

**UNCLASSIFIED**

# VOLUME III

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## Independent Oversight Inspection of Emergency Management at the Y-12 National Security Complex



Washington, DC 20585

November 28, 2001

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Office of Independent Oversight  
and Performance Assurance

**UNCLASSIFIED**

**INDEPENDENT OVERSIGHT  
INSPECTION OF  
EMERGENCY MANAGEMENT AT THE  
Y-12 NATIONAL SECURITY COMPLEX  
VOLUME III**

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## ACRONYMS

<b>Acronym</b>	<b>Definition</b>
BJC	Bechtel Jacobs Company
CATS	Critical Action Tracking System
CAPS	Corrective Action Planning System
CCA	Control Center Assistant
DOE	U.S. Department of Energy
DTS	Deficiency Tracking System
EAL	Emergency Action Level
ECC	Emergency Control Center
EPZ	Emergency Planning Zone
ERO	Emergency Response Organization
HA	Hazards Assessment
HS	Hazards Survey
NARAC	National Atmospheric Release Advisory Capability
NNSA	National Nuclear Security Administration
OA	Office of Independent Oversight and Performance Assurance
OR	Oak Ridge Operations Office
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
PSS	Plant Shift Superintendent
UT	University of Tennessee
Y-12	Y-12 National Security Complex
YAO	Y-12 Area Office


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# INDEPENDENT OVERSIGHT INSPECTION OF EMERGENCY MANAGEMENT AT THE Y-12 NATIONAL SECURITY COMPLEX

## VOLUME III

### 1.0

### INTRODUCTION

 **Independent Oversight performed an inspection of the Y-12 National Security Complex in October 2001.**

The Secretary of Energy's Office of Independent Oversight and Performance Assurance (OA) conducted an emergency management program review at the Y-12 National Security Complex (Y-12) in October 2001. The inspection was performed by OA's Office of Emergency Management Oversight. The purpose of this inspection was to assess Y-12's readiness to protect site personnel and the public from the consequences of onsite events that could result in the release of hazardous materials from site facilities and activities. The focus areas selected for this review included site emergency planning hazards surveys (HSs) and hazards assessments (HAs); emergency response implementing processes and protocols; training, drill, and exercise programs; and feedback and improvement mechanisms, including programmatic enhancements that were implemented in response to the December 1998 integrated safety management evaluation. In addition, tabletop performance tests were conducted for a sample of the site's initial decision-makers and technical staff to evaluate the ability of emergency responders to mount an effective response to postulated emergencies.

Current site activities performed at Y-12 include maintaining the capability to produce secondaries and cases for nuclear weapons; storing and processing uranium and lithium materials and parts; dismantling nuclear weapons secondaries returned from the stockpile; and providing special production support to U.S. Department of Energy (DOE) weapons laboratories and to other DOE programs. In addition, the Y-12 plant performs stockpile surveillance activities on the components it produces. The nature and quantities of both radiological and non-radiological materials pose significant potential hazards to site workers and the public; consequently, the site's emergency management program must meet the various provisions of DOE Order 151.1A, *Comprehensive Emergency Management System*, for establishing an operational emergency hazardous material program.

The National Nuclear Security Administration (NNSA) Deputy Administrator for Defense Programs is the cognizant secretarial officer for Y-12. As such, it has overall Headquarters responsibility for programmatic direction and funding of activities at the site. Under the Deputy Administrator, the Office of Operations and Readiness is the line organization responsible for monitoring Y-12 operations. At the site level, the Y-12 Area Office (YAO) has line management responsibility for Y-12 operations. For Y-12, the Department's emergency management responsibilities are primarily divided among YAO, the Oak Ridge

Operations Office (OR), and the Y-12 management and operating contractor, BWXT. BWXT was awarded the contract for Y-12 operations in November 2000. Additionally, both University of Tennessee (UT)-Battelle and Bechtel Jacobs Company (BJC) operate some facilities and conduct work activities at the Y-12 site. UT-Battelle is the Oak Ridge National Laboratory (ORNL) prime contractor, and BJC is the prime contractor to OR for environmental management activities across the Oak Ridge Reservation (ORR).

Specific YAO, OR, and BWXT emergency management programmatic and response responsibilities are defined in the ORR emergency plan, associated Y-12 plan annex, and other agreement documents. As currently configured, the ORR emergency plan is intended to govern all ORR emergency operations, including activities at the ORNL, Y-12, and the East Tennessee Technology Park. The ORR emergency plan also consolidates all state, local, Federal, and DOE Order 151.1A requirements into one functional emergency response plan. As the Y-12 lead contractor, BWXT is responsible for emergency response to all Y-12 site facilities (including those operated by BJC and UT-Battelle), along with developing and administering all emergency planning, preparedness, and response aspects for BWXT facilities. In addition, BWXT is primarily responsible for providing and maintaining the emergency operations center, the joint information center, and the public warning system for use by other ORR sites.

Emergency management at Y-12 was evaluated as part of a 1998 Office of Environment, Safety and Health integrated safety management evaluation. Overall, the 1998 evaluation found that longstanding weaknesses in the emergency management program had not been addressed because they had not received sufficient management priority and attention within either the Y-12 DOE site office or the contractor organization. Significant deficiencies were identified in hazards analyses, emergency

response implementing procedures, and the performance of initial decision-makers during tabletop exercises. In addition, OR had not implemented the ORR-wide emergency management approach, which is intended to ensure that emergency management functions at all ORR sites are effectively and efficiently coordinated. Further, the weaknesses in the Y-12 emergency management program had remained uncorrected even though OR was notified of similar weaknesses at another OR site during the 1998 evaluation of emergency management programs across the DOE complex.



**Progress was evident in nearly every area of weakness identified in 1998.**

The results of the current inspection indicate that Y-12 has made notable progress in nearly every area of weakness identified in 1998, and that the large majority of weaknesses have been satisfactorily addressed. YAO has been aggressively involved in the emergency management upgrade program, and BWXT's progress is reflective of management commitment in this area and the efforts of the emergency management program manager and staff. Although OA identified some weaknesses, which resulted primarily from the magnitude of the overall task and resource constraints, the Y-12 emergency management program provides confidence that site workers and the public can be protected in the event of a hazardous material release.

Section 2 of this report provides an overall discussion of inspection results that characterize Y-12 emergency management program elements. Section 3 provides OA's conclusions regarding the overall effectiveness of the program. Section 4 presents the ratings assigned as a result of this inspection. Appendix A provides supplemental information, including team member composition. Appendix B identifies the findings that require corrective actions and follow-up. Appendices C through F detail the results of the reviews of individual emergency management program elements.

# 2.0

## RESULTS

### 2.1 Positive Program Attributes

**Management attention has led to substantial improvement.**

Through a combination of YAO and BWXT senior management commitment and emphasis and extraordinary efforts on the part of YAO and BWXT emergency management program managers and staff, the Y-12 emergency management program has been transformed over the past two years. Y-12 now has in place a program that provides confidence that the emergency response organization (ERO) can mount an effective response to a wide range of initiating events. Positive attributes of the emergency management program include:

- **The Y-12 emergency management program has dramatically improved in virtually every area identified as having weaknesses during the 1998 evaluation.** In response to a comprehensive corrective action plan, 26 HAs have been developed in accordance with a model HA process to cover all of Y-12's high- and moderate-hazard facilities; plant shift superintendent (PSS) proficiency has improved dramatically; the response tools utilized by initial decision-makers are effective; the site has improved its capabilities for consequence assessment; structure and valuable content have been added to the training, drill, and exercise program; and the site conducted a series of drills and exercises culminating in a successful full-participation exercise.
- **A technically sound foundation for the Y-12 emergency management program has been established.** HSs have been completed for all facilities at Y-12, and HAs

have been completed for all of the facilities that have been determined to have hazardous material quantities that warrant HA development. The BWXT HS/HA development process is rigorous and systematic. The process for identifying the quantity and type of material theoretically at risk for release (i.e., the "material-at-risk") and the criteria used to screen the impact of smaller quantities of hazardous materials on co-located workers and the public are significant strengths. YAO has a systematic process for reviewing and approving HS and HA documents. Noteworthy is YAO's use of a multi-disciplinary team (i.e., facility operations, fire protection, and industrial safety personnel) to perform the review and the use of a formal comment and resolution process.

- **The Y-12 initial decision-makers have been provided with the necessary facilities, equipment, practice, and tools to facilitate timely and accurate decision-making in a high-stress environment.** The PSS is responsible for initial decisions regarding classification of events that involve the release of hazardous materials in order to initiate emergency response actions, such as activating the ERO and initiating protective actions. The staffing levels of initial emergency responders and decision-makers, together with emergency plan implementing procedures, checklists, and other decision-making tools, support timely and accurate decision-making (i.e., categorization/ classification, determination of protective actions, and notifications). Initial response decision-makers and consequence assessment team members demonstrated good proficiency during tabletop performance tests. The drill and exercise program has provided numerous opportunities during calendar year 2001 to practice and hone tools.
- **YAO has been effective in providing guidance, oversight, and focused incentives to the BWXT emergency**



**management program.** The YAO Emergency Management Program Manager is proactively involved in the oversight of emergency drills and exercises and in the review of emergency management documents submitted by BWXT. YAO has developed emergency management award fee objectives and milestones that are achievable and measurable, resulting in improvements to the emergency management program.

## 2.2 Program Weaknesses and Items Requiring Attention



**Weaknesses remain in training, hazard documentation, and program assessment.**

Although many aspects of the Y-12 emergency management program have been substantially improved, weaknesses were noted in the training program for new ERO cadre members and in the YAO and BWXT issues and corrective action management systems. Additionally, some work remains in the HS/HA area. Specific weaknesses include:

- **The BWXT emergency management training program does not provide the learning and evaluation activities that are necessary to prepare new ERO members for assignment to the ERO rotation.** The emergency management training plan describes a mix of classroom, self-paced, and performance-based learning activities, which are designed to prepare individuals to function as ERO cadre members. However, completion of “qualification” activities is not a requirement for assignment to the ERO rotation; qualification does not include a formally defined and structured training element that familiarizes the trainee with position-specific tasks and equipment in the job setting; and drill/exercise participation is not required for initial ERO qualification. Additionally, BWXT does not accurately track drill/exercise participation or promptly identify personnel who are indicated as not

current in satisfying their drill/exercise participation requirements. Therefore, new ERO cadre members can be assigned to the ERO rotation without having adequate proficiency in performing the assigned job, and existing ERO cadre members can go for an extended period without participating in a drill/exercise and yet maintain their position on the ERO roster. As a result, ERO performance could be degraded during an actual event when conditions require a time-urgent response. This condition is partially mitigated by the significant amount of additional training that was provided to current ERO cadre members during the extensive preparations for the full-participation exercise.

- **Remaining weaknesses in HS and HA documents for Y-12 facilities and their output products limit the effectiveness of the ERO preparedness and response posture.** BJC HS and HA documents and UT-Battelle HS documents do not provide assurance that all hazardous materials at the BJC and UT-Battelle facilities have been adequately evaluated to quantify the risk and to support emergency response. The screening process used by BJC and UT-Battelle did not consistently use the maximum material-at-risk as a benchmark for comparison to hazardous material thresholds, and the hazards screening process used at these facilities may have inappropriately excluded certain materials (e.g., silver cyanide) from further consideration in an HA. Consequently, Y-12 emergency responders may not be adequately prepared for worst-case events at these facilities, although it is believed that the BJC and UT-Battelle facilities do not generally represent a significant hazard. A few concerns related to the BWXT HAS were also identified. The process for converting emergency action levels (EALs) derived from the HA output results to response procedures used by the PSS has not been consistently rigorous, and the EAL set included as part of the event classification

procedure does not include all event scenarios evaluated in the BWXT HAs. As a result, the EALs are not complete and do not adequately support classification of all postulated events. In addition, the transportation of hazardous materials on site has not been adequately evaluated, and the site still lacks a technically sound basis for its emergency planning zone. While most of these items are recognized weaknesses and corrective actions are scheduled for completion, continued management attention will be required to ensure adequate resolution.

- **The YAO and BWXT assessment processes applied to the site emergency management program are not sufficiently rigorous to ensure that programmatic weaknesses are identified and addressed in a timely manner.** YAO schedules assessments of the emergency management programmatic elements over a three-year period to distribute the workload and to meet the three-year requirement specified in DOE Order 151.1A. However, the accompanying YAO process document does not specifically define how each element is to be assessed, nor does it include defined assessment criteria. As a result, YAO assessments of the Y-12 emergency management program over the past three years were not comprehensive, rigorous, or well documented. Furthermore, the YAO and BWXT issues management systems (the Deficiency Tracking System and Corrective Action Planning System, respectively) contain such a high threshold for entry items that weaknesses and improvement items are effectively excluded from tracking and trending. Finally, the BWXT system used within the emergency management program for tracking and trending concerns, weaknesses, and improvement items resulting from drills, inspections, surveillances, and technical document reviews has not been used for the past two years, and its implementing procedure is outdated.

## 3.0

## CONCLUSIONS



**Despite some deficiencies, the emergency management program now provides confidence that workers and the public can be protected.**

Since the 1998 evaluation, Y-12 has made remarkable progress in implementing an emergency management program that, with few exceptions, has prepared the site ERO to respond effectively to a wide range of initiating events, including hypothetical worst-case accidents. Technically sound basis documents in the form of HAs have been developed and used to generate effective response tools for initial ERO decision-makers. Additionally, these decision-makers have demonstrated that they can work in pre-established teams, in a disciplined and well-coordinated manner, to accurately and promptly make the necessary decisions and notifications in a time-urgent environment. Furthermore, the drill and exercise programs are rigorous and provide the opportunities necessary for the ERO to establish and maintain proficiency.

More importantly, YAO and BWXT have demonstrated their ability to work together to identify and implement needed programmatic improvements. YAO has provided significant guidance and oversight, particularly in the HA and exercise planning and execution areas, and has effectively used contractual performance incentives to indicate areas of focus. BWXT's commitment to success in the emergency management area is demonstrated by the improvements implemented to date and its willingness and ability to self-identify areas requiring further improvement.

Several weaknesses were identified in the Y-12 emergency management program. For several facilities and activities, initial decision-makers lack a complete set of EALs that are consistent

with the event scenarios identified in the associated HAs, and a technically based Y-12 composite emergency planning zone has not been developed. In addition, the methodology used by BJC and UT-Battelle in screening hazardous materials and in developing HAs for their facilities on the Y-12 site does not provide sufficient assurance that the emergency planning and response tools provided for initial Y-12 decision-makers are adequate. Additionally, the plans that BWXT established for the training and qualification program have not been fully implemented. The significant reduction in BWXT staffing limited BWXT's ability to implement a mature training program, and consequently, inexperienced personnel entering the ERO training program may not be equipped with an adequate level of knowledge and skills upon qualification to be proficient in their ERO tasks.

Finally, the current structure and implementation of the site feedback and improvement

mechanisms are not sufficiently rigorous to ensure that the positive performance trend will continue. The construct of both the YAO and BWXT corrective action systems precludes the effective tracking and trending of emergency management programmatic weaknesses and improvement items, and weaknesses in the YAO assessment process are not conducive to the systematic identification of improvement items.

Overall, the results of this inspection indicate that Y-12 has implemented an emergency management program that, for the most part, provides the structure, mechanisms, and personnel necessary for mounting an effective response to a site accident. Although several important weaknesses were identified, their collective impact is not sufficient to seriously impact Y-12's current response capabilities. Therefore, the Y-12 emergency management program provides confidence that both site workers and the public can be protected in the event of a hazardous material release.

# 4.0

## RATINGS

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This review was limited to a detailed assessment of four key emergency management programmatic elements. Consequently, no overall program rating has been assigned. The individual element ratings reflect the current status of the respective Y-12 emergency management program elements.

The ratings for the individual program elements are:

Hazards Surveys and Hazards Assessments	SATISFACTORY
Emergency Management Plans and Procedures	SATISFACTORY
Training and Drills	MARGINAL
Exercises	SATISFACTORY
Feedback and Improvement	SATISFACTORY

# APPENDIX A

## SUPPLEMENTAL INFORMATION

### A.1 Dates of Inspection

	<u>Beginning</u>	<u>Ending</u>
Planning Meeting	October 1, 2001	October 5, 2001
Onsite Visit, Report Writing	October 15, 2001	October 25, 2001
Outbriefing		October 25, 2001

### A.2 Inspection Team Composition

#### A.2.1 Management

Glenn S. Podonsky, Director, Office of Independent Oversight and Performance Assurance  
Michael A. Kilpatrick, Deputy Director, Office of Independent Oversight and Performance Assurance  
Charles B. Lewis, Director, Office of Emergency Management Oversight  
Bradley A. Peterson, Director, Office of Cyber Security and Special Reviews (Team Lead)  
John E. Hyndman, Deputy Director, Office of Safeguards and Security Evaluations (Deputy Team Lead)

#### A.2.2 Quality Review Board

Michael A. Kilpatrick	Dean C. Hickman	Kathryn P. McCarty
Bradley A. Peterson	Barbara R. Stone	John E. Hyndman

#### A.2.3 Inspection Team

Steven C. Simonson (Topic Lead)	David H. Schultz	James R. Lockridge
James B. O'Brien	Thomas Rogers	

#### A.2.4 Administrative Support

Shirley J. Cunningham  
Kim M. Zollinger

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## APPENDIX B

### SITE-SPECIFIC FINDINGS

**Table B-1. Site-Specific Findings Requiring Corrective Action Plans**

<b>FINDING STATEMENT</b>	<b>REFER TO PAGES:</b>
The Y-12 Area Office and the Oak Ridge Operations Office have not ensured that Bechtel Jacobs Company and University of Tennessee-Battelle appropriately identify and screen hazardous materials for their facilities on the Y-12 site so that all hazardous materials are adequately evaluated to support emergency planning and response, as required by DOE Order 151.1A.	18-19
The BWXT emergency classification procedure does not include all required EALs for all facility hazards assessment event scenarios that could result in hazardous material releases warranting event classification, as required by DOE Order 151.1A.	27
The Y-12 training program does not ensure that all personnel completing the emergency response organization training and qualification program are proficient in all tasks for which they are responsible, as required by DOE Order 151.1A.	31
Y-12 Area Office emergency management assessments are not sufficiently structured, performed, or documented to conclude that all elements of the BWXT emergency management program are assessed at least once every three years, as required by DOE Order 151.1A.	36
The Y-12 Area Office and BWXT corrective action tracking systems are inadequately structured or utilized to ensure that all emergency management deficiencies, weaknesses, and concerns are identified, tracked, trended, and adequately dispositioned, as required by DOE Order 151.1A.	38

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## APPENDIX C

### HAZARDS SURVEYS AND HAZARDS ASSESSMENTS

#### C.1 INTRODUCTION

U.S. Department of Energy (DOE) Order 151.1A, *Comprehensive Emergency Management System*, requires that the scope and extent of emergency planning and preparedness at a DOE site be commensurate with the hazards. In accomplishing this graded approach, emergency management planning efforts begin with the hazards survey (HS), which is the identification and qualitative assessment of site-specific hazards and associated emergency conditions that may require a response. If the HS identifies hazardous material quantities that pose a potentially serious threat to site workers or public health and safety, then a quantitative emergency planning hazards assessment (HA) is performed to estimate the severity of the impact, thereby providing the technical basis for the scope of the site's comprehensive emergency management program.

The Office of Independent Oversight and Performance Assurance (OA) evaluation of this element of Y-12's emergency management program consisted of a review of documents guiding the development and maintenance of HSs and HAs; interviews with personnel responsible for developing and maintaining HSs and HAs; and a detailed review of HSs and HAs for several facilities, including a walkdown of the facilities. The HAs were reviewed for technical accuracy and conformance with DOE Order 151.1A. Particular attention was focused on the use of HAs in developing emergency management tools such as emergency action levels (EALs), predetermined protective actions, and facility-specific and sitewide emergency planning zones (EPZs).

#### C.2 STATUS AND RESULTS

The Y-12 HS and HA documents were evaluated as part of the 1998 integrated safety management evaluation. At the time of that review, only a few of the many required HSs and HAs had been completed, and significant deficiencies were identified with the completed HAs. As a result, emergency planning tools such as EALs and predetermined protective actions had not been developed for all facilities, and a technical basis had not been established for the Y-12 site EPZ.

Following the 1998 review, the Y-12 emergency response organization (ERO) developed a plan to prioritize the development of HSs and HAs for those facilities containing the largest quantities of hazardous materials. Four groups of facilities were identified (i.e., Phases I - IV), with Phase I facilities having the largest quantity of hazardous materials. BWXT has implemented this plan to guide its effort to complete the HSs and HAs for the Y-12 site.

##### C.2.1 Hazards Surveys

All three primary contractor organizations with facility operations on the Y-12 site —BWXT, Bechtel Jacobs Company (BJC), and University of Tennessee (UT)-Battelle—have developed HSs for their facilities. UT-Battelle developed a single HS covering activities at all 38 of its facilities; BJC developed 3 HSs for its 80 facilities; and BWXT developed 95 HSs for all 686 of its facilities. This is a significant milestone in establishing the technical basis for the Y-12 emergency management program.



The process for developing and maintaining the Y-12 HSs is described in the Oak Ridge Reservation (ORR) emergency plan, and details are provided in a BWXT HS/HA emergency planning procedure. This procedure closely follows the DOE emergency management guide for developing HSs; it is very detailed, and it provides very good guidance for developing HSs. Particularly noteworthy is the process used for identifying and documenting the maximum material-at-risk located at each facility. Facility walkdowns and reviews of authorization basis documents are performed to identify the hazards, and a standard form is used to document the results. The screening criteria specified in the Y-12 HS/HA procedure are well defined and provide assurance that lesser quantities of hazardous materials (e.g., below-threshold planning quantities) are also scrutinized to determine whether an assessment in an HA is warranted. This noteworthy process provides for a more comprehensive evaluation of hazardous materials, the release of which could impact co-located workers or members of the public located in close proximity to the site.

Facility management is involved in HS development and approval. Furthermore, DOE line management reviews and approves the HSs, HAs, EALs, and EPZs. The Oak Ridge Operations Office (OR) review protocol includes a formal comment and resolution process and the issuance of a documented review report. The HS review process is commendable; it includes the involvement of facility representatives and subject matter experts (e.g., fire protection personnel and industrial safety personnel). However, the Y-12 Area Office's (YAO's) implementation of the process has resulted in delayed approval of the BWXT HSs (it takes about four months for YAO to review HSs). This is due, in part, to competing priorities and the level of detail and number of personnel involved in the review. Currently, all but one HS for the Phase I and II facilities (the highest-hazard facilities) have been approved. However, all 60 HSs for the Phase III and IV facilities that have been submitted to YAO are awaiting approval.

During this assessment, a sample of HSs was reviewed to determine whether they were developed in accordance with the BWXT procedure and meet DOE Order 151.1A requirements. In general, all HSs that were reviewed are organized in a manner consistent with the order and contain a good overview of site conditions and hazards. Tables include survey details on each facility and are in the matrix form prescribed in the order. Although each HS includes a list of applicable emergency planning requirements, the lists are not comprehensive. For example, the BWXT HSs included only the emergency planning requirements applicable to hazardous material screening, and none of the HSs identified any applicable State of Tennessee emergency preparedness requirements.

The BWXT facilities followed the hazard identification process prescribed in the BWXT HS/HA procedure, resulting in the identification of the maximum anticipated quantities of hazardous materials. However, at the time that the UT-Battelle and BJC HSs were developed, the BWXT hazard identification process had not been established. Instead, UT-Battelle and BJC followed a process described in an ORR standard to develop their HSs. This standard is less prescriptive than the BWXT procedure used at Y-12 and does not clearly require the identification of the maximum quantities of material that may be stored or used at a facility. In most cases, both UT-Battelle and BJC used actual quantities on hand at the time of the surveys to determine whether the facility required an HA. Use of actual rather than maximum quantities does not provide assurance that facility hazards have been correctly screened from further analysis. Furthermore, UT-Battelle and BJC used the less conservative screening criteria specified in the ORR standard, which does not provide as thorough an evaluation of smaller quantities of hazardous materials as the BWXT HS/HA procedure.

**FINDING: YAO and OR have not ensured that BJC and UT-Battelle appropriately identify and screen hazardous materials for their facilities on the Y-12 site so that all hazardous materials are**

**adequately evaluated to support emergency planning and response, as required by DOE Order 151.1A.**

UT-Battelle is currently revising its HS to meet the more stringent requirements of the BWXT HS/HA procedure. BJC also plans to revise its HSs and intends to meet any new HS development requirements established in the new revision of DOE Order 151.1A, which is expected to be issued in early 2002.

### **C.2.2 Hazards Assessments**

From the hazardous material identification and screening process, 25 BWXT facilities/complexes and 3 BJC facilities/projects were identified as warranting development of HAs. In addition, BWXT identified a need to develop an HA covering onsite transportation of special nuclear material. All of these HAs have been completed, although five are still awaiting approval by YAO.

As discussed in the previous section, BWXT has developed an excellent procedure guiding the development of the HSs and HAs. The BWXT HS/HA procedure's instructions for developing HAs closely follow those provided in the DOE emergency management guide and include additional guidance specific to the Y-12 site. The procedure provides detailed guidance for evaluating certain accident initiators, such as airplane crashes and malevolent acts, as well as HA maintenance. For example, it describes the process for considering the impact of significant changes to facilities and for notifying emergency preparedness personnel of changes in the HA that may warrant changes in other emergency preparedness documents (e.g., EALs). This process is integrated with the process for evaluating whether changes are needed in the authorization basis and the fire hazards analysis. In addition, the HS/HA procedure specifies the records that are to be maintained for the HA, including hazard identification documents, hazard screening data, documentation of the facility walkdown, and working files that contain details on source term development and consequence assessment. This procedure serves to ensure that a consistent methodology is used to perform the HAs for the various facilities on the Y-12 site. Furthermore, the procedure specifies that facility personnel are to be involved in both the development and the approval of HAs.

HAs for several BWXT and BJC facilities covering a spectrum of operations, hazards, and responsible organizations were reviewed in detail to determine whether the formal HA development process had been effectively implemented. In general, the BWXT HAs are comprehensive and exhibit many positive attributes. The HAs are thorough and methodically developed, and they serve as stand-alone documents for the analyzed facilities. The HAs contain the appropriate attributes, such as facility description, barrier identification, and hazard characterization. Event identification and supporting quantitative assessments are detailed and complete for the postulated accidents that are analyzed. Facility-specific HAs include an evaluation of potential events involving the shipping and receiving of hazardous materials (other than special nuclear material) at the facility. However, BWXT has determined that the facility-specific HAs do not adequately evaluate the transportation of hazardous materials on site and is developing a stand-alone transportation HA. The HAs provide estimates of potential consequences at key onsite and offsite receptors (including estimated plume travel time). The more recently developed HAs include improvements in presenting the results of the HAs, such as clearly identifying the maximum distance at which protective action criteria are exceeded, which make the HAs more useful in emergency planning and as an emergency response resource.

The BWXT HAs include a wide spectrum of possible accident initiators, including spills, fires, and natural and manmade phenomena. Particularly noteworthy is the analysis of the potential impact of an

explosion at a nearby propane facility that could serve as an accident initiator at some Y-12 facilities. In addition, the HAs include an analysis of malevolent acts, using three different severity levels. However, some of the HAs do not address the potential impacts of vehicle crashes on facilities. In addition, one HA does not provide adequate justification for not assessing the impact of potential events on a tank storing a significant quantity of potassium hydroxide. Furthermore, the calculations of event consequences typically consider only worst-case scenarios and do not consider potential mitigation features that might result in less severe consequences, which would be useful in developing EALs for partially mitigated events.

The BJC HAs that were reviewed vary in the level of detail provided and the manner in which hazards are evaluated. This is due, in part, to different project organizations being responsible for developing the HAs. The BJC HA for the Alpha-4 facility provides a good description of facility operations and the most significant hazards contained in the facilities. The HA includes an analysis of the maximum amount of hazardous material that may be contained in the facility and evaluates a large number of events that might occur at the facility, in a manner consistent with the BWXT HS/HA procedure. However, one type of event, vehicle collision, is not included. This type of event may have consequences that warrant event classification. A major deficiency in this HA is that it does not identify an appropriate protective action criterion for mercury and therefore does not evaluate the distance at which protective actions for a release of mercury should be taken. Although an emergency response planning guideline is not available for mercury, a surrogate value (e.g., Temporary Emergency Exposure Level) should have been developed for the protective action criterion, as described in the DOE emergency management guide. Another concern with the Alpha-4 facility HA is that the consequences of events impacting lithium carbonate were not evaluated because this material is inappropriately considered a “common industrial hazard.”

A number of deficiencies were also identified in the BJC HA for the legacy waste facilities. The results of the HS for these facilities determined that an HA was needed. However, because the maximum quantities of materials had not been identified and further screening performed in the HA used inappropriate criteria, it was determined that events that might cause the release of the hazardous material did not need to be analyzed. Several examples of inappropriate criteria used to screen the materials were identified. For example, mercury was screened out because it has a low vapor pressure, without considering the possible effect of fire on the material; silver cyanide was screened out because it is a common industrial hazard; and 6,600 pounds of cyanide-contaminated waste was screened out without documenting the actual amount of cyanide in the waste. The rationale provided for eliminating these materials is not adequate to support the decision not to perform a quantitative analysis of the impact of various event scenarios on site workers and the public.

### **C.2.3 HA Output Products**

Indications and information for detecting events requiring classification as an emergency were identified in the HAs for each facility. However, many of the facilities lack instrumentation that can be used to recognize hazardous material releases; for example, fire detection instrumentation in some buildings does not indicate specific fire locations. As a result, a large number of events are conservatively classified at the general emergency level because the exact nature or location of the event cannot be readily determined. BWXT recognizes this as a limitation and has made efforts on new projects to ensure that appropriate indicators are included in the project design. Although the HS/HA procedure specifies that recommendations for additional indicators be documented as part of the HA process, this has not been performed. The benefit of having indicators to support event classification is demonstrated in the hydrogen fluoride process at the 9212 building. The monitoring instruments installed during this facility

upgrade project have facilitated development of a more thorough set of EALs for potential accidents involving this process.

Another output product of the HA is the technical basis for the predetermined protective actions. BWXT has identified predetermined protective actions for each EAL included in its classification procedure. The predetermined protective actions specify an isolation zone around the immediate event scene, a protective action area for site areas around the event, and protective action recommendations for offsite areas (applicable only for general emergencies). The predetermined protective actions are based upon HA event analyses and appear to be appropriate. However, the linkages between the HA results and the distances specified for the initial isolation zones are not clearly described in the HAs.

The BWXT process for determining facility-specific and sitewide EPZs is consistent with that provided in the DOE emergency management guide. All of the HAs that were reviewed contained data that can be used to determine site-specific EPZs, but only the first step in the process for determining these zones was executed in the HAs (i.e., only the maximum and minimum distances of the EPZ are identified for each hazardous material that may be released). Further analysis is needed to determine the exact extent of the facility-specific EPZs, and the results of the analysis should be used to develop a composite sitewide EPZ. BWXT is actively working on completing its analysis of the EPZ technical basis, and plans to complete this effort by June 2002.

### **C.3 CONCLUSIONS**

In conclusion, BWXT has achieved a significant milestone in completing the development of HS and HA documents for all of their facilities on the Y-12 site. The BWXT procedure for developing the HSs and HAs provides very good guidance, particularly in the areas of hazards identification and screening, and Y-12-specific event scenarios. The HSs and HAs that were developed provide a good technical basis for establishing the comprehensive emergency management program for the BWXT facilities. However, because UT-Battelle and BJC did not always identify the maximum expected quantities of hazardous materials as part of their hazard identification process, and because they used a screening methodology that is not as conservative as that specified in the BWXT process at Y-12, there is inadequate assurance that all facilities and materials requiring an assessment in an HA have been identified. In addition, BWXT has not completed development of facility-specific and Y-12 site EPZs. In general, YAO and BWXT have established a comprehensive and sound technical basis for the Y-12 emergency management program. Additional attention is warranted to ensure that the emergency management program technical basis that was developed by other contractors conducting work at Y-12 is equally effective.

### **C.4 RATING**

With few exceptions, YAO and BWXT have established an effective program for evaluating the potential hazards at site facilities and developing the tools necessary to plan an effective response to a wide range of initiating events. A rating of SATISFACTORY is therefore assigned.

### **C.5 OPPORTUNITIES FOR IMPROVEMENT**

This OA inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible DOE, National Nuclear Security Administration, and contractor line management and

prioritized and modified as appropriate, in accordance with site-specific programmatic emergency management objectives.

- Revise the format of output tables in the HAs to make them more useful as an emergency response resource document. Currently, the format of the output tables in the HAs varies between the earlier and more recent HAs. (The later version of the tables is better organized but can be further improved.) For example, the tables should provide a clear linkage between the specific event scenario descriptions, the rollup of the events into EAL statements, and the consequences of the events at various receptor locations, including the maximum distance at which protective action criteria are exceeded.
- Better document the technical basis for establishing the predetermined protective actions. Predetermined protective actions are provided for each of the EALs. The EAL development procedure states that the basis for the initial isolation zone provided in the action statement is the 2000 Emergency Response Guidebook. However, this guide has not always been used, and the actual basis for the distance chosen for the isolation zone is not documented in the EAL table or in the HA. Y-12 should review the basis for the isolation distances chosen in the EALs and document it in the EAL and/or the HAs.
- Document the linkage between the EALs provided in the HAs and those provided in the EAL matrix. Y-12 combined many of the specific event scenarios identified in the HA when developing the EAL statement used in the classification procedure. However, the rationale for combining the events was not well documented. Documenting this rationale will help in the maintenance of the procedure and will help ensure that the events were properly combined to form the EAL statement in the classification procedure.
- Improve the description of the facility by including schematics of the building and locations of hazardous materials. Some of the more recent HAs include schematics of the building, which provide a better description of the facility. For example, a fire pre-plan schematic that provides an appropriate level of detail was used in one HA. In addition, some of the HAs could be improved by including better descriptions of the ventilation systems.
- Evaluate whether analysis of mitigating features might provide a more realistic assessment of event scenarios. Currently, the HAs assume a leak path factor of 1.0 for most of the event scenarios. Further evaluation of the mitigating features that might reduce the source term (and thereby warrant a leak path factor of less than 1.0) would improve the HAs. Although it may be appropriate to calculate the event scenario with a leak path factor of 1.0 to conservatively bound the event, additional information on the more realistic release scenario would improve the HAs.
- Expedite approval of HAs and HSs. Currently, it takes about four to seven months for the YAO to approve an HS or HA. Consider prioritizing support resources (e.g., fire protection personnel and safety engineers) to improve the timeliness of the reviews.

## **APPENDIX D**

### **EMERGENCY MANAGEMENT PLANS AND PROCEDURES**

#### **D.1 INTRODUCTION**

An emergency management plan describes the results of technical evaluation of emergency conditions that may affect facilities and the site, and identifies and defines the program that must be established. The plan includes response organizations and resources that must be assembled to effectively mitigate the consequences of analyzed events. Emergency plan implementing procedures must be developed to dictate response activities and must be usable by all echelons of response personnel in performing their duties. Plans and implementing procedures must clearly define roles, responsibilities, and authorities, and should provide detailed instruction in accomplishing the preplanned actions.

This evaluation by the U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) focused on the Y-12 emergency management plan and implementing procedures, and resources established by the plan for the BWXT organization. The primary goal was to determine whether the plan and procedures fulfill the goals and standards established by National Nuclear Security Administration (NNSA) policy, requirements, and guidance, and are capable of providing adequate protection to site responders, co-located workers, and the public in the event of an emergency at the site. Data collection activities included performance-based, tabletop evaluations of key members of the emergency response organization (ERO).

#### **D.2 STATUS AND RESULTS**

The 1998 integrated safety management evaluation identified numerous concerns in emergency response plans and procedures, response resources, and the proficiency of ERO members in performing their assigned responsibilities. This current evaluation determined that significant improvements have been made in preparing plans and procedures, integrating and coordinating response resources, and in the proficiency of selected members of the ERO.

##### **D.2.1 Plans, Procedures, and Response Resources**

The Oak Ridge Reservation (ORR) emergency plan, published in November 1999, addresses the planning activities for the three major sites at ORR, including the Y-12 plant. This plan describes ORR's overall concept of operations and includes requirements and policy set forth by DOE Order 151.1A, associated guidance, and other state and local requirements. Annex C, Y-12 Plant, Site-Specific Annex to the ORR emergency plan was also published in November 1999. The plan and annex require implementation of a unified incident command system at all ORR sites and identify extensively shared emergency response assets such as the emergency operations center and joint information center. Numerous memoranda of understanding and agreement are in place to further define other support arrangements, such as medical and fire response, roadblocks, and security functions.

Although ORR emergency plan implementing procedures have been developed by the Oak Ridge Operations Office (OR), the procedures lack the specificity deemed necessary by BWXT for the response employed at Y-12. Thus, BWXT has developed implementing procedures that are used in lieu of ORR procedures to define the BWXT and Y-12 Area Office (YAO) response actions. As a result, there are

some differences between current Y-12 response activities and those described in the ORR emergency plan and annex. In order to prepare a Y-12 emergency plan that is consistent with the desired BWXT concept of operations, BWXT is developing a multi-year emergency response transition plan to define the process, milestones, and deliverables associated with the establishment of separate emergency management programs. Initial implementation is scheduled to begin in fiscal year 2002. Key steps include:

- Clearly defining YAO and OR strategies and responsibilities for creating successful but separate emergency management programs for their respective operations, yet maintaining common areas (e.g., site common response plans and shared facilities/equipment) where appropriate
- Issuing the Y-12 emergency plan for approval by YAO, currently scheduled for March 2002
- Maintaining the YAO/OR service agreement current to document the status of the transition activities and the evolution in roles and responsibilities.

Building emergency plans have been developed for each facility to supplement the Y-12 sitewide implementing procedures. These plans specify facility worker responsibilities for response to and recovery from facility emergencies identified in facility hazards surveys and assessments.

OA determined that the Y-12 concept of operations defines and establishes an effective incident response organization, and that emergency implementing procedures and associated tools have improved significantly during the past three years. These resources provide effective tools for decision-makers to implement emergency response actions. Initial response is set in motion by any plant worker who discovers off-normal conditions. The worker reports the condition to the fire dispatcher and the plant shift superintendent (PSS) by calling 911 or by contacting them by radio. The PSS is stationed in the emergency control center (ECC) 24 hours a day, 7 days a week. For emergency conditions, the PSS becomes the interim emergency director and has the responsibility and authority to perform initial decision-making, including determining protective actions, categorizing and classifying events, and performing required notifications. The control center assistant (CCA), who performs administrative duties such as notifications and ERO recall as directed by the PSS, and the site protective force shift commander, who coordinates all protective force activities for the PSS, are also available around the clock in the ECC. This team provides adequate manpower in the ECC to carry out the initial response actions defined by procedures.

The PSS directs the incident commander, who is in charge of the incident command system, to the scene of the emergency. The incident commander for non-security events is the senior responder from the fire protection organization, and the senior responder from the protective services organization for security events. For all events, the fire and security responders combine to form a unified incident command system. Typically, the same incident commanders are usually on shift together, promoting a cohesive, stable incident command system. The OA team noted another substantive incident command system enhancement since the 1998 review—a significant increase in Y-12 fire department staffing (14 on all shifts). This increase permits staffing the required positions in the incident command system for structural fire response and hazardous material spills. Similar shift rotation among the ECC team and incident commanders has enhanced the collective response effort.

An improved developmental process for the emergency plan implementing procedures used by the PSS was initiated following the 1998 review. The process started with an assessment of ECC equipment,

instrument indications, and alarms requiring procedural direction, and continued with research of emergency plan requirements, lessons learned, and other guidance to determine the adequacy of existing procedures. Deficient conditions were identified, incorporated into new documents, and then verified and validated through extensive testing and training with persons responsible for procedure implementation, including the PSSs.

Significant improvements were also noted in overall procedure coordination and internal procedure organization. The PSS uses an overall generic crisis checklist for the Y-12 complex to orchestrate response activities, beginning with receipt of incident notification and proceeding through initiation of incident response, categorization and classification, formulation of protective actions, and notification. The generic checklist is large, providing space for listing details of each of the major response activities and documenting event-specific information, such as the results of the incident commander's initial event assessment. Where appropriate, detailed procedures and/or additional checklists support each of the major activities referred to on the generic checklist, such as classification. Incident commanders possess and use well-designed, position-specific checklists that define their response activities. With the exceptions noted below, overall improvements were made in emergency classification documents, including the preparation of facility-specific emergency action levels (EALs) for onsite facilities with approved hazards assessments (HAs), predetermined protective actions, and discretionary EALs to permit classifying events at facilities without approved EALs.

## **D.2.2 Performance-based Testing Results**

ERO members demonstrated good knowledge of their roles and responsibilities, and demonstrated proficiency in performing their assigned duties.

### Senior ERO Managers

A YAO emergency manager and two BWXT crisis managers, who are responsible for the adequacy of the overall emergency response effort and are co-located in the emergency operations center, were interviewed concerning their positions and authorities in the ERO. These managers embraced the concepts and necessity for performing hazards surveys and assessments to provide the technical basis for all elements of the emergency management program. They also demonstrated a working knowledge of analyzed facility events of significant concern. The managers clearly understood their responsibilities in providing leadership to the response organization and demonstrated problem-solving abilities for hypothetical situations that could occur during emergency events. The BWXT and YAO managers effectively coordinated their respective roles in management of the response and oversight of the contractor activities.

### Consequence Assessment Team

Ongoing consequence assessment is performed in the emergency operations center following activation of the ERO. The consequence assessment team assesses the adequacy of initial decision-making performed by the interim emergency director (i.e., the PSS) by performing hazardous material dispersion analyses and interpreting field monitoring results. A postulated accident scenario was presented to one of the Y-12 consequence assessment teams, simulating that the team had responded to the emergency operations center. The team promptly employed procedures, checklists, and other documents, such as the affected facility HA, to respond effectively to the postulated emergency. The National Atmospheric Release Advisory Capability (NARAC) is the primary dispersion model used at Y-12, with secondary resources



available using EPICode and HOTSPOT for straight-line Gaussian dispersion modeling and other calculations. Sophisticated model results were available from NARAC approximately eight minutes after the input of event parameters. The results were quickly depicted for both the radiological and toxicological hazards of uranium dispersion based on percentage enrichment, and were graphically displayed in a format fully integrated with an aerial photograph and other maps of the area in and around Y-12. Team members demonstrated good skill in operating all dispersion modeling systems and equipment. They readily interpreted the computed results and explained impacts to simulated members of the balance of the ERO. The team was sensitive to maintaining close communications with their counterparts in the state organization to assure understanding of consequence assessment results and the potential impact on protective action recommendations. When presented with postulated field data, the data was readily integrated with the dispersion model to determine a revised source term. The OA team determined that the consequence assessment team could perform its function effectively during an emergency response.

### Interim Emergency Director

As noted above, the PSS is the interim emergency director until relieved by the technical support center manager or the emergency operations center crisis manager. Tabletop performance tests were conducted with three PSS, CCA, and protective force site commander teams to verify that these emergency response personnel were knowledgeable of their responsibilities and able to utilize their procedures and checklists effectively to (1) categorize and classify postulated events; (2) determine protective actions for responders, co-located workers, and the public; and (3) perform notifications. Two facility-specific scenarios (an operations event and a security event) were presented to the teams by a BWXT trusted agent. The trusted agent ensured scenario validity and delivery of accurate event cues.

All three ECC response teams performed effectively as a team, clearly demonstrating the significant training and drilling participation that has orchestrated their combined efforts into a cohesive, task-oriented unit. PSSs promptly recognized the postulated conditions as an emergency and initiated response actions in accordance with applicable checklists, operator aids, and procedures. Initial event assessment was performed well, except that one PSS improperly applied the wind direction to one event, resulting in a delay in ERO augmentation. All PSSs promptly and correctly classified the operational emergency, and two of three PSSs correctly issued predetermined protective actions and protective action recommendations based on the EAL used to make the classification. However, one PSS implemented protective action recommendations that were much more conservative than prescribed by the EAL. This PSS's decision to increase the affected area was not based on consequence assessment or other technical data; increasing the affected area without a technical basis could cause confusion among state decision-makers who may reach a different conclusion based on the available emergency information.

For the postulated security event affecting a hazardous material facility, all PSSs correctly implemented bomb threat checklists to make credibility determinations. Two of three PSSs promptly and correctly classified the malevolent act based on its potential effects and implemented protective actions that were consistent with the available EALs. However, the available predetermined protective actions were not consistent with the consequences determined in the facility HA and therefore would not have protected the public during the postulated event. One PSS incorrectly classified the malevolent act as a site area emergency; this PSS verbalized the correct classification of general emergency should the threatened malevolent act occur, but did not notify offsite agencies of the potential for the more severe classification. As a result, onsite protective actions were implemented, but an incorrect protective action recommendation of "none" was issued to offsite authorities. One PSS consulted the facility HA to

confirm the adequacy of the protective action decisions made using the available EALs, but was unsuccessful in interpreting the data provided in the HA. At minimum, incorporation of HA data into the EAL tables is warranted.

Although most of the EALs are appropriately based upon the HA results, a number of deficiencies were identified in the use of the HA to develop and include required EALs in classification procedures. For the Alpha-4 facility, EALs were not developed in the HA for a fire event scenario. For the 9212 complex, EALs were developed for events in the C wing but were not included in the EAL procedures (this problem was corrected during the evaluation). Although malevolent acts were identified in the HA as having the potential for causing classifiable events with offsite consequences, the events were not included in EALs for a number of facilities, but were included for others. This condition resulted in the performance problem noted above. Because of these deficiencies, the EAL procedure is not complete and does not provide an adequate tool for classifying all potential events.

**FINDING: The BWXT emergency classification procedure does not include all required EALs for all facility HA event scenarios that could result in hazardous material releases warranting event classification, as required by DOE Order 151.A.**

All PSSs implemented notifications and initiated ERO staff recall in a timely manner. However, one PSS did not control the release of notification information either by completing the form or reviewing the form completed by an ECC team member before making notifications. Instead, this team member used personal notes from his understanding of events to make oral notifications to the agencies identified by the PSS. Although the OA team noted no instance of incorrect information being released, the practice is contrary to procedure.

#### Fire and Security Incident Commanders

An operational event scenario similar to the performance-based exercises conducted for the ECC was performed for each of two teams of incident commanders in the field. Based on event information, both teams quickly determined that the fire department incident commander was the lead for the postulated operational explosion in the specified facility. The incident commanders demonstrated good use of checklists and equipment in the command vehicle, as well as a good understanding of personal protective equipment requirements. Both incident commanders demonstrated good understanding of the relevance of meteorological conditions to the approach path of response vehicles, placement of the incident command post and staging area, and the arrival path of mutual aid response units. Good understanding of the correlation between event time of day and event severity was also demonstrated. Both incident commanders promptly recognized the significance of the emergency conditions, performed the scene assessment, and provided appropriate scene information to the interim emergency director. Good teamwork was demonstrated by the unified command system, particularly in establishing access control. Clear understanding of priorities among life safety and security issues, such as setting containment and personnel access, was also evident. Incident commanders experienced some difficulty with the plant map available in the command vehicle. The map lacks some critical information, such as the location of assembly stations and distinctive magnetic and true north direction indicators to permit application of wind direction to certain activities, such as stationing personnel.

### **D.3 CONCLUSIONS**

The Y-12 complex emergency plan and associated implementing procedures establish an ERO with adequate resources to effectively mitigate incidents that could affect facilities on the site. Well-conceived emergency response procedures and tools designed to accomplish the critical objectives of timely and accurate initial decision-making are readily available to support response staff in performing their assigned duties. Decision-makers demonstrated good proficiency in using their authorities to execute their assigned roles and responsibilities.

### **D.4 RATING**

Emergency management plans and procedures at the Y-12 complex have been effectively implemented. A rating of SATISFACTORY is therefore assigned.

### **D.5 OPPORTUNITIES FOR IMPROVEMENT**

This OA inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible NNSA and contractor line management and prioritized and modified as appropriate, in accordance with site-specific programmatic emergency management objectives.

- Consider advancing the completion date for the new Y-12 complex command center.
- Continue performance-based training for PSSs, focusing on areas of weakness observed during tabletop performance tests. Some examples are: determining protective actions, classifying events based on the *potential* for hazardous material release; applying facility HA information after initial decision-making; and (although not tested during tabletop exercises) using facility-specific EALs for transportation accidents pending development of the transportation HA.
- Resolve inconsistencies among the ORR emergency plan and implementing procedures and the Y-12 concept of operations currently implemented by BWXT implementing procedures.
- Consider providing access to the NARAC dispersion model in the ECC and/or technical support center to enhance tools available to initial decision-makers.
- Continue the enhancement of tools employed by PSSs and incident commanders, such as generic checklists and maps.

## **APPENDIX E**

### **TRAINING, DRILLS, AND EXERCISES**

#### **E.1 INTRODUCTION**

To develop and maintain the necessary emergency response, a coordinated program of training through instruction and drills must be an integral part of the emergency management program and apply to all emergency response personnel and organizations relied on to respond to emergencies. For a training program to be effective, it must include initial training that will develop individual and team skills, and periodic training to keep the emergency response organization (ERO) proficient while keeping pace with changes in plans, procedures, and facility equipment. An exercise program must be established to determine whether ERO skills are compatible with the procedures' level of detail and promote effective response to an emergency condition using available tools and equipment. For the exercise program to be effective, it must provide critical and periodic assessments of emergency response that will provide for the demonstration of all elements of the emergency response program using realistic event scenarios.

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) reviewed the Y-12 training, drill, and exercise programs to determine whether these programs provide both the requisite training to prepare members of the ERO to perform their assigned duties during emergency conditions and the means to validate the strategies and procedures employed by the ERO. The scope of the review included the emergency plan; the training, drill, and exercise plans; the implementing procedures supporting these plans; and output products, such as lesson plans, drill and exercise packages, and records of these activities.

#### **E.2 STATUS AND RESULTS**

The 1998 integrated safety management evaluation identified weaknesses in the training, drill, and exercise programs. These weaknesses included a less than fully effective training program for emergency responders in general, and specifically identified performance weaknesses in the proficiency of emergency response decision-makers. The corrective actions taken by BWXT personnel to address these concerns include developing training, drill, and exercise plans; program procedures; specific training for decision-makers; and training on the operation of specific equipment for targeted positions employed in the field during an emergency condition. The deliverables that were developed to close these corrective actions provide a significant improvement in the program elements for training, drills, and exercises, and improved the proficiency of emergency response decision-makers. However, the implementation of all elements described in the BWXT training plan has not been fully realized.

##### Training

The overall Y-12 ERO training plan is a composite of four separate training plans developed by (1) the BWXT emergency management training staff, (2) the fire protection service of BWXT, (3) the protective force of Wackenhut, Inc., and (4) the Oak Ridge Operations Office (i.e., the Oak Ridge Reservation emergency plan). The core of the Y-12 ERO training plan resides in the emergency management training plan because the emergency management program staff have the lead responsibilities, comprise the majority of the ERO, and are responsible for the training of emergency response decision-makers. The emergency management program also provides a matrix of ERO training requirements to the fire

protection service and the protective force to communicate their expectations of topical training requirements for their ERO positions.

The emergency management training program description consists of a well-conceived set of plans, procedures, and training materials that adequately integrate the ERO training program into the other Y-12 organizational training programs. The emergency management training plan clearly defines the role of the ERO training program and assigns the responsibilities of the ERO training program and other Y-12 organizational training programs, such as the training and qualification program for radiological control technicians who participate in emergency response. The emergency management training plan describes the initial training process as a systematic approach to training. This plan outlines a methodical approach for identifying training needs, developing and using formally-approved lesson plans, and providing specialized task-specific training to personnel for their assigned ERO function, including on-the-job training requirements. The training plan also describes the training as performance-based using a mixture of hands-on training, Web-based training, and lecture-type classroom instruction using qualified instructors, including periodic training for lessons learned, changes in procedures and equipment, and annual refresher training. The plan also requires ERO members to demonstrate that they are capable of performing assigned duties. The descriptions of the requalification and periodic training programs include the same techniques and formality as used for initial training. The training plan also includes a training matrix that identifies topical areas of instruction for each ERO position and provides the basis for qualification as a member of the ERO for each specified position. Additional training requirements include general employee training, and annual participation in a performance test, drill, or exercise. The program described by the emergency management plan provides a high degree of confidence that all personnel involved in an emergency response will have received the appropriate training for tasks assigned to their positions as members of the ERO.

However, the actual development and implementation of the emergency management training program does not reflect the description provided in the emergency management ERO training plan. The divergences from the training plan description include the following:

- A systematic approach to training has not been formally implemented. For example, a job task or training needs analysis has not been performed in accordance with site training procedures, and the informal training needs analysis would not suffice to train new and inexperienced personnel in all assigned tasks.
- On-the-job training requirements have not been identified and developed. For example, there are no formal training elements that require training to be administered in the job position setting, and no lesson plans or performance documentation checklists have been developed for on-the-job training.
- Not all training requirements identified in the body of the plan are in the ERO training matrix, and some do not have formal lesson plans developed to ensure that complete and consistent training is provided to all ERO trainees. For example, the team drill training and the protective force incident commander training are not included in their respective ERO training matrices, and no lesson plans have been developed for these or for the position orientation training.
- Classroom instruction is not included as an integral part of the training program. The core material is all Web-based, with some informal hands-on training.

- Qualified instructors are not typically used in the training sessions. Training is primarily self-study, with some instruction provided by subject matter experts.
- ERO cadre member performance evaluations are not an integral part of the qualification process. Evaluations of trainees for qualification are limited to Web-based written examinations. Post-qualification drills and exercises are used only to evaluate team performance, so there is no evaluation or record of individual performance.
- The annual refresher training also has not been developed and implemented using the methods described for the initial training program, which are described in the plan. The annual training is simply a repeat of the Web-based training material used in the initial training course, or the requirement can be satisfied simply by passing a written examination.

Although all of these missing training program elements would provide a more robust training and qualification program, the absence of both a structured approach to training personnel on ERO member job tasks and an appropriate task performance evaluation are the most significant. The emergency management training program appears to have been designed around the needs of existing experienced personnel, rather than those of a new, inexperienced person. For example, the training requirements for a dispersion modeler do not include any training in the use of the modeling program. It can be rationalized that training is not necessary for the personnel who are currently responsible for performing this task, because they are known to be proficient. However, a new person can complete the training program as a dispersion modeler without knowing how to use the modeling program or demonstrating his or her proficiency in using it. Under the current design, the only programmatic elements that might provide task training for any of the ERO cadre positions are team drill training, position orientation training, and drill participation. However, these three elements are either informal or are not required for ERO position qualification, and they are not sufficiently tracked to ensure that all ERO cadre trainees participate. Under a systematic approach to training, required skills would be a part of an entry-level requirement, or the task training would be included as a training requirement for position qualification. Under this system, new individuals who already have the required skills could be excused from unnecessary training through an exception/exemption process.

The OA team identified additional weaknesses regarding the use of untrained personnel or personnel whose training requirements may not have been fully satisfied under the Y-12 ERO training program. For example, untrained personnel were used as ERO members during the September 11 emergency condition. Some of these untrained personnel were subsequently credited with position orientation training because they served as ERO members, and there are no documented controls established for on-the-job training to prevent them from being credited for such service. Additionally, personnel who are not current in their ERO training requirements may still be called to active ERO participation. Lastly, DOE technical support center representatives who have incomplete training records have been placed on the ERO roster, and there are lapses in ensuring that ERO drill participation training requirements are satisfied.

**FINDING: The Y-12 training program does not ensure that all personnel completing the ERO training and qualification program are proficient in all tasks for which they are responsible, as required by DOE Order 151.1A.**

## Drills

The drill program is an integral part of the ERO training program and is formally defined by plans and procedures. Drill packages are developed and executed, and performance results are documented. BWXT has conducted numerous drills to exercise ERO responses in the past year, primarily in preparation for the full-participation exercise performed in May, but there have also been other team drills, a no-notice drill, as well as the required evacuation and accountability drills. The drill program has been effective in providing and identifying needed training, as evidenced by the training performed during and between drills used in preparation for the May full-participation exercise, and as further evidenced by the successful completion of the May exercise. However, there are some weaknesses in tracking and providing credit for drill participation. The database used for tracking ERO members' participation in drills is not kept current and therefore does not accurately reflect drill participation to satisfy annual training program requirements. Furthermore, the database is not being used to provide deficiency reports or alerts when ERO members are deficient or are due to update their annual drill participation requirement. Additionally, drill participation can be credited for any involvement in a drill, even if the participant is not serving in his or her assigned ERO position. For example, the participant may serve as an evaluator or a controller at a position outside of his or her ERO duty station and still fulfill the annual drill requirement. It is recognized that an effort is made to use evaluators and controllers who are qualified at the observed ERO position.

## Exercises

The exercise program has been significantly upgraded since the 1998 evaluation through the development of an exercise plan and procedure, a recently chartered emergency drill and exercise committee, and active execution of the exercise program in the past year, which included a full-participation exercise and a no-notice, after-hours exercise. The emergency management organization plans to perform a Y-12 full-participation exercise at least once every three years. The exercise packages are formally developed and include clear objectives with measurable performance criteria, and the results of exercises are documented in detail in an exercise evaluation report. Exercise critiques identify and discuss both problems and noteworthy practices. Items requiring corrective action are entered into the sitewide corrective action system for processing, although, as discussed in Appendix F, these items may not be adequately addressed. Exercises are planned to ensure that all elements of the emergency response program are evaluated at least once every five years and are rotated among facilities as allowed by realistic scenarios. Future exercises will be planned by the recently chartered emergency drill and exercise committee, which allows for the incorporation of each organization's program objectives by including a representative from each organization in the committee membership. Although the committee is new, execution of its stated plans should improve the exercise program.

## **E.3 CONCLUSIONS**

Since the 1998 review, the training, drill, and exercise programs have been significantly improved at the program level and in the frequency of drill and exercises. However, plans established for the training and qualification program have not been fully implemented. While the drill and exercise program has been successful in establishing proficiency in at least a portion of the ERO cadre, the structure of the existing training program does not provide assurance that inexperienced personnel will be equipped with adequate knowledge and skills upon qualification to be proficient in his or her ERO tasks.

## **E.4 RATING**

The emergency management training and qualification program does not ensure that upon qualification, personnel are trained and proficient in the ERO tasks that they need in order to provide adequate protection under time-urgent conditions. However, this condition is partially compensated for by the experience the current ERO cadre members gain during post-qualification training, such as drills and exercises, and other job-related activities outside of the ERO training program. A rating of MARGINAL is therefore assigned to the training and drill area, and a rating of SATISFACTORY is assigned to the exercise area.

## **E.5 OPPORTUNITIES FOR IMPROVEMENT**

This OA inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible National Nuclear Security Administration and contractor line management and prioritized and modified as appropriate, in accordance with site-specific programmatic emergency management objectives.

- Develop a formal qualification card for each ERO position to provide an easily obtainable record of training and qualification and to improve the management of required training and drill requirements.
- Review the current emergency management training plan to ensure that the documented requirements best meet the needs of the responders and the organization.
- Reschedule the annual evacuation and accountability drills to occur earlier and more evenly throughout the year to prevent a high drill load on participating organizations at the end of the year, and to avoid putting the annual drill performance requirements at risk.
- Formally incorporate the team training expected by management into the qualification process.



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# **APPENDIX F**

## **FEEDBACK AND IMPROVEMENT**

### **F.1 INTRODUCTION**

Feedback and improvement constitute one of the five core functions of the integrated safety management system governed by U.S. Department of Energy (DOE) Policy 450.4, *Safety Management System*. In addition, as part of the readiness assurance element of emergency management discussed in the emergency management guide, feedback and continuous improvement programs provide the mechanism to track and correct deficiencies and program weaknesses identified from assessments, exercises, and other activities. These programs should also include provisions for sharing lessons learned from both internal and external sources.

The feedback and improvement elements of the emergency management programs at the Y-12 Area Office (YAO) and BWXT that were assessed during this inspection include assessment programs, issues management, lessons learned, and performance incentives and metrics.

### **F.2 STATUS AND RESULTS**

The 1998 integrated safety management evaluation of the Y-12 emergency management program identified that neither the DOE site office nor the site contractor had established effective emergency management corrective action or lessons-learned programs. The current review conducted by the DOE Office of Independent Oversight and Performance Assurance (OA) determined that emergency management feedback and improvement programs for both YAO and BWXT have been established, documented, and implemented at Y-12. In addition, the significant improvements discussed in the preceding sections of this report are indicative of the site's commitment to and success in establishing an effective emergency management program. However, the weaknesses discussed below limit the site's ability to continue to improve the program. YAO and BWXT each maintain their own assessment and lessons-learned programs and corrective action tracking systems for higher-level issues, as described in the following paragraphs.

#### **F.2.1 Assessment Programs**

A key attribute of an effective feedback and improvement program is a viable assessment program. YAO has implemented a variety of mechanisms to assess contractor emergency management programs, including observation of drills and exercises, frequent interaction with BWXT emergency management staff, and reviews of BWXT emergency management technical policies, procedures, hazards assessments, and hazards surveys. The YAO emergency management program manager is responsible for oversight of the BWXT emergency management program; he has established a rapport with BWXT emergency management staff, which has resulted in programmatic problems being identified and solutions being implemented effectively and in a timely manner. The formal YAO emergency management assessment program consists of quarterly assessments that, over a three-year period, would result in an assessment of each of the emergency management programmatic elements described in DOE Order 151.1A. YAO has conducted 11 programmatic emergency management assessments since 1998, although many of these assessments are not properly documented. Five of these assessments were associated with follow-up reviews after the 1997 Hanford explosion and were conducted within a span of a few months. Since mid-

1999, scheduled emergency management programmatic assessments have not been performed or documented because YAO priorities were more appropriately focused on hazards assessments and the exercise program.

Although the YAO emergency management program manager performs frequent evaluations of BWXT emergency management activities and summarizes BWXT performance in the YAO monthly assessment summary, there is no apparent correlation between the monthly assessment summary reports and scheduled emergency management programmatic assessments. During the past two years, YAO observation of emergency management exercises has been used to fulfill some scheduled programmatic assessments. However, there are no records to indicate how exercise observations satisfy the requirements for formal scheduled assessments as described in the YAO "Performance of Assessments" procedure or how they address the DOE programmatic guide criteria for the element being assessed. Overall, since the 1998 integrated safety management evaluation, YAO emergency management assessments have not been sufficiently planned and documented to show that all elements of the BWXT emergency management program are assessed at least once every three years as required.

**FINDING: YAO emergency management assessments are not sufficiently structured, performed, or documented to conclude that all elements of the BWXT emergency management program are assessed at least once every three years, as required by DOE Order 151.1A.**

The BWXT emergency management assessment program consists of formal self-assessments, evaluations of drills and exercises, inspections of equipment and facilities, and external assessments. For the period ranging from the 1998 evaluation until the transition of contractors in November 1999, contractor efforts focused on rebuilding the emergency management program. During that period, annual assessments of the emergency management program were not conducted as required by DOE Order 151.1A. However, during the past year, BWXT developed a self-assessment program guide and completed their first emergency management programmatic assessment in accordance with the program guide. Furthermore, evaluations of eight drills and exercises and a full-participation exercise conducted during the past year have resulted in continual feedback and improvements in the emergency management program. Also during the past year, the BWXT Site Services Division conducted a management assessment of integrated safety management and safety elements of the emergency management program, and BWXT Quality Assurance evaluated the emergency management lessons-learned program.

The BWXT emergency management assessment program is challenged by having to satisfy self-assessment requirements imposed by both DOE Order 151.1A and the BWXT management assessment requirements described in BWXT Procedure Y15-902. In some cases, these assessment requirements conflict, particularly with respect to terminology. The emergency management self-assessment guide has yet to be "cross-walked" with the BWXT management assessment procedure to determine whether emergency management self-assessments can be considered management assessments, or whether further assessments must be conducted with the limited emergency management staff available. Furthermore, BWXT Procedure Y15-902 does not provide adequate guidance to define the minimum requirements for a management assessment. This lack of guidance allows the results of emergency management inspections and tests (e.g., monthly beeper tests) to be considered as management assessments, although this is clearly not the intent of the procedure.

## F.2.2 Issues Management

YAO has a well-established issues management system and a user-friendly Deficiency Tracking System (DTS) that provides a mechanism for tracking emergency management-related deficiencies. The DTS process is documented in a 1999 Y-12 Site Office procedure that is outdated and does not describe the monthly performance summary process, which has been in use for over a year. Currently, there is only one open emergency management-related deficiency in DTS, which is the emergency management issue resulting from the 1998 evaluation. Since 1997, 23 emergency management deficiencies have been entered into DTS; no issues have been generated or closed in calendar year 2001, and only 3 issues were closed during the previous year. Based on the significant shortcomings identified in the contractor's emergency management program during this period, a number of which were identified by YAO, it would appear that either DTS is not being sufficiently utilized for emergency management-related concerns, or the threshold for entering these concerns into DTS is too high. YAO indicates that the explanation for the limited number of deficiencies being identified and closed is that several DTS issues are substantial and include numerous corrective actions (e.g., the issue from the 1998 evaluation includes 44 corrective actions), and that the most significant emergency management program deficiencies were identified during the 1998 evaluation. In either case, the DTS, by itself, is insufficient to identify, track, and trend YAO emergency management concerns, since only higher-level deficiencies, and not weaknesses, are tracked in DTS. There is no YAO system for tracking and trending weaknesses in the emergency management program. During the past year, the YAO monthly performance summaries have documented a record of continual improvement in the BWXT emergency management program. However, 5 of the past 12 months have been rated as "yellow" (improvement needed), and some emergency management concerns have been documented in the summaries; none of these deficiencies or weaknesses has yet been entered into the YAO issues management tracking system. In general, since YAO emergency management assessments are informal, opportunities for identifying and documenting deficiencies and weaknesses have been missed.

BWXT-identified emergency management concerns are processed through the BWXT issues management program. The core of the BWXT issues management process is the computer-based Corrective Action Planning System (CAPS) and an issues management and prioritization board. The prioritization board provides an effective means for evaluating concerns, utilizing a team of multi-disciplined subject matter experts to review all identified concerns, risk-rank the concerns based on well-established criteria, and determine whether the concerns are deficiencies or weaknesses. Currently, there are 13 emergency management-related open issues in CAPS, 6 of which are identified as deficiencies. Like the BWXT assessment program, the emergency management issues management program is required to satisfy guidance provided in the DOE emergency management guide and utilize the institutional tracking system (i.e., CAPS). In most cases, CAPS is a useful tool for tracking emergency management-related weaknesses and deficiencies, but a few exceptions exist. For example, the prioritization board downgraded a number of deficiencies identified in recent exercises to "weaknesses" in CAPS; the weaknesses did not meet the CAPS deficiency threshold because the DOE emergency management guide and CAPS are inconsistent on the definition of a deficiency. Because deficiencies, but not weaknesses, require corrective action, a number of exercise evaluation observations that could be considered "deficiencies" do not have any required corrective actions.

A variety of emergency management concerns have been identified through assessments, exercise evaluations and drills, inspections, and surveillances. Typically, however, only concerns from self-assessments, exercises, and external assessments are entered into CAPS. Although BWXT emergency management staff recognize a need for tracking and trending other concerns and developed the Critical

Action Tracking System (CATS) for those concerns that would not meet the threshold for entry into CAPS, the system documentation is outdated, and CATS has not been used in over two years. The status of CATS was identified as an issue in the recently completed emergency management self-assessment.

**FINDING: YAO and BWXT corrective action tracking systems are inadequately structured or utilized to ensure that all emergency management deficiencies, weaknesses, and concerns are identified, tracked, trended, and adequately dispositioned, as required by DOE Order 151A.**

The OA inspection team also reviewed corrective actions initiated in response to the emergency management issue identified during the 1998 evaluation. The team's review of the corrective actions found that the identified corrective actions were comprehensive and appropriate, and directly captured most of the concerns identified in 1998. Concerns not directly captured as an issue, such as preparation of a technically defensible emergency planning zone, are embedded in the corrective action for other more fundamental concerns (i.e., "perform hazards assessments"). Of the 44 corrective actions, 2 remain open, and therefore the issue appropriately remains open. Contractor completion of corrective actions was thorough, and corrective actions were aggressively implemented. For example, pursuit of the corrective action on the habitability of the Y-12 emergency control center (ECC) resulted in a study of the habitability of the ECC and technical support center following the onsite releases of hazardous materials. The ECC study formally concluded that construction of a new command center is the only economically sound course of action and is now part of the proposed Y-12 site integrated modernization program. Some corrective actions require ongoing activities, such as "communicate plant hazards to local community medical facilities on a semi-annual basis." These actions are now documented in emergency management procedures, and documentation is available to demonstrate that required actions are being implemented.

### **F.2.3 Lessons Learned**

YAO has an active lessons-learned process, but the process has yet to be formalized through YAO procedures and clearly defined roles and responsibilities. Before October 2001, the YAO industrial safety manager had administered the lessons-learned process, although such responsibilities were not clearly delineated and assigned to him. Lessons-learned bulletins, including emergency management lessons learned, are received by the YAO lessons-learned administrator from BWXT and external agencies and are forwarded to the appropriate YAO staff. YAO corrective actions that are generated in response to lessons-learned bulletins are infrequent and typically consist of general office safety items.

The BWXT emergency management lessons-learned program is a facet of the BWXT institutional-level lessons-learned program, which is well documented, accessed through a user-friendly lessons-learned Web site, and managed by a dedicated lessons-learned program manager. Since 1998, the emergency management program has generated several lessons-learned bulletins and initiated a few related corrective actions. The BWXT emergency management lessons-learned program, however, is minimal. It is supported by only a small fraction of one staff member's time and consists primarily of the review and distribution of lessons-learned bulletins received from the BWXT lessons-learned program manager. The BWXT lessons-learned program and, consequently, the emergency management facet of the program are deficient in several areas. For example, corrective actions from some lessons-learned bulletins reviewed by the inspection team were not clearly identified, nor is there a process for documenting corrective actions taken. There are no training programs for lessons-learned coordinators, and the expected roles and responsibilities of coordinators are not clearly identified in the lessons-learned procedure. In addition, there is no process for trending lessons learned, or assessing the effectiveness of

the distribution of lessons learned or the implementation of corrective actions. The BWXT lessons-learned program manager has identified several of these concerns, and corrective actions are planned.

#### **F.2.4 Performance Metrics**

Before 1998, emergency management was not included as a metric in the contractor's award fee process. YAO management's inclusion of the metric and the development of detailed quantitative award milestones by the YAO emergency management program manager have resulted in considerable improvements in the Y-12 emergency management program. Performance milestones are developed annually, are tailored to current emergency management issues, and require a formal agreement between YAO and BWXT. Both the YAO and BWXT emergency management program managers expend considerable effort in the development and completion of award fee activities. In addition to award fee milestones, BWXT's emergency management progress is also evaluated monthly, and color-coded ratings are documented in the YAO monthly assessment summary.

### **F.3 CONCLUSIONS**

Following the 1998 evaluation, emergency management feedback and improvement activities were limited, in part, because of a significant reduction in emergency management staff levels and a redirection of remaining staff to program development. Staff reductions eliminated support for emergency management issues management and lessons learned. However, existing program deficiencies were readily apparent and widespread, thereby lessening the need for an emergency management assessment program. However, in 1999, a number of positive changes in the emergency management feedback and improvement programs began to emerge and continue today. These changes can be attributed to YAO staff and contractors who are dedicated to improving the Y-12 emergency management program. Although progress in emergency management feedback and improvement programs is evident, BWXT emergency management assessment programs, issues management programs, and lessons-learned programs lack several important elements. The YAO emergency management program manager has been proactively engaged in working with BWXT to improve the Y-12 emergency management program and has developed discrete milestones that BWXT has met. However, some aspects of the YAO emergency management feedback and improvement program lack the formality required by YAO procedures and DOE requirements.

#### **F.4 RATING**

The feedback and continuous improvement programs used by YAO and BWXT are maturing and, with time, should be effective in continuously identifying opportunities for improvement in the Y-12 emergency management program. A rating of SATISFACTORY is therefore assigned.

#### **F.5 OPPORTUNITIES FOR IMPROVEMENT**

This OA inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible National Nuclear Security Administration and contractor line management and prioritized and modified as appropriate, in accordance with site-specific programmatic emergency management objectives.

## **YAO**

- Establish criteria for the assessment of emergency management program elements; perform scheduled programmatic emergency management assessments in accordance with the criteria; and document the results of the assessments in an appropriate report.
- Use existing and alternative corrective action tracking systems to document and track emergency management program weaknesses to better identify positive and adverse performance trends.

## **BWXT**

- Improve the consistency between BWXT management assessment and issues management systems and DOE emergency management program requirements and guidance documents.
- Revise and update the CATS implementing procedure and resume using CATS as a tool for tracking and trending weaknesses and concerns from drills, inspections, and technical document reviews.
- Enhance the BWXT lessons-learned program to include training requirements for coordinators, requirements for documenting the basis and disposition of corrective actions, and a process for assessing the effectiveness of lessons-learned corrective actions.