSS office, located in a Limited Area in Building 9706-2, is staffed continuously and is the location from which day-to-day operation of the Y-12 site is coordinated. When an emergency occurs at Y-12, the PSS office becomes the ECC and the on-duty PSS assumes the role of Emergency Director (ED). The ECC is responsible for initiating callout of the ERO, directing initial protective actions, making initial required notifications, and performing event categorization and classification. If the ECC staff is required to relocate, Building 9737 serves as the alternate ECC (AECC). The PSS, acting as the ED, manages and controls all aspects of the Y-12 emergency response until relieved of the ED duties by the TSC Manager or EOC Crisis Manager.

The TSC is located in Building 9706-2 adjacent to the ECC within a Limited Area and is primarily used to house the site management personnel needed to support the TSC Manager. The TSC is responsible for the emergency response efforts and resources within the Y-12 emergency response boundary, but outside the incident scene. If the TSC staff is required to relocate, Building K-1650 at the East Tennessee Technology Park (ETTP) serves as the alternate TSC. During the early stages of an emergency event and before the EOC becomes operational, the TSC Manager serves as the ED. Once the EOC is operational, the EOC Crisis Manager assumes the role of ED.

The EOC, located in a Limited Area in the basement of Building K-1650 at ETTP, would not be affected by a hazardous material release from Y-12. The EOC is responsible for the emergency response efforts and resources outside the Y-12 emergency response boundary, including coordination with offsite local, state, and Federal agencies and organizations. If the EOC staff is required to relocate due to an event outside the Y-12 site, Room 25 in Building 9706-2, adjacent to the ECC and TSC, serves as the alternate EOC (AEOC).

Three emergency response functions provide critical capabilities needed to respond to a severe natural phenomena event at Y-12. FPO, located in Building 9710-2 within a Protected Area, houses the Fire Department Alarm Room (FDAR) on the second floor. FPO is principally an industrial fire service, capable of attacking urban-type fires within the Y-12 emergency response boundary but with a very limited capability to address small brush and wildland fires. Additionally, FPO maintains proficiency in dealing with fires involving a number of substances and materials unique to the Y-12 mission. In addition to fire response, FPO provides emergency medical services, limited rescue capabilities, and hazardous material response for the Y-12 site.

The Personnel Survey Depot (PSD), located in Building 9723-28, is designated as the primary point for decontamination of non-injured employees in case of a large-scale contamination event at Y-12. The

PSD also serves as the primary point for blood sodium activation screening for non-injured personnel in case of a nuclear criticality event. The Personnel Survey Team East (PSTE) staffs the PSD as needed during an emergency.

The Field Monitoring Team (FMT), located in Building K-1650 at ETTP, provides timely monitoring data for use by decision-makers at the Y-12 EOC and the state of Tennessee EOC (SEOC). The FMT identifies the boundary of the area impacted by an offsite hazardous material release and works in conjunction with the state of Tennessee field teams under the direction of the Y-12 EOC and the Tennessee Emergency Management Agency (TEMA) Environmental Monitoring Control Center.

**Normal and Backup Power Systems**

Independent Oversight reviewed normal and backup power supplies for emergency response command centers and two nuclear facilities. The reliability of power was analyzed through a review of applied industry and DOE standards for the design, maintenance, and testing of emergency power supply systems. The capability to provide long-term emergency power was determined through a review of generator refueling plans. Battery systems were reviewed to determine their service times and identify the equipment that would be lost in the event of a long-term loss of alternating current power. Independent Oversight reviewed design, maintenance, and test documents; interviewed personnel; and performed system walkdowns to make its conclusions.

All facilities reviewed, except the PSD, are equipped with a fixed diesel generator and stationary batteries to serve as an uninterruptible power supply (UPS) for important loads in case of a loss of offsite commercial power. The PSS office manages the maintenance and testing of all generators except for the HEUMF, which manages the maintenance and testing of its own generators (including one safety significant generator). Facility personnel manage the maintenance and testing of UPSs within their facilities. The B&W Y-12 Fire Protection Engineering organization serves as the code interpretation authority for National Fire Protection Association (NFPA)-110, *Standard for Emergency and Standby Power Systems*, and designates the generator level for maintenance and testing activities as described in the standard.

B&W Y-12 manages the level-1 and level-2 generators through a formal configuration management program to ensure that the generators do not exceed 80% of capacity and that as-built drawings are updated appropriately. A PSS Operational Safety Board governs changes to the generator systems and the components up to and including the automatic transfer switch; each facility's operational safety board governs the changes beyond the automatic transfer switch and must receive the approval of the PSS office when changing loads on a generator to ensure that the loading does not exceed capacity limits.

The ECC is equipped with backup power capabilities; however, the power sources are vulnerable to some natural phenomena events. The ECC electrical power sources include a single offsite power feed, a 40.2 kilowatt (kW) level-1 emergency generator, an optional 125 kW backup generator, and fixed and portable stationary batteries that serve as a UPS for selected equipment. Both generators are located outside the building. Additionally, a mobile generator can provide power to the ECC through a receptacle near the fixed emergency generator. The ECC emergency generator supports emergency lighting, the Emergency Notification System (ENS) main control station, and some equipment in the PSS office. The optional generator provides redundant power to the level-1 generator and is the backup power system for selected TSC and AEOC equipment. Most ECC UPS systems are in the form of small mobile units; however, a fixed stationary battery system is available to power the fire alarm panel in the ECC, which is a backup to the fire alarm panel in the FDAR located at the Y-12 fire station. There is no generator to support the fire alarm panel batteries because B&W Y-12 considers the stationary battery system to have sufficient capacity. The fire alarm batteries are sized for 60 hours of use and are load tested for 24 hours when

installed. The power supplies are vulnerable to seismic and high wind events because the two generators are collocated near a utility pole and the automatic transfer switches and distribution lines are supported by a non-seismically qualified storage building before the lines enter the non-seismically qualified ECC building. In case of a complete loss of power at the ECC, the ECC personnel would relocate to the AECC.

The TSC is equipped with backup power capabilities; however, these power sources are vulnerable to the same natural phenomena events identified for the ECC. Although the TSC has no critical equipment that would necessitate a level-1 or level-2 generator, it is equipped with an optional 125 kW backup generator and portable UPS units to provide a reliable power supply for some important equipment, such as computers, needed to perform TSC functions. Additionally, a mobile generator can power the TSC through a receptacle near the optional generator. One important load without backup power is the building heating and ventilation system, so if normal power is lost, the ability of equipment and personnel to function in the TSC could be limited by the ambient temperatures. In case of a complete loss of power at the TSC, B&W Y-12 would relocate the TSC response functions to the EOC.

The EOC is equipped with backup power capabilities that should survive all but the most severe natural phenomena events. The EOC is equipped with alternate power supplies in case of a loss of normal commercial power. If the single feed of normal power is lost, a 125 kW level-1 emergency generator starts automatically and transfers all EOC loads to the emergency diesel generator through an automatic transfer switch. The EOC is also equipped with an UPS to ensure that key loads are powered when normal and emergency power supplies are not available. Additionally, a mobile generator can provide power to the EOC through a receptacle near the emergency generator. The EOC building itself meets the seismic qualifications that were in effect in 1993; however, the analysis for seismic qualification did not evaluate the power supply system or other systems within the EOC.

The management of generator tests, maintenance, and inspections is based on the generator level designator assigned per NFPA-110 and supplier recommendations. Fire Protection Engineering designates the generator class, type, and level or assigns an "optional" designator, based on generator loads, as described in NFPA-110. A power system is further designated as a safety significant system when it is credited as a safety feature in the DSA and it is included in the facility's technical surveillance requirements. The PSS office and HEUMF ensure that periodic testing, inspection, and maintenance of their generators, including the generators designated as "optional," meet appropriate NFPA-110 standards. As an additional backup power supply, B&W Y-12 also maintains three 100 kW mobile generators, any of which can be installed at a facility using a standard receptacle near the facility's fixed generator. The PSS office ensures that mobile generators undergo monthly tests and inspections to ensure operability.

B&W Y-12 ensures that the quality and quantity of generator diesel fuel is sufficient to maintain long-term operations. To ensure fuel quality, B&W Y-12 has the fuel tested annually for contaminants and uses a fuel polisher system to maintain purity as needed. For long-term operations, B&W Y-12 plans for generator refueling operations that use onsite storage and fuel transport capabilities and a nearby offsite fuel storage facility. B&W Y-12 maintains a minimum 12-hour fuel supply in the fixed generators that have integral fuel tanks and checks the level weekly by dipstick. When generators are in use, personnel monitor the fuel levels, and procedures require generator refueling within 24 hours of a 5-hour planned generator run. The onsite fuel storage tanker is required to maintain a minimum of 500 gallons of fuel. A Department of Transportation approved fuel transport vehicle performs generator refueling, and procedures allow refueling during emergency operations to ensure continuous generator operations. The OST underground fuel storage tanks provide a nearby offsite fuel source. OST maintains a contract with a vendor to replenish their fuel storage tanks.

The approach to maintaining reliable sources of emergency power is based on the significance of the equipment that relies on the power system. During this review, only one nuclear safety significant system was identified, which is a HEUMF power system. The other important systems include life safety code lighting, monitoring and alarm systems, and voice announcement capability for communicating site protective actions. Typical generator level-1 loads consist of building emergency lighting; these lights have a dedicated stationary battery at the light fixture to provide power before the generator picks up the load. Typical generator level-2 loads consist of the ENS, criticality accident alarm systems (CAASs), and fire alarm systems. A UPS typically powers these systems until the generator picks up the load. At the EOC and the HEUMF, the UPS is a fixed single system. For other facilities, multiple small UPS units are located at various locations within the facility to provide power until the generator picks up the load or the batteries are exhausted. B&W Y-12 does not have a comprehensive list of the loads on the UPS systems to allow a complete determination of what capabilities and functions would be lost if the batteries were exhausted. (See Opportunities for Improvement, **OFI-2**.)

All UPS systems undergo periodic maintenance and testing based on vendor recommendations, the system's duty cycle, equipment self-diagnosis capabilities, or trouble alarms, but testing does not meet all applicable DOE standards. B&W Y-12 load tests the ENS and CAAS batteries for 15 minutes, some computer room batteries for 4 hours, and the fire alarm system batteries in the ECC and FDAR for 24 hours before installation. Except for the fire alarm systems, batteries are replaced on a two-year cycle; battery replacement for the fire alarm systems is performed on a four-year cycle. UPS testing is not always performed as described in DOE-STD-3003-2000, *Backup Power Sources for DOE Facilities,* which is included in the *Y-12 Standards/Requirements Identification Document* (RUID 11286). The DOE standard identifies fundamental criteria, surveillance testing, reporting, and reliability considerations for engine generators and UPS systems. DOE developed this standard using NFPA-110 and Institute of Electrical and Electronics Engineers standards; however, no evidence indicates that B&W Y-12 considered this DOE standard in developing its UPS test, inspection, and maintenance requirements. For example, cognizant system engineers were not familiar with the standard during interviews, and B&W Y-12 does not perform some tests identified in the standard or performs them less frequently than the standard recommends. Additionally, personnel at the HEUMF recently recognized that battery voltage checks and resistance checks, which are included in the DOE standard, should be performed periodically and that procedures should be revised to include these checks. Further, B&W Y-12 could not produce the procedure identified in the *Y-12 Standards/Requirements Identification Document* for implementing codes and standards. (See Opportunities for Improvement, **OFI-3**.)

To summarize, normal and backup power systems (i.e., offsite commercial power, fixed generators, mobile generators, and UPS battery systems) are ready to provide power to emergency response systems during all but the most severe natural phenomena events. However, limitations in the testing and configuration management for UPSs diminish the readiness of the systems to provide power when needed.

**Communication Systems**

Independent Oversight reviewed the key communication systems used by the emergency response command centers and critical emergency response functions to communicate with each other, site personnel, the surrounding public, and offsite local, state, and Federal agencies and organizations. The primary and backup systems were examined, along with the processes for maintaining and periodically testing the systems to ensure operability. Independent Oversight also reviewed the availability of alternate means to perform critical tasks when a primary system is out of service due to a severe natural phenomena event.

FPO operates the 911 telephone system and ensures continuous operability of the system. The FDAR has two incoming telephone lines for 911 calls from site personnel; the PSS office and medical clinic can also listen in on incoming 911 calls. If the FDAR has to evacuate, the FDAR Operator can route the 911 telephone lines to the PSS office, relocate to the PSS office, and answer 911 calls from that location. The FDAR Operator tests the 911 telephone system each morning.

The PSS has a variety of methods for notifying employees of an emergency and facilitating the safe evacuation of employees. ENS is the primary method for communicating emergency alarms (including criticality alarms) and instructions to onsite workers and is accessible from the ECC and AECC. ENS covers most occupied buildings, outside areas, and parking lots with speakers, electronic horns, and flashing magenta lights. Additionally, a public address (PA) system is available in the ECC to communicate emergency instructions to onsite workers. Further, the ECC has equipment that allows the PSS to communicate with hearing-impaired employees to ensure that they receive emergency notifications. In case of an evacuation, a ring-down telephone system in the ECC allows the PSS to contact all of the assembly stations simultaneously to relay emergency instructions, and the system also allows the assembly stations to individually contact the ECC if needed. The ring-down telephone system for the assembly stations is not available in the AECC; however, the PSS has access to the telephone numbers and can call the assembly stations directly from the AECC if needed. The PSS uses the ENS and PA system daily for plant announcements. EMPO and the PSS office perform a monthly test of the ring-down telephone system for the assembly stations.

The PSS can warn the public immediately surrounding Y-12 of an emergency using the Public Warning Siren System (PWSS). The PWSS, consisting of 22 battery-powered sirens, is the primary method for warning the public within two miles of the site boundary that an emergency is occurring at Y-12. When the PSS activates the sirens from the ECC, the system verifies the operation and generates a status report that lists which sirens sounded. If the PSS is unable to activate the PWSS at the ECC, several alternate locations (including the EOC, Roane County, and the city of Oak Ridge) can activate the sirens. B&W Y-12 physically inspects and performs preventive maintenance on the sirens every six months. The PSS performs several periodic tests of the PWSS, including daily tests to ensure the integrity of the communications link between the computer and the sirens, weekly tests to check the status of all the components, and monthly tests to verify the sirens are operational. B&W Y-12 uses a performance metric that tracks the results of the monthly PWSS tests, and the recent monthly tests show that the reliability of the PWSS is less than desired. B&W Y-12 plans to replace all of the PWSS sirens with more reliable sirens in fiscal year (FY) 2012.

A ring-down telephone system provides for efficient notifications to offsite organizations. The system connects such offsite organizations as DOE Headquarters, TEMA, SEOC, and the city of Oak Ridge and allows the Y-12 ERO to provide emergency information to all parties simultaneously. The ERO can access the system from the ECC, TSC, and EOC. The system is not available in the AECC, so the PSS would use the readily-available telephone numbers in the AECC to call each organization individually to provide notifications from this location. At the request of TEMA, the PSS participates in quarterly tests to ensure the operability of the ring-down telephone systems and maintain familiarity with notification procedures. The PSS initiates the quarterly test by using the ring-down telephone line for a hypothetical general emergency that includes the DOE Headquarters Watch Office, Oak Ridge Operations (ORO) Center, TEMA Operations Center, and the 911 centers for the city of Oak Ridge and Anderson, Roane, Loudon, and Knox counties. The PSS categorizes and classifies an emergency event based on a hypothetical scenario, verbally relays information on the ring-down telephone line, and then prepares and sends a written notification by either e-mail or facsimile to all parties. Issues identified during the quarterly tests have led to a standardized notification form, used by all parties, that has improved the efficiency of notifications.

The EOC is equipped with an Emergency Communications Network (ECN) node that permits classified videoconferences with DOE Headquarters and other NNSA site offices. The ECN allows the EOC to transmit live video, recorded video, and projected images to DOE Headquarters in both unclassified and classified modes. DOE Headquarters conducts a comprehensive weekly test of the ECN with the Y-12 EOC.

The Wide Area Radio System (WARS) provides an extensive and reliable mobile communications link that allows enhanced operability with state and local responders. WARS is an ultra high frequency simulcast system that provides broad coverage for the Y-12, Oak Ridge National Laboratory (ORNL), and ETTP sites and allows users to talk within and between all three sites using a network of transmitters/repeaters at each site. WARS is the primary communication method used by FPO, protective force, and field personnel at Y-12 with over 2000 radios in operation, consisting of hand-held units, vehicle-mounted units, and consoles. WARS is also the primary method for communications between the FMT in the field, the Y-12 FMT Captain at Building K-1650, and the TEMA Environmental Monitoring Control Center in Knoxville. In addition, FPO's hand-held units have specific channels set aside for mutual aid responders, and the city of Oak Ridge has hand-held units for use during mutual aid responses. Furthermore, the Y-12 ERO uses WARS at all locations to broadcast and monitor radio communications during an emergency. B&W Y-12 is responsible for maintaining the Y-12 WARS infrastructure except for the WARS central controller on the Y-12 site, which ORO maintains. The WARS consoles do not require regular maintenance, but preventive maintenance is done annually on infrequently-used consoles, such as those located in the EOC and TSC. The hand-held units are checked every two years in accordance with the manufacturer's specifications to ensure that they are operating within specified parameters. WARS is a robust system that can operate as a stand-alone system for Y-12 if the central controller or ORNL and ETTP transmitters/repeaters were to fail. If the Y-12 WARS should fail, FPO and the protective force can use the Y-12 conventional radio system, with their WARS hand-held unit as a backup.

B&W Y-12 performs periodic testing on most WARS hand-held and vehicle-mounted units. FPO performs daily and weekly tests of the hand-held units and monthly tests of the vehicle-mounted units. Additionally, FPO performs weekly tests on the connectivity of WARS with the Regional Medical Communications Center (RMCC), which includes all mutual aid responders in the Knoxville area. The PSS and PSTE use their hand-held units daily, while the FMT tests their hand-held units during quarterly training sessions. The AEOC relies solely on hand-held units, but EMPO does not periodically test their operability. (See Opportunities for Improvement, **OFI-4**.)

B&W Y-12 uses an in-house information management system, the Emergency Management Information System (EMInS), to share comprehensive unclassified information about an ongoing emergency between most of the Y-12 ERO, TEMA, and DOE Headquarters. (EMInS can also operate in a classified mode, but this mode requires termination of all external connections and would not allow TEMA and DOE Headquarters to access the information.) The ERO uses EMInS to acquire and distribute a variety of emergency-related information, such as incident scene details, consequence assessment results, and live incident scene video. In addition, B&W Y-12 recently purchased new hardware for the video system that will add cameras to increase the coverage of the Y-12 site and will allow enhanced sharing of the video feed in EMInS. The FMT also enters real-time field monitoring data collected off site directly into EMInS using laptop computers equipped with wireless technology and global positioning system (GPS) sensors. The GPS location of each field monitoring data point is sent to the geographic information system (GIS) mapping program in the EOC and automatically uploaded into EMInS. The GPS sensors also allow real-time tracking of the location of all FMTs. EMInS is available at most ERO facilities, and the FPO Incident Commanders (ICs) have laptop computers with wireless capabilities that allow direct access to EMInS while in the field. The FDAR also recently acquired access to EMInS, and refresher training is being scheduled to familiarize FPO personnel with the system. The EMInS program is

distributed across several computer servers to minimize the risk that a server failure would cause the program to become inoperable. Additionally, several spare laptop computers configured for EMInS are available at the emergency response command centers so that staff can replace a malfunctioning unit. The FMT also tests the laptop computers during quarterly training sessions to make sure they can connect to EMInS. Most locations can share information using EMInS, but the PSTE does not have access to EMInS at the PSD, and FPO does not periodically test whether its laptop computers can connect to EMInS. (See Opportunities for Improvement, **OFI-5**.)

EMPO employs innovative testing techniques to ensure the continuous availability of EMInS. EMPO runs an automatic computer script nightly that checks for communication problems with EMInS on any of the 125 EMInS workstations or associated computer equipment, such as servers, video devices, and switches. The computer script automatically generates and e-mails a list of workstations and equipment that failed the communications check to EMPO, who can then resolve the identified problems on arrival at work each morning. Typically 96% or more of the workstations and equipment pass the daily communications check, including the six to ten spare laptops that can be put in service to replace any malfunctioning EMInS workstation. In addition, EMPO negotiated an exemption from the automatic computer patches from the Y-12 Information Technology department to the Y-12 computer network, because the patches often caused all of the EMInS workstations to fail the next communications check. The exemption permits the patches to be installed on only a few selected workstations, and EMPO then tests whether the patches on those workstations interfere with their functioning. Once testing is complete and any issues are resolved, EMPO manually installs the patches on the remaining EMInS workstations. EMPO negotiated a similar exemption for the EMInS servers to ensure their continuous availability.

The emergency response command centers and critical emergency response functions are mostly well-equipped with telephones and facsimile machines. All locations are equipped with an adequate number of telephones with direct lines in the ECC and AECC so that the PSS can answer incoming calls at either location. In addition, the PSD has an internal intercom system, with intercom boxes located throughout the facility. Furthermore, telephones authorized for classified conversations are available in the ECC, TSC, EOC, and fire station. Most locations are also equipped with facsimile machines, and the locations within the Limited Area have access to facsimile machines capable of receiving classified information. Each location has one or two backup telephone options if the Y-12 telephone system should become inoperable. The ECC, TSC, and EOC have several telephone lines routed through a telephone switch external to the Y-12 site that can quickly be plugged in to an existing telephone. In addition, B&W Y-12 allows the use of government-issued cellular telephones during emergencies in all areas of Y-12 by the FPO officers and in the Limited Areas of the ECC, AECC, and TSC by the ERO. Government-issued and personal cellular telephones can also be used in the remaining areas of Y-12 and while performing offsite field monitoring activities. Although most locations have an adequate array of primary and backup equipment, the AECC does not have a facsimile machine or a telephone authorized for classified information, which the PSS may need to perform critical functions. (See Opportunities for Improvement, **OFI-6**.)

B&W Y-12 periodically tests most telephones and facsimile machines; however, tests on infrequently-used equipment do not consistently ensure that the equipment will operate as intended. The PSS and FPO use their telephones and facsimile machines daily. The PSTE performs quarterly tests of the telephones, intercom, and facsimile machine in the PSD, while the PSS tests the equipment in the AECC monthly. The *K-1650 Building Managers Handbook* (Y40-53-EM-205) requires monthly tests of the EOC and TSC telephones and facsimile machines; however, the tests do not verify the functionality of all equipment. For example, the EMPO's monthly tests do not verify whether the telephones can support a classified conversation or transmit a classified facsimile, nor do they ensure that all of the external telephone lines are operational. Furthermore, EMPO does not periodically test the operability of the telephones and facsimile machines in the AEOC. (See Opportunities for Improvement, **OFI-4**.)

B&W Y-12 uses paging systems to activate the ERO and to recall additional FPO personnel. When an emergency occurs, the PSS activates the ERO through an automated paging system, integrated with EMInS, that transmits a message from the ECC or AECC to the alphanumeric pagers carried by the ERO. Most of the ERO cadre positions are set up as a tiered hierarchy, with a primary, first alternate, and second alternate responder. The system sends a page to the primary responder first, and if no response is received in a designated amount of time, the system then pages the first alternate and second alternate in sequence. An affirmative response by a responder assigned to the position terminates the paging sequence for that position. For the remaining ERO cadre positions (such as the FMT and PSTE), all responders for the position are paged simultaneously. If the automated paging system should fail, a separate paging system is available as a backup that notifies all members of the ERO as a group. A notable feature of the automated paging system is that the ERO cadre members can update their contact and availability information directly in EMInS. EMPO is implementing an enhanced notification system that will significantly increase the number of telephone lines available for paging the ERO, allow transmission to a wider range of devices (such as cellular telephones), and enhance the reliability of the paging system. To recall additional FPO personnel when needed, FPO uses a separate paging system that can contact only five pagers at a time. EMPO plans to include FPO in the enhanced notification system to alleviate this limitation.

Most of the ERO participates in periodic pager tests. EMPO performs a monthly, unannounced test of the ERO automated paging system and uses the data from the tests in a performance metric that measures ERO availability. EMPO's goal is to receive affirmative responses from greater than 90% of the ERO positions, and testing data for FY 2012 demonstrates that this goal is being met. However, limitations in the pager testing process reduce its usefulness. For the tiered ERO positions, the monthly test does not include all responders for each position but rather sends a test message to the hierarchy chain until an affirmative response is received. The testing process does not ensure that ERO members further down the hierarchy chain can receive a page. In addition, the Radiological Control Department asked EMPO to exclude the PSTE from the monthly, unannounced tests, and the PSTE pagers are not otherwise tested except during their annual drill. Because of the limitations in their paging system, FPO does not periodically test the pagers they use to recall personnel. Once the enhanced notification system is implemented, FPO plans to participate in the EMPO monthly, unannounced pager tests. (See Opportunities for Improvement, **OFI-7**.)

The AECC is located close enough to the ECC to be affected by any emergency that would cause an evacuation of the ECC. Based on the results of the EPHAs, emergencies involving hydrogen fluoride or acetonitrile could result in exposures at both the ECC and AECC substantially above the threshold for early lethality. The time before the plume would arrive and exceed the threshold for early lethality levels is short enough that the PSS would have to immediately evacuate either location. If neither facility were habitable, the PSS would need to drive a vehicle outside of the plume and conduct ECC communication-related operations from the vehicle. The PSS could use a radio and cellular telephone while in the vehicle but could not use the ENS or PA system for employee announcements or activate the ERO using the paging system. Such a situation would severely limit the PSS's ability to perform offsite notifications and direct employee accountability. (See Opportunities for Improvement, **OFI-8**.)

To summarize, communication systems (i.e., 911 calls, employee notifications, public warnings, offsite notifications, and ERO communications) are ready to facilitate information flow during severe natural phenomena events. The redundancy in the communication systems for the critical emergency response functions increases the likelihood that one or more systems will be available for performing each function in case of any disruptions caused by a severe natural phenomena event. However, limitations in the AECC equipment, access to EMInS, and testing of equipment somewhat diminish the robustness of the communication systems. Most notably, severe emergencies involving the release of hydrogen fluoride or

acetonitrile would cause the immediate evacuation of the ECC and AECC, thereby greatly limiting the ability of the PSS to notify site workers, activate the ERO, provide offsite notifications, and direct employee accountability.

**Consequence Assessment Systems**

Independent Oversight reviewed the consequence assessment team (CAT) processes and dispersion modeling software programs to ensure that the site has established and maintained a consequence assessment system with overall responsibility for initial and ongoing emergency response and provisions for generating timely and useful information for decision-makers. Consequence assessment personnel were interviewed to examine their understanding of the CAT processes and dispersion software programs. The review team also conducted a walkdown of the AEOC and additional interviews to determine whether consequence assessment personnel adequately understand how to conduct their CAT responsibilities if the EOC becomes unavailable.

The B&W Y-12 consequence assessment process ensures timely and useful information is provided to emergency response decision-makers. The CAT conducts initial consequence analyses using source term data from the EPHAs or actual data from the release location. Plume projection modeling is accomplished by using the Complex Hazardous Air Release Model (known as CHARM) and Emergency Prediction Information Code (known as EPICode) dispersion modeling software programs for chemical releases and the HotSpot Health Physics Code dispersion modeling software program for radiological releases. The CAT conducts ongoing consequence analyses for both chemical and radiological releases using the National Atmospheric Release Advisory Center (NARAC) dispersion modeling software program. Plume plot projections are obtained from the relevant software program and uploaded into the GIS mapping program, and the resulting GIS map is uploaded into the EMInS software program used by the ERO. EMInS provides the Y-12 ERO, TEMA, and SEOC access to current emergency event data, information, and projections.

Consequence assessment activities can be conducted at alternate locations, but EMPO has not documented how this would be accomplished. The CAT has a consequence assessment computer in the TSC (adjacent to the AEOC) that contains the same software and data as the EOC consequence assessment computers. EMPO consequence assessment personnel have the same software on their office computers and also have access to a shared network drive that contains executable files for the software used in the EOC. As an additional backup method, all CAT members have NARAC accounts and can develop projected plume plots by accessing any Internet-enabled computer if Internet connectivity is available. Consequence assessment data regarding the hazards involved in the event and the projected plume plots are provided through EMInS for access by ERO, TEMA, and SEOC. Although various processes have been identified for conducting consequence assessment activities if the EOC is unavailable, the CAT has not tested these processes in a drill or exercise. Further, EMPO has no process document or checklists describing how to make the AEOC operational or how to conduct consequence assessment activities using the other available processes. (See Opportunities for Improvement, **OFI-9**.)

To summarize, the B&W Y-12 CAT is ready to provide information on hazardous material releases that may occur because of a severe natural phenomena event. The CAT can use several locations (i.e., EOC, TSC, EMPO offices, and any Internet-enabled computer) to access dispersion modeling software, which increases the probability that consequence assessment activities can continue during severe natural phenomena events. However, EMPO only drills, exercises, and tests the operability of the EOC consequence assessment processes and does not have process documents or checklists describing how to operate at the other locations.

**Habitability Equipment**

Independent Oversight reviewed the emergency response command centers to identify any habitability systems and to evaluate system readiness. The EOC has an installed habitability system, but B&W Y-12 no longer keeps it in operable condition since the permanent removal of hazardous materials from the nearby ETTP facilities.

**Personal Protective Equipment**

Independent Oversight reviewed the essential PPE used by the critical emergency response functions, along with the processes for any required maintenance and periodic testing of the equipment.

B&W Y-12 provides the FMT with adequate PPE and with response kits that contain Tyvek® coveralls, shoe covers, gloves, and respirators for use in evacuating a contaminated area. Although the FMT is instructed to not enter the plume, the response kits contain baby wipes that can be used for gross decontamination if needed. The FMT response kits are stored in Building K-1650 at ETTP, which also serves as the coordination center for the FMT during operations. EMPO checks the FMT response kits quarterly and after each use to ensure that they contain all the required PPE.

The PSTE stocks the PSD with an assortment of PPE for responders and personnel undergoing the decontamination process. PPE for the responding PSTE members consists of latex gloves, shoe covers, and lab coats, which are maintained in locked supply areas at the PSD. The PPE for personnel undergoing decontamination at the PSD is stored in locked supply areas and includes such items as Tyvek® coveralls and shoe covers. The PSTE also covers the chairs in the PSD segregation area with large bags that are changed after each occupant in order to minimize the possibility of cross contamination. The supply areas are inventoried quarterly, and the results are documented.

FPO personnel are equipped with PPE that is consistent with the identified hazards at Y-12, but records of equipment maintenance and testing are informal. Based on the hazardous materials that FPO personnel might encounter, Level A suits are available for use along with chemically resistant gloves and boots. FPO visually inspects the Level A suits every six months or after each use and pressure-tests them annually or after each use (if the suit was able to be decontaminated). Self-contained breathing apparatus (SCBA) units are provided and have a one-hour duration. FPO refills the SCBA using a breathing air compressor at the Y-12 fire station, or at the Oak Ridge Fire Department if the Y-12 compressor is out of service. FPO conducts numerous inspections of the SCBA units, including daily status checks, monthly equipment inspections, and annual pressure testing. In addition, a manufacturer's representative performs maintenance on the breathing air compressor every 100 hours of operation or every six months. Further, the quality of the breathing air used in the SCBA is checked quarterly by an onsite laboratory and annually by an offsite laboratory. FPO keeps records of the inspections, tests, and maintenance for the Level A suits, SCBA units, and breathing air compressor; however, these records are informal and are not documented on company-approved forms. Furthermore, FPO does not store some records at the locations indicated by FPO procedures and stores other records on computer systems that are not readily accessible. (See Opportunities for Improvement, **OFI-10**.)

To summarize, appropriate PPE is available for field monitoring, decontamination, and FPO activities that may be necessary for response to a severe natural phenomena event. However, FPO's informal recordkeeping practices diminish the assurance that PPE is properly maintained.

**Radiation Survey Equipment**

Independent Oversight reviewed the essential radiation survey equipment used by the FMT and the radiological onsite monitoring team (OMT) organizations, along with the relevant checklists and processes for any required maintenance and periodic testing of the equipment.

The FMT and OMT monitor for the airborne radiological hazards for the most significant scenarios identified in the EPHAs and appropriately maintain and calibrate the equipment. B&W Y-12 tasks the FMT with collecting dose readings off site and the OMT with collecting dose readings on site during emergency events. The FMT radiological equipment, located off site in Building K-1650 at the ETTP, consists of beta-gamma and alpha Geiger counters to detect ionizing radiation and a Micro-Rem instrument to measure doses. The OMT radiological equipment, located on site in Building 9706-2, consists of beta-gamma and alpha instruments to detect ionizing radiation, dose rate instruments, personal radiation detection instruments, and one alpha spectrometry instrument. The equipment provided to the teams meets the needs identified by the EPHAs. In addition, both teams conduct periodic inspections, operational checks, calibration, preventive maintenance, and testing of the various radiation detectors as required by the manufacturer's instructions and industry standards. Furthermore, the FMT and OMT organizations use inventory checklists to ensure that emergency equipment and supplies are available, and they use readily-available check sources to calibrate the equipment before each use.

To summarize, an adequate quantity of operable and calibrated radiation survey equipment is available to respond to a radiological release caused by a severe natural phenomena event.

**Hazardous Material Detection Equipment**

Independent Oversight reviewed the hazardous material detection equipment used by FPO and FMT, along with the processes for calibrating the equipment.

The FMT monitors for the airborne hazardous chemicals for the most significant scenarios identified in the EPHAs and appropriately calibrates the detectors. The FMT uses the Dräger Pac III Gas Monitor to detect hydrogen cyanide (indicator of an acetonitrile release), chlorine, hydrogen chloride, hydrogen fluoride, and nitrogen dioxide. The FMT discovered during an exercise that the detectors are extremely sensitive to changes in temperature and humidity and can give false readings, for example, when leaving an air-conditioned vehicle while it is hot and humid outside. To alleviate this issue, the FMT purchased a longer sampling tube for the units so that the instrument can remain inside the FMT vehicle while the sampling tube is extended out through a slightly open window. The industrial hygiene members of the FMT bring calibration materials with them when they respond to Building K-1650 and calibrate the detectors before use. The detectors are also calibrated annually at the onsite calibration laboratory.

FPO monitors for the airborne hazardous chemicals for the most significant scenarios identified in the EPHAs; however, FPO does not calibrate the detectors in accordance with the manufacturer's specifications. FPO uses the Mine Safety Appliances (MSA) Solaris® MultiGas Detector to monitor for hydrogen cyanide, hydrogen chloride, combustible gases and vapors, and oxygen-deficient and oxygen-rich atmospheres. FPO sends the detectors to the onsite calibration laboratory for annual calibration. FPO also performs a "fresh air setup" before using the detector; however, the *MSA Solaris® MultiGas Detector Operating Manual* states that the detector's calibration must be checked each day or before use with the appropriate calibration kit and that the "fresh air setup" is not a substitute for daily calibration checks. (See Opportunities for Improvement, **OFI-11**.)

To summarize, an adequate quantity of operable and calibrated hazardous material detection equipment is available to respond to a hazardous chemical release caused by a severe natural phenomena event. However, FPO does not calibrate its equipment before each use as recommended by the manufacturer.

**Decontamination Equipment**

Independent Oversight reviewed B&W Y-12's preparations for a large-scale contamination event.

The PSD is equipped to handle these events and is divided into three separate response areas to facilitate decontamination efforts. The segregation area is used to obtain worker information, perform initial surveys, and direct workers to the appropriate shower area. The shower area is divided into three sections: highly contaminated workers, male contaminated workers, and female contaminated workers. Workers are decontaminated and surveyed before being released to the holding area, which is used to control the movements of decontaminated workers until they are released. Any workers who cannot be fully decontaminated are kept in a separate portion of the holding area pending a decision on further actions. For chemically contaminated personnel, an industrial hygiene member of PSTE advises whether the personnel can be decontaminated safely at the PSD. The PSTE conducts an annual drill at the PSD to maintain proficiency.

FPO is equipped to handle multi-person contamination events by means of a decontamination tent system that can be set up near the scene of the emergency. The system is equipped with heat, air conditioning, a water heater, and nozzle positions that reduce the number of personnel needed to manually decontaminate personnel and hand-carried equipment. FPO ensures the operability of the decontamination tent system by using the system in training and drills for each rotating shift at least once per year.

To summarize, B&W Y-12 is ready to respond to a large-scale contamination event that may occur because of a severe natural phenomena event.

**HEUMF**

Independent Oversight reviewed HEUMF's documented capability to withstand analyzed severe natural phenomena events and its ability to receive protective action information, implement planned protective actions, and conduct and report personnel accountability after a facility evacuation. Independent Oversight reviewed EPHAs; design, maintenance, and test documents for key systems; and building/facility emergency plans (B/FEPs) and procedures, as well as performing a walkdown of the facility. Key systems of interest included communications, power supplies, and facilities and equipment used to perform protective actions.

The HEUMF is a dry storage facility for radioactive components that do not require forced cooling systems for decay heat removal. HEUMF, a new facility at Y-12, is robustly constructed using reinforced concrete and steel. Components are in a form that is not easily dispersible and are stored in containers on seismically qualified racks in configurations designed to meet nuclear criticality safety requirements. This facility has no active systems integral to its intended function; however, it is equipped with an active safety related secondary confinement system that can be used to remove radioactive contaminants from the building's internal atmosphere. The facility also contains safety related automatic fire suppression that includes pressure monitoring of the water supply.

A spectrum of plausible natural phenomena scenarios were analyzed for the HEUMF, including:

- Earthquake with induced fires
- Flooding from creeks, dam breaks, intense rainfall, or local water tower breaks

- High winds, including an F3 tornado
- Building roof loads from rainfall and snowfall
- Building lightning strikes with induced fires.

The design basis earthquake is a 7 – 8 Richter scale magnitude earthquake from the New Madrid Seismic Zone (NMSZ), which runs roughly along the west Tennessee border. The analysis concluded that HEUMF can withstand the analyzed events; however, the analysis identified a need for contingency planning regarding evacuation of the building occupants after an earthquake and prompted additional response planning for rescue operations. Procedures and equipment are in place for rescue operations specific to HEUMF.

Important emergency systems at HEUMF include emergency lighting, ENS, CAAS, fire alarm system, emergency power supply system, and the building drainage system. HEUMF has no processes that require shutdown, so the B/FEP is the sole source for safe shutdown instructions, which are limited to the closure of building utility block valves. Important emergency response facilities and equipment include muster areas, shelter-in-place kits, and the capability to secure ventilation systems for indoor muster areas. Important facility preparedness documents include the B/FEP, pre-fire plans, personnel accountability rosters and checklists, special fire fighting procedures for nuclear criticality conditions, and the previously mentioned plan for special rescue operations.

The HEUMF emergency power supply system consists of a safety related emergency generator and a non-safety related emergency generator, each having its own UPS to provide continuous power to important systems upon the loss of normal commercial building power and before the generators begin operating. The safety related emergency generator is a 200 kW NFPA level-1 generator that provides power to the secondary confinement system. The non-safety related generator is a 750 kW level-1 generator that provides emergency power to emergency lighting, ENS, CAAS, and the fire alarm system.

HEUMF manages the maintenance and testing of the HEUMF emergency power supply system in accordance with the facility's safety related technical surveillance requirements, NFPA-110 criteria, and supplier recommendations. The technical surveillance requirements encompass the generator, the automatic transfer switch, the UPS, and the generator room louvers. HEUMF maintenance, test, and inspection practices are the same for both generator systems. However, HEUMF recently identified a need to commence periodic UPS battery voltage and resistance tests to meet the applicable Institute of Electrical and Electronics Engineers standards. Procedures are being revised to add these surveillances.

HEUMF emergency plans and procedures are available for performing protective actions, personnel accountability, event mitigation, and facility shutdown. HEUMF maintains its readiness to execute the B/FEP by assigning a building emergency warden with specific tasks that include maintaining the B/FEP, ensuring that the B/FEP is executable, and training the building employees. EMPO also provides some oversight of HEUMF emergency planning. The HEUMF B/FEP contains employee actions for a spectrum of plausible natural phenomena events, including earthquake, tornado, and flood events. Also contained in the B/FEP are instructions for building occupants regarding event reporting, evacuation routes, assembly station locations, shelter-in-place and take-cover locations and actions, personnel accountability protocols, and accountability reporting. Additionally, the B/FEP provides event-mitigating instructions by identifying building utility cutoff locations. Similarly, but more extensively, the HEUMF pre-fire plan provides building details for use by responding personnel, including fire water connections, available water supplies, detection and protection systems, hazards, occupancies, assembly stations, and when to recall additional B&W Y-12 personnel or request mutual aid. The pre-fire plan also references a procedure for nuclear criticality safety guidelines for fire fighting at Y-12 and provides building-specific tactical plan considerations.

The HEUMF facility and equipment adequately support the emergency response capabilities specified in the plans and procedures. HEUMF is equipped with the ENS to inform employees of protective actions and has four shelter-in-place areas for building occupants that can accommodate all workers, regardless of where the workers may be when protective actions are announced. Shelter-in-place supplies are available at a designated storage location and undergo periodic inventory surveillance. Shelter-in-place effectiveness can also be optimized by securing building ventilation quickly and safely from a remote control panel inside the building. For building evacuations, HEUMF has one designated assembly station, which it also shares with personnel from the EUO facility. For HEUMF, a roster of personnel is used to perform accountability, which should be sufficient for a quick accounting of the less than 50 personnel residing in the building. A log at the entrance of HEUMF is used to account for visitors who would not be on the HEUMF roster. HEUMF and EMPO separately perform functional testing of assembly station equipment and inventory supplies. Shelter-in-place kits and the assembly station are equipped with operable equipment in accordance with the B/FEP, and the building emergency warden was familiar with all of these capabilities.

To summarize, HEUMF is able to withstand severe natural phenomena events and is prepared to implement protective actions and to account for personnel.

**EUO Facility**

Independent Oversight reviewed the EUO facility's documented capability to withstand analyzed severe natural phenomena events and its ability to receive protective action information, implement planned protective actions, and conduct and report personnel accountability after a facility evacuation. Independent Oversight reviewed EPHAs; design, maintenance, and testing documents for key systems; and B/FEPs and procedures, as well as performing a walkdown of the facility. Key systems of interest included communications, emergency power supply systems, and facilities and equipment used to perform protective actions.

The purpose of the EUO facility is to perform operations with enriched uranium. Operations include wet chemistry, oxide conversion reduction, casting, machining and forming, and salvage treatment. These operations do not require forced cooling systems for decay heat removal. The EUO facility was built approximately 60 years ago and is vulnerable to some analyzed natural phenomena scenarios. The building is equipped with some active safety related components intended to contain hazardous materials in case of seismic motion.

A spectrum of plausible natural phenomena scenarios were analyzed for the EUO facility, including:

- Earthquake with induced fires
- Flooding from creeks, dam breaks, intense rainfall, or local water tower breaks
- High winds, including an F3 tornado
- Building roof loads from rainfall and snowfall
- Building lightning strikes with induced fires.

The design basis earthquake is a 6 – 7 Richter scale magnitude earthquake from the NMSZ (a lesser magnitude than the design basis for HEUMF). The analysis concluded that the EUO facility can withstand some of the analyzed events; however, structural failure can result from the analyzed earthquake, basement flooding from the analyzed flood scenarios, and roof collapse from the building load scenarios. Although the building has a lightning protection system, the system is not fully compliant with the relevant NFPA standard and B&W Y-12 is working towards a solution.

Important emergency systems at EUO facility include emergency lighting, ENS, CAAS, fire alarm system, and the backup power supply system. The EUO facility has processes that should be shut down if personnel are able to do so without danger, and the EUO facility safe shutdown procedure provides the details needed to perform such process shutdowns. Important emergency response facilities and equipment include muster areas, shelter-in-place kits, personnel accountability equipment, two assembly stations, and the capability to secure ventilation systems from inside the building for the indoor muster areas. Important facility preparedness documents include the B/FEP, pre-fire plans, personnel accountability rosters and checklists, and special fire fighting procedures for nuclear criticality conditions.

The EUO facility backup power supply system consists of an optional generator and small UPS units to provide continuous power to important systems upon the loss of normal commercial building power and before the generator begins operating. The optional 80 kW generator provides backup power to ENS, CAAS, and the fire alarm system. The PSS office manages the maintenance and testing of the EUO facility generator and UPS units. The testing and maintenance performed on the EUO facility generator is the same as that performed on the other level-2 generators assigned to the PSS office. Important loads on the UPS units include ENS, a PA system, and a CAAS. The UPS units perform self-diagnosis and are equipped with audible and visual alarms if trouble is diagnosed. The UPS units also undergo a 15-minute load test, representing a duty cycle that is adequate for announcing a building evacuation in case the generator did not start and pick up the load. The batteries in the UPS units are replaced every two years.

The EUO facility emergency plans are available for performing protective actions, personnel accountability, event mitigation, and facility shutdown. The EUO facility maintains its readiness to execute the B/FEP by assigning a building emergency warden with specific tasks that include maintaining the B/FEP, ensuring that the B/FEP is executable, and training the building employees. EMPO also provides oversight of EUO facility emergency planning activities. The EUO facility B/FEP contains employee actions for a spectrum of natural phenomena events, including earthquake, tornado, and flood events. Also contained in the B/FEP are instructions for building occupants regarding event reporting, evacuation routes, assembly station locations, shelter-in-place locations and actions, take-cover actions, personnel accountability, and accountability reporting. Additionally, the B/FEP provides event-mitigating instructions by identifying building utility cutoff locations. Similarly, but more extensively, the EUO facility pre-fire plan provides building details for responding personnel, including fire water connections, available water supplies, detection and protection systems, hazards, occupancies, assembly stations, and when to recall additional B&W Y-12 personnel or request mutual aid. The pre-fire plan also references a procedure for nuclear criticality safety guidelines for fire fighting at Y-12 and provides building-specific tactical plan considerations, such as water exclusion areas, water sensitive areas, foam use areas, and posted “no radio” areas.

An EUO facility safe shutdown procedure provides details on how to secure natural gas, oxygen, hydrogen, steam, special nuclear material, classified matter, vaults, vacuums, solution transfers, and hazardous material. Full implementation of the safe shutdown procedure would be a rather lengthy process, but its implementation is not required before a building evacuation for life threatening events. The type and form of material in the building and its passive safety features provide a sufficiently stable configuration of the EUO facility material that partial implementation of the safe shutdown procedure would not endanger personnel.

The EUO facility and equipment adequately support the emergency response capabilities specified in the plans and procedures. The EUO facility is equipped with ENS to inform employees of protective actions and has two shelter-in-place areas for building occupants that can accommodate all of the approximately 400 workers. Shelter-in-place supplies are available at a designated storage location, which undergo periodic inventory surveillance, and building ventilation can be secured for the shelter-in-place rooms from inside the building using local switches. For building evacuations, the EUO facility has two

designated assembly stations where personnel muster and accountability equipment is staged. At the assembly station, the EUO facility can conduct personnel accountability by using either the building badge reader system or a paper roster system in case of a loss of power to the assembly station. A log at the entrance of the EUO facility is used to account for visitors who are not in the badge reader system or on the roster. The EUO facility and EMPO separately perform functional testing of the assembly station equipment and inventory supplies. Shelter-in-place kits and assembly station equipment are equipped with operable equipment in accordance with the B/FEP, and the building emergency wardens were familiar with all of these capabilities.

To summarize, the EUO facility is able to withstand only some severe natural phenomena events and is prepared to initiate safe shutdown procedures (if time permits), implement protective actions, and account for personnel.

**Protective Force**

Independent Oversight reviewed the protective force response capabilities that are critical for response to an emergency caused by a severe or catastrophic natural phenomena event. Independent Oversight also reviewed the protocols used when offsite law enforcement provides support to the onsite protective force.

Overall, the protective force response capabilities are adequate for initial response to severe or catastrophic natural phenomena events; however, limitations in short-term recovery planning for severe and catastrophic events were noted. WSI provides the operational and manpower elements for the protective force, while B&W Y-12 provides the planning and oversight elements. WSI organizes the protective force in shifts, with each shift under the supervision of a Commander. Each shift contains all of the disciplines necessary for a full security response, including access control personnel, Special Response Team personnel, and dog handler teams. Additionally, the protective force has various agreements with Federal, state, and local law enforcement jurisdictions to ensure effective integration of supplemental personnel, equipment, and capabilities. Pre-planned protocols with several offsite agencies provide supplementary personnel to the protective force during an emergency event, as documented in 12 letters of agreement. Notably, B&W Y-12 developed the *Federal Bureau of Investigation (FBI) Response Plan with Y-12*, which defines roles, responsibilities, logistical requirements, and procedures used during an event at Y-12 that requires intervention by the FBI. In addition, there has been considerable planning for reconstituting Y-12 after a catastrophic security event. WSI interacts annually with the 56 law enforcement agencies within a 50-mile radius of Y-12 and provides training related to response and interface with the protective force, and the site has recently conducted nine tabletop exercises with the Federal, state, and local jurisdictions that may be involved in reconstitution following a Y-12 security event. Nevertheless, B&W Y-12 lacks a written response plan that defines operations following a catastrophic security event. (See Opportunities for Improvement, **OFI-12**.)

To summarize, the protective force is ready to provide full security services and to integrate supplemental law enforcement personnel in case of a severe natural phenomena event. However, a written response plan does not exist to guide security operations after a catastrophic event with severe consequences.

**Objective 4: The site's planning is adequate for obtaining and integrating offsite response assets for events beyond the site's response capability.**

Independent Oversight reviewed the site's planning and interactions with offsite response authorities and organizations responsible for protecting the public and augmenting site response resources. Further, this review looked at the routine dialogue and interfaces with organizations needed to establish and maintain emergency response roles, responsibilities, capabilities, and information needs, consistent with the requirements of the National Incident Management System. Independent Oversight also examined

written support agreements with offsite response agencies and organizations, evaluated related response plans, and assessed the adequacy of response and short-term recovery procedures following a severe or catastrophic event.

**Offsite Interactions**

A clear and comprehensive understanding of required relationships is documented in the *Y-12 Emergency Plan,* which includes detailed listings of Federal, state, and local response organizations with emergency response or regulatory control responsibilities relevant to Y-12. These organizations are invited to participate in site-level exercises designed to test offsite interfaces and capabilities. Numerous B&W Y-12 exercises drew on offsite participation during the past three years, including:

- Six full-scale exercises in FY 2009
- Five exercises in FY 2010, including three full-participation exercises
- Five full-scale exercises in FY 2011
- One full-participation exercise to date in FY 2012.

Likewise, B&W Y-12 holds regular interface meetings with offsite response organizations to exchange information and address any response issues before an emergency occurs. For example, EMPO represents Y-12 on the Anderson County Local Emergency Planning Committee (LEPC), serves as an officer in the LEPC, and manages the LEPC Facebook page and web site. In addition, EMPO meets quarterly with Federal and contractor staffs on the Oak Ridge Reservation Emergency Management Council to exchange emergency planning information, and YSO and B&W Y-12 routinely participate in quarterly offsite interface meetings with TEMA and local response organizations.

September 2011 marked the tenth year of the Oak Ridge Regional Emergency Management Forum, held at Y-12. The forum is an important venue for Federal, state, city and county emergency responders to network and learn about the resources each organization has available should they need mutual aid support. In addition to numerous Y-12 and local emergency responders, this year's event drew approximately 400 attendees from such organizations as the FBI, United States Army, Tennessee Army National Guard, United States Geological Survey, and TEMA. Notably, presentations provided information on the 2011 earthquake in Japan, the 2009 Fort Hood active shooter event, and the September 2001 Pentagon emergency medical response.

Offsite authorities are well informed about the availability of assistance from DOE/NNSA national assets, and the state of Tennessee includes information on each asset's capabilities in the *Tennessee Emergency Management Plan (TEMP)*. The most visible asset is the Region 2 Radiological Assistance Program (RAP) that covers eight states and two United States territories, and which participated in 35 different offsite interactions during the last four years, including:

- Radiological response training for Civil Support Teams who assess suspected weapons of mass destruction attacks
- Participation in several DOE/NNSA exercises involving integration of RAP with the state of Tennessee assets
- Participation in numerous nuclear power plant emergency exercises
- Radiological and nuclear security support for several significant and high profile events held within Region 2
- Coordination with the state of Tennessee Division of Radiological Health on several actual events.

**Support Agreements**

Support agreements are in place to identify the resources, the onsite personnel authorized to request offsite resources, and the offsite individuals authorized to implement the arrangement. In accordance with the *Y-12 Emergency Plan* and other site response documents, the PSS makes most requests for assistance. Appropriate protocols are in place and routinely tested by B&W Y-12 to acquire needed support from the state of Tennessee, city of Oak Ridge, or other response agencies and organizations. For example, the PSS maintains up-to-date listings of pre-designated offsite points of contact, including organizations, names, and telephone numbers. Additionally, B&W Y-12 benefits from a statewide mutual aid agreement with all government entities, widely referred to as the *Mutual Aid and Emergency and Disaster Assistance Agreement Act of 2004* (Tennessee Senate Bill No. 3139). This act negates the need for DOE and B&W Y-12 to execute mutual assistance agreements with all potential offsite response organizations. However, the act does recognize that some governmental entities may elect to provide aid and assistance under a separate agreement.

B&W Y-12 initiated a *Memorandum of Understanding between Oak Ridge Methodist Medical Center (MMC) and BWXT Y-12, LLC* for the transport, acceptance, and treatment of radiologically or chemically contaminated, or potentially contaminated, injured patients from Y-12. MMC is the closest major hospital in the Oak Ridge area and is the primary hospital that would treat personnel injured in an event at Y-12. The DOE Radiation Emergency Assistance Center/Training Site, also located in the MMC complex, supports the MMC during a radiological event. If a mass-casualty event occurs at Y-12, MMC coordinates with other area hospitals to transfer and subsequently treat patients, depending on the type of injury and extent of contamination.

Similarly, B&W Y-12 has a *Memorandum of Understanding between University Health Systems, Incorporated and BWXT Y-12, LLC*, for the transport, acceptance, and treatment of radiologically or chemically contaminated or potentially contaminated, injured patients from Y-12 at the University of Tennessee (UT) Hospital Trauma Center. The UT Hospital Trauma Center is located in Knoxville, Tennessee, and is accessible by ambulance and medical helicopter. This trauma center is the closest level 1 trauma center to Y-12.

Lastly, B&W Y-12 has a *Mutual Aid Agreement for Emergency Ambulance Service in the East Tennessee Region* to enable requests for assistance from B&W Y-12 to the RMCC, which is located in the UT Medical Center. The RMCC determines the most expedient way to respond to a request utilizing the available ambulance services in 16 counties. In addition, the Division of Emergency Medical Services in the Tennessee Department of Health coordinates with the RMCC, as necessary, for other resources (e.g., ambulances or medical helicopters) located outside the East Tennessee region.

**Offsite Response Planning**

B&W Y-12 documents suitable provisions for interfacing and coordinating with Federal, state, and local agencies responsible for offsite emergency response in the *Y-12 Emergency Plan*; however, a few limitations related to response communications and decision-making during severe or catastrophic events were noted. Overall, planning and coordination among DOE/NNSA, B&W Y-12, the state of Tennessee, the surrounding counties (Anderson, Roane, Knox, and Loudon), and local governments (city of Oak Ridge) is in accordance with the requirements for responding to incidents that may occur at Y-12, as documented in Appendix G of the *Tennessee Oversight Agreement.* The TEMP provides the state of Tennessee's planned responses to an event at Y-12 and includes comprehensive annexes that provide guidance in support of specific threats or programs, including the *Multi-Jurisdictional Emergency Response Plan (MJERP) for the DOE Oak Ridge Reservation* and the *Tennessee Catastrophic Event Plan* (TN 100-24). Further, the TEMP defines the roles and responsibilities associated with the mitigation,

preparedness, response, and recovery efforts directed at natural disasters, man-made hazards, attacks, and other catastrophic events that affect the state of Tennessee.

The MJERP is the primary planning document used by offsite response agencies and organizations for an emergency event at Y-12 and describes general concepts that guide the offsite response to emergency events. A provision of the *Tennessee Oversight Agreement*, a voluntary agreement between DOE and the state of Tennessee, tasks TEMA with developing and maintaining the MJERP. A key element of the plan is the coordinated response between Federal, state, and local organizations during an emergency event at Y-12. Additionally, the plan defines TEMA's responsibility to coordinate the development of state and local emergency response programs, including:

- Review, revision, and maintenance of planning documents
- Coordination of local emergency planning activities
- Development and delivery of training
- Conduct of drills and exercises to verify effective offsite response capabilities.

The TEMP also includes the *Tennessee Catastrophic Event Plan*, which is based on the NMSZ catastrophic earthquake phase II design scenario. The eight states of the Central United States Earthquake Consortium, in concert with the Federal Emergency Management Agency, developed the plan to increase the state's readiness for an NMSZ catastrophic earthquake event and to improve regional and national readiness. The plan provides a sound basis for departments, agencies, and offices in the state of Tennessee with emergency functions in any Tennessee region to formulate supporting procedures. Additionally, the plan provides a basis for Federal agencies (e.g., DOE/NNSA), private organizations, and industry having disaster response missions to become part of the regional planning and response process. Special considerations for rapid impact and needs assessments, mass care, relocations, evacuations, and infrastructure condition assessments are included in the plan.

Lastly, a March 24, 2003, memorandum from the Deputy Secretary of Energy that designated a Lead Federal Manager (LFM) for each of the DOE multi-program sites influences the Y-12 site's response to a regional catastrophic event. For the Oak Ridge Reservation, the Deputy Secretary of Energy assigned this role to the ORO Manager. Although B&W Y-12 included the LFM concept in the *Y-12 Emergency Plan*, DOE has not tested the LFM concept of operations for managing a multi-site emergency on the Oak Ridge Reservation or an event involving Y-12 since 2005. (See Opportunities for Improvement, **OFI-13**.)

**Response and Recovery Operations**

B&W Y-12 appropriately uses hazard surveys, EPHAs, and other technical basis documents to identify the requisite skills and disciplines needed for mitigation of most emergency events at Y-12; however, limitations in response and short-term recovery planning for severe and catastrophic events were noted. The *Y-12 Emergency Plan* captures the concept of operations that the on-duty Y-12 PSS and other key on-shift personnel immediately transition to an ERO after an operational emergency is declared. The PSS serving as the ED has full authority and responsibility to implement the emergency plan during the response to an operational emergency. Procedures, desk aids, and checklists require the PSS either to initially perform or to oversee the following minimum functions:

- Detect or assess the emergency event or conditions.
- Categorize and classify (as necessary) the emergency event or conditions.
- Perform initial notifications.
- Implement onsite protective actions.

- Issue offsite protective action recommendations.
- Initiate response by appropriate emergency resources (such as fire, rescue, medical, security, hazardous material personnel, and mutual aid).

A Y-12 IC (senior Fire Battalion Chief or Protective Force Commander) manages and controls all response activity at the event scene. The IC typically coordinates the activities of multiple response elements at the scene (i.e., fire, rescue, medical, spill containment, and mutual aid) and makes on-the-spot decisions. The division of authority and responsibility between the IC and the ED position is clearly established and maintained, allowing the IC to focus on tactical aspects of the response.

A baseline needs assessment process performed in accordance with DOE Order 420.1B, using the B&W Y-12 hazard surveys and EPHAs, determined the necessary onsite fire and rescue support resources. Additionally, the assessment concluded that FPO is capable of responding to most emergencies at Y-12 using only FPO assets that consist of a command vehicle, an engine, a ladder truck, a rescue squad, a hazardous material squad, and an ambulance. Various mutual aid agreements with ORNL and civilian jurisdictions provide supplemental personnel and apparatus, including water rescue, collapsed structure rescue, and ambulance support. In order of request priority, the response organizations that Y-12 relies upon, including their estimated initial resource capability and calculated response time to Y-12, are:

- ORNL Fire Department (1 engine and 1 ambulance with 2 additional responders; ~20 minute arrival time)
- City of Oak Ridge Fire Department (1 engine and 1 rescue unit with 6 additional responders; ~8 minute arrival time)
- Knoxville Volunteer Rescue Squad (heavy rescue equipment with 5-15 emergency responders; ~1 hour arrival time).

B&W Y-12 elected to plan for significant events in the city of Oak Ridge that could adversely affect Y-12 operations and to plan for events at Y-12 that could adversely affect the city of Oak Ridge. This planning led to the publication of *Emergency Response Plan between Y-12 and the City of Oak Ridge* (EMPO-644), which provides the basic framework for emergency response, interfaces, and expected actions between B&W Y-12 and the city of Oak Ridge for effectively managing such emergencies. Importantly, the plan documents the B&W Y-12 response to chlorine releases from ORWTP; waterborne diseases in the finished water from the ORWTP; and propane releases from the Oak Ridge Utility District Peak Shaving Plant. Lastly, the plan serves as a formal agreement between B&W Y-12 and the city of Oak Ridge to provide cooperation and support on emergency matters of mutual concern.

EMPO also assessed catastrophic event scenarios and consequences associated with the *Tennessee Valley Authority Dam Safety Emergency Action Plan (EAP)*, which identified potential emergencies involving the Norris/Loyston Backwater Dike. The EAP indicates the areas that would be flooded under the hypothesized conditions of a probable maximum flood with and without Norris Dam failure and the failure of the Norris Dam during a period without a flood. The *Tennessee Valley Authority Dam Safety EAP* provided B&W Y-12 with the necessary information to:

- Determine the portion of an area that would be affected by inundation or isolation
- Identify the evacuation routes for movement of people from each part of the area
- Identify the amount of time available for evacuation
- Assess the adequacy of emergency response plans.

B&W Y-12 describes emergency event recovery operations in Y40-131, *Emergency Recovery*, which includes the associated recovery plan template used by the B&W Y-12 Recovery Organization. Recovery

planning is routinely tested, and most functional exercises require the preparation of a recovery plan as a stated exercise objective. However, potential severe and catastrophic events postulated for Y-12 do not have site/facility-specific catastrophic event response plans and procedures that include short-term recovery plans considering infrastructure damage and outages that may impede the normal response of onsite or offsite responders. (See Opportunities for Improvement, **OFI-14**.) Lastly, EMPO has conducted few exercises focused on a severe or catastrophic event as the initiating event that impacted a facility containing hazardous materials and required a significant offsite response with heavy rescue equipment. (See Opportunities for Improvement, **OFI-15**.)

To summarize, B&W Y-12's planning is adequate for obtaining and integrating offsite response assets that might be needed to respond to a severe natural phenomena event. B&W Y-12 appropriately interacts with offsite response agencies and organizations responsible for augmenting site response resources. Support agreements identify the mechanisms to request supplemental resources from offsite organizations and the *Y-12 Emergency Plan* contains provisions to communicate with offsite response assets and to coordinate decision-making. B&W Y-12 uses hazards surveys, EPHAs, and other severe event analyses to establish the offsite response assets that may be needed. However, B&W Y-12 has not considered how infrastructure damage and outages might affect offsite responders' ability to support an emergency response at Y-12, has not recently tested the LFM concept of operations, and has conducted few exercises focused on the response to a catastrophic event at a hazardous materials facility.

## 5.0 CONCLUSIONS

This review focused on a detailed assessment of selected emergency management programmatic elements with an emphasis placed on the B&W Y-12 processes for identifying emergency response capabilities and maintaining them in a state of readiness to respond to a severe natural phenomena event. Independent Oversight identified no findings that indicate specific emergency management requirements are not being met; however, several opportunities for improvement were noted, which would further strengthen the emergency management program.

The B&W Y-12 hazards surveys and EPHAs appropriately identify applicable emergency events and conditions and consider severe natural phenomena events. The bounding events analyzed in the EPHAs and the *FPO Baseline Needs Assessment* were used to determine the emergency response capabilities needed at the site. Additionally, the EPHAs adequately support the development of the B&W Y-12 EALs, which in turn support timely event classification and provide pre-determined protective actions for onsite and offsite populations. Furthermore, EMPO developed a Prompt Categorization/Classification Matrix for the PSS to use for catastrophic events.

With few exceptions, B&W Y-12 provides systems and equipment that are adequately maintained, inspected, and tested. Backup power is provided by fixed and mobile diesel generators and is further supplemented by battery systems serving as a UPS. For the most severe natural phenomena events, backup power supplies should allow the implementation of protective actions and enable workers to evacuate buildings. In addition, B&W Y-12 is well equipped to communicate between the emergency response command centers and critical emergency response functions and with site workers, the surrounding public, and offsite local, state, and Federal agencies and organizations. Redundant communication systems increase the likelihood that B&W Y-12 can still perform critical tasks if outages result from a severe natural phenomena event. Further, initial and ongoing consequence analyses are conducted using appropriate and approved dispersion modeling software and several alternate locations are equipped to perform consequence analyses. Additionally, B&W Y-12 provides appropriate PPE for emergency responders and equips the monitoring organizations with an adequate quantity of radiation and

hazardous chemical detection equipment. Finally, B&W Y-12 is prepared to manage a large-scale contamination event.

B&W Y-12's emergency response capabilities at HEUMF and the EUO facility are sufficient to properly implement protective actions and account for personnel. The HEUMF is a new facility that should withstand severe natural phenomena events. Although the EUO facility is over 60 years old and is not expected to withstand some severe natural phenomena events (e.g., earthquakes, flooding, and tornadoes), B&W Y-12 has developed safe shutdown procedures designed to minimize the impact of such events. In addition, the protective force identified the disciplines necessary for a security response through a very structured approach and completed noteworthy planning with the FBI to define roles, responsibilities, logistical requirements, and procedures for events at Y-12 requiring FBI intervention.

B&W Y-12 establishes and maintains effective interfaces with offsite response assets through frequent and meaningful interactions. Through the *Y-12 Emergency Plan*, several subordinate plans, and corresponding state of Tennessee emergency plans, B&W Y-12 has established a solid framework for integrating offsite response assets into its emergency management program. Support agreements with offsite response assets appropriately identify the available resources, request and authorization processes, and points of contact.

Despite the comprehensive nature of the Y-12 emergency management program, a few areas were noted that diminish the strength of the overall program. Inconsistencies exist between the seismic analyses in the EPHAs and DSA report and in the testing and configuration management for UPSs. Limitations in the AECC equipment, access to EMInS, and testing of communication systems equipment were also noted. EMPO does not drill, exercise, or test the ability to perform consequence assessment processes at the alternate locations and does not have process documents or checklists describing how to operate at those locations. In addition, FPO keeps informal records on PPE maintenance and does not calibrate its hazardous chemical detection equipment as recommended by the manufacturer. Further, the protective force does not have a written response plan following a catastrophic event and EMPO has done few drills and exercises involving a catastrophic event at a facility with hazardous materials and requiring a significant offsite response. Additionally, little planning has been done regarding infrastructure damage and outages from a severe natural phenomena event might affect offsite responders' ability to support an emergency response at Y-12. Most notably, a few severe emergencies would cause the immediate evacuation of the ECC and AECC, thereby greatly diminishing the ability of the PSS to perform essential tasks.

Overall, B&W Y-12 has analyzed plausible scenarios for severe natural phenomena events and has developed EALs that allows for a quick determination regarding the severity of the event. Although some opportunities for improvement were identified, B&W Y-12 has integrated offsite response assets with the site's emergency response capabilities and has maintained the site's facilities, systems, equipment, and critical emergency response functions in a state of readiness to deal with a severe natural phenomena event.

## 6.0 OPPORTUNITIES FOR IMPROVEMENT

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

**OFI-1:** To further improve natural phenomena event analyses in the EPHAs, consider:

- Incorporating the information from the updated seismic analysis, *Update of the Seismic Hazard at DOE NNSA Y-12*, when revisions or updates are conducted on the EPHAs.
- Increasing the depth and scope of DSA report reviews to include verification that the referenced technical documentation in the DSA reports corresponds to that in the EPHAs.

**OFI-2:** To provide a means of identifying what equipment and functions would be lost in case of an extended loss of alternating current power and to ensure the performance of appropriate maintenance and testing activities, consider:

- Extending the B&W Y-12 configuration management program to include UPS systems.
- Maintaining system load lists that include load, equipment, and function, and updating as-built drawings accordingly.

**OFI-3:** To ensure that all applicable standards are implemented for UPS systems, consider:

- Developing the written instructions for evaluating the use of national consensus codes and standards.
- Implementing DOE-STD-3003-2000 for UPS testing.

**OFI-4:** To strengthen the EMPO monthly verification checks, consider:

- Adding the AEOC hand-held WARS radios, telephones, and facsimile machines to the monthly tests required by the *K-1650 Building Managers Handbook*.
- Including the AEOC hand-held WARS radios, telephones, and facsimile machines in Appendix F, EOC/TSC Phone Line Verification Sheet, of the *K-1650 Building Managers Handbook*.
- Expanding the detail included in Appendix F, EOC/TSC Phone Line Verification Sheet, of the *K-1650 Building Managers Handbook* to note the specific equipment checked (such as a list of the telephone lines connected to the external switch) and the operability expected of the equipment (such as ability to transmit a classified facsimile or conduct a classified conversation).

**OFI-5:** To further the ability of the Y-12 ERO to access and use EMInS, consider:

- Providing the PSTE with access to EMInS through a workstation or laptop computer.
- Testing the ability of FPO laptops to reliably connect with EMInS.

**OFI-6:** Consider adding a telephone and facsimile machine authorized for classified discussions and information to the AECC.

**OFI-7:** To further improve the usefulness of the ERO pager tests, consider:

- Including all responders for ERO positions in a tiered hierarchy periodically.
- Adding the PSTE to the monthly tests.

**OFI-8:** To strengthen the PSS's ability to perform the critical functions of providing employee announcements, activating the ERO, performing offsite notifications, and directing employee accountability, consider relocating the AECC far enough from the ECC that an emergency would not necessitate an evacuation of both the ECC and the AECC.

**OFI-9:** Consider developing a process document or checklists to describe how to make the AEOC operational and how to conduct consequence assessment activities using the alternate processes.

**OFI-10:** To improve the formality of FPO recordkeeping system for PPE, consider:

- Keeping records on company approved forms.
- Storing records as indicated in FPO procedures.
- Providing ready access to records stored on FPO computer systems.

**OFI-11:** Consider either modifying the use of the Solaris® MultiGas Detector to include calibrating the unit in accordance with the manufacturer's specifications, or requesting that industrial hygiene staff perform hazardous material detection when needed.

**OFI-12:** To strengthen response and short-term recovery activities for a severe or catastrophic event at Y-12, consider:

- Expanding the definition of a severe event to include catastrophic events caused by natural phenomena, man-made disasters, and terrorism that result in severe consequences.
- Incorporating critical planning objectives for a catastrophic event response, prioritized in the order of saving lives, safeguarding and securing special nuclear material, protecting public health and safety, restoring critical infrastructure and critical services, and mitigating future property and environmental damage.
- Increasing the depth and scope of catastrophic event planning to provide the operational framework for implementing the security response strategies contained within the site emergency plan.
- Including planning provisions to facilitate the integration of state and Federal resources and capabilities in support of a site response to a catastrophic mass casualty/evacuation event.

**OFI-13:** To improve response communications and decision-making during severe or catastrophic events at Y-12, consider:

- Verifying the continuing applicability of the March 24, 2003, memorandum from the Deputy Secretary of Energy designating an LFM for each of the multi-program sites.
- Reflecting any updated information on the LFM policy and guidance in the B&W Y-12 emergency plans and procedures.
- Conducting tabletop and functional exercises demonstrating the LFM concept with appropriate Federal, state, and local response agencies and organizations that would respond to a catastrophic event caused by natural phenomena, man-made disaster, or terrorism.

**OFI-14:** To continue to improve site-specific planning for severe and catastrophic events at Y-12, consider:

- Developing a catastrophic event plan, as an appendix to the site emergency plan, for catastrophic events caused by natural phenomena, man-made disasters, and terrorism resulting in severe consequences.
- Integrating the site catastrophic event plan with applicable related state and Federal catastrophic event plans.
- Integrating other site-specific emergency planning documents, as appropriate, as annexes to the emergency plan (e.g., the *Heightened Security Conditions Response Plan* (Y40-012) or *Continuity-of-Operations Plan* (EMPO-800)).

- Including the planning assumptions that these severe and catastrophic events overwhelm site and local response capabilities, adversely impact site safeguards and security measures, cause a long-term outage of critical site infrastructure and systems (e.g., power, water, and communications), and cause secondary events such as fires, dam breaches, or landslides.
- Developing facility- or organization-specific emergency response procedures, matrices, or checklists needed to implement the catastrophic event plan. Key site organizations and functions to consider include protective force operations, power and utilities, FPO, telecommunications, shift operations, and critical facilities/operations.

**OFI-15:** Consider reinforcing the Y-12 ERO and offsite responder skills and capabilities related to severe and catastrophic events by:

- Incorporating catastrophic event plan scenarios in the B&W Y-12 drill and exercise program.
- Conducting tabletop exercises with appropriate Federal, state, and local response agencies and organizations that would respond to a catastrophic event caused by natural phenomena, man-made disaster, or terrorism.
- Updating response plans and procedures to reflect information extrapolated from catastrophic planning workshops, drills and exercises, and lessons learned from past disasters.

## Appendix A
## Supplemental Information

**Dates of Review**

| | |
|---|---|
| Scoping Visit: | November 8-10, 2011 |
| Onsite Data Collection: | December 12-15, 2011 |
| | January 9-12, 2012 |
| Validation and Closeout: | February 2, 2012 |

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

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**Appendix B**
**Documents Reviewed and Interviews**

Documents Reviewed

- Accountability Coordinator Checklist
- ADM-011, OMT Minimum Mission Essential Emergency Response Equipment Inventory Checklist, Rev. 5, 10/07/09
- Assembly Station Director's Checklist
- B&W Y-12 Security Condition Response Plan, 3/12/10
- BFEP-601, Y-12 Building/Facility Emergency Plan – 9212, Rev. 14, 5/31/11
- BFEP-857, Y-12 Building/Facility Emergency Plan – Building 9720-82, Rev. 5, 8/11/11
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- EMPO Line Oversight and Contractor Assurance System Metrics, 9/30/11
- EMPO-500, Y-12 Emergency Plan, Rev. 6, 3/11
- EMPO-508/HS-010, Hazards Survey for the 9212 Complex, Rev. 3, 1/09
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- EMPO-514/TBC-019, Emergency Planning Technical Basis for ORWTP, Rev. 0, 12/10
- EMPO-525, Emergency Readiness Assurance Plan for Y-12, Rev. 10, 9/29/11
- EMPO-532, Y-12 Emergency Management Training Plan, Rev. 6, 7/26/11
- EMPO-543, Habitability of the Y-12 Plant ECC and the TSC following Onsite Releases of Hazardous Materials, 2/00
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- EMPO-560/EAL-010, EALs for the HEUMF Building 9720-82, Rev. 2, 8/09
- EMPO-560/EAL-025, EALs for the Oak Ridge Utility District Peak Shaving Plant, Rev. 1, 12/10
- EMPO-560/EAL-035, EALs for Onsite Transportation Activities, Rev. 2, 11/06
- EMPO-560/EAL-065, EALs for OST Shipments, Rev. 0, 1/06
- EMPO-560/EAL-071, EALs for Building 9212, Rev. 4, 6/09
- EMPO-560/EAL-086, Discretionary EALs, Rev. 1, 10/11
- EMPO-644, Emergency Response Plan between Y-12 and the City of Oak Ridge, 2/1/10
- EMPO-662, Exercise Report Emergency Management Exercise 2005-1, Rev. 1, 2/16/05
- EMPO-666, Exercise Report Emergency Management Exercise 2005-3, 4/13/05
- EMPO-671, Exercise Report Emergency Management Exercise 2005-4, 7/27/05
- EMPO-685, Exercise Report Emergency Management Exercise 2006-2, 2/22/06
- EMPO-720, Exercise Report Emergency Management Exercise 2009-3, 3/27/09
- EMPO-736, Exercise After-Action Report Y-12 Emergency Preparedness Integrated Capability Exercise 2010-1, 4/28/10

- EMPO-743, Exercise After-Action Report Y-12 Emergency Preparedness Integrated Capability Exercise 2010-2, 7/29/10
- EMPO-744, Exercise After-Action Report Y-12 Emergency Preparedness Integrated Capability Exercise 2010-3, 10/7/10
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- EMPO-800, Continuity of Operations Plan, 8/9/11
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- ES/CNPE-95/3, Recommended High Speed Straight Wind and Tornadic Hazard Levels for the Oak Ridge, Tennessee DOE Reservation, 9/95
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- FBI Response Plan with Y-12, 4/03
- HSS Criteria, Review, and Approach Document 45-51, Emergency Management Program Inspection Criteria, Approach, and Lines of Inquiry, Targeted Review of Site Preparedness for Severe Natural Phenomena Events, Rev. 0, 11/17/01
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- Performance Track ERO Training Status, 11/11
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- PFP-9212, 9212 Pre-Fire Plan, Rev. 8
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- RT-ST-921200-A001, Update of the Seismic Hazard at DOE NNSA Y-12, 9/03
- RUID 11286, Standards/Requirements Identification Document
- TEMA Schedule for DOE Oak Ridge Reservation Emergency Notification Drills, 2/10
- TEMP, 12/21/06
- Tennessee Oversight Agreement, Agreement between the DOE and the State of Tennessee for Emergency Management Coordination, Appendix G, 5/13/91
- Tennessee Senate Bill No. 3139, Mutual Aid and Emergency and Disaster Assistance Agreement Act of 2004, 5/24/04
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- TN 100-24, Tennessee Catastrophic Event Annex, 9/1/10
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- Y/EN-4683, Seismic Hazard Evaluation for DOE Oak Ridge Reservations, Oak Ridge, Tennessee, 9/92
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- Y17-001, Engineering, Design, and Support During Construction, Rev. 7, 11/7/03
- Y40-011, Emergency Medical Response Team, 4/1/09
- Y40-012, Initial Response to Heightened Security Conditions, 1/26/10
- Y40-013PD, RAP, 4/14/09
- Y40-131, Emergency Recovery, 4/9/07
- Y40-136, Emergency Management Drills, 7/31/08
- Y40-139, Y-12 ERO, 2/10/10
- Y40-140, Y-12 Building/Facility Emergency Program, 8/23/11
- Y40-148, Emergency Management Exercises, 3/23/06
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- Y40-152, Onsite Monitoring Team Operations, 9/26/06
- Y40-153, TSC Operations, 9/7/11
- Y40-154, Incident Command and Control, 8/16/11
- Y40-155, Offsite Notification, 1/28/08
- Y40-162, EOC Operations, 4/16/08
- Y40-164, Field Monitoring, 12/2/10
- Y40-165, ECC Operations, 10/4/11
- Y40-166, Release of Personnel Due to Abnormal Condition, 6/27/07
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- Y40-53-EM-203, Assembly Station Systems, 1/8/07
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- Y59-45-SM-006, Generator: Monthly Preventive Maintenance/Post Maintenance Test, Rev. 0.3, 6/7/10
- Y73-116, PPE Program, 3/31/11
- Y73-200PD, Industrial Hygiene Program, 3/28/11
- Y75-56-005PD, RADCON Emergency Response Program, 9/28/10
- Y75-56-504, Emergency Response Instructions for the Personnel Survey Team West, 8/30/10
- Y75-56-505, Emergency Response Instructions for the Medical Staging Team, 9/2/10
- Y75-56-508, Emergency Response Instructions for the PSTE, 9/1/10
- Y79-300, Emergency and Standby Power Generator Systems Management, Rev. 4, 11/2/11
- Y79-54-FDO-005, FPO Administrative Instructions, 5/31/11
- Y79-54-FDO-029, Alarm Room Operations, 7/16/07
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- Y-QS-0003, Lessons Learned from the July 22-23, 1997 Flood Incident at the Y-12 Plant, 12/5/97.

Interviews

- B&W Y-12 Building 9212 Shift Technical Advisor/Building Emergency Warden
- B&W Y-12 CAAS and ENS System Engineers
- B&W Y-12 Design Authority Representatives
- B&W Y-12 Emergency Management Exercise Coordinator
- B&W Y-12 Emergency Management Meteorologist
- B&W Y-12 Emergency Management Operations Team Lead
- B&W Y-12 Emergency Management Planning Specialist
- B&W Y-12 Emergency Management Program LEPC Representative
- B&W Y-12 Emergency Management Program Manager
- B&W Y-12 Emergency Management Systems Lead
- B&W Y-12 Emergency Management Technical Basis Team Lead
- B&W Y-12 FDAR Operator
- B&W Y-12 Fire Department Special Projects
- B&W Y-12 FMT Coordinator
- B&W Y-12 FMT Industrial Hygiene Representative
- B&W Y-12 FPO Acting Chief
- B&W Y-12 FPO Equipment Manager
- B&W Y-12 FPO Safety Officer
- B&W Y-12 FPO Technical Officer
- B&W Y-12 FPO Training Officer
- B&W Y-12 HEUMF Operations Manager/Building Emergency Warden
- B&W Y-12 HEUMF System Engineer
- B&W Y-12 K-1650 Building Manager
- B&W Y-12 PSS
- B&W Y-12 PSS Emergency Power Supply System Engineer
- B&W Y-12 PSS Manager
- B&W Y-12 PSTE Captain
- B&W Y-12 Radio System Manager
- B&W Y-12 Region 2 RAP Manager

- TEMA DOE Oversight Supervisor
- TEMA East Region Director
- WSI Director of Support Services
- WSI Senior Security Planner
- YSO HEUMF Facility Representative.