

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

John E. Mansfield, Vice Chairman  
Joseph F. Bader  
Larry W. Brown  
Peter S. Winokur

625 Indiana Avenue, NW, Suite 700 Washington, D.C. 20004-2901  
(202) 694-7000



March 12, 2010

The Honorable Inés R. Triay  
Assistant Secretary for Environmental Management  
U.S. Department of Energy  
1000 Independence Avenue SW  
Washington, DC 20585-0113

Dear Dr. Triay:

The Defense Nuclear Facilities Safety Board (Board) is concerned the Hanford Tank Operations Contractor, Washington River Protection Solutions, LLC (WRPS), has not adequately institutionalized Integrated Safety Management (ISM) at the activity level. During the past 6 months, the Board's staff has evaluated WRPS through a series of three reviews: (1) observation of a combined Phase I and II Integrated Safety Management System (ISMS) verification conducted by the Department of Energy (DOE), (2) examination of how ISM is implemented at the activity-level to protect workers from hazards, and (3) surveillance of conduct of operations in the tank farms. These reviews identified deficiencies in the contractor's ISMS description and implementation that raise concerns about the contractor's ability to develop work instructions that assist the workforce in ensuring activity-level work is conducted safely.

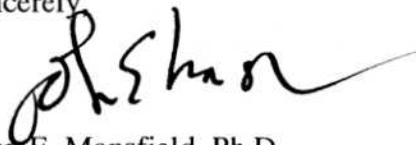
Through these reviews, the staff identified the following deficiencies, details of which are provided in the enclosed report: (1) the DOE ISMS verification was underfunded and did not thoroughly evaluate the completeness of the ISMS description; (2) WRPS's work planning directives are unnecessarily complex and confusing; (3) WRPS's hazard analysis process is not well defined or executed; (4) a team approach to walkdowns, verifications, and hazard analysis is not adequately employed; and (5) a highly skilled workforce modifies work procedures ad hoc when the procedures cannot be performed as written. These deficiencies result in work instructions that cannot be followed as written and incomplete controls for authorized work.

Until recently, DOE's Office of River Protection (ORP) had not been sufficiently involved in the oversight of WRPS's work planning and control. Facility Representatives have been active in the oversight of daily work activities, but ORP has provided little oversight by subject matter experts in this area. A recent effort by ORP to provide adequate oversight of work planning and control has the potential to help WRPS in this critical area. ORP initiatives include the recent hire of a work planning subject matter expert and a letter to the contractor noting significant problems with the development and use of work instructions. In response to these ORP efforts and the staff's reviews, WRPS has implemented revisions to improve work planning and control. Ultimately, the ISMS description will have to be updated before any changes can have real and lasting effect.

DOE-Headquarters should enhance ORP's oversight of work planning and control by providing tools to assist in identifying problems and driving corrective actions. ORP's oversight would benefit from the issuance within the DOE directives system of a technical standard for work planning and control and a guide supporting DOE Order 226.1A, *Implementation of Department of Energy Oversight Policy*. To be effective, this guide would include a Criteria and Review Approach Document for critical work activities. The need for such a technical standard and guide was previously identified in the Board's letter of March 23, 2009, to DOE's Office of Environmental Management regarding work planning for the Idaho Cleanup Project at Idaho National Laboratory. The Board also identified this need in letters to the National Nuclear Security Administration dated January 22, 2009, and December 2, 2009, regarding work planning at the Y-12 National Security Complex and Los Alamos National Laboratory respectively. Despite the previous identification of these needs, insufficient action has been taken by DOE-Headquarters.

Based on the above observations and pursuant to 42 U.S.C. § 2286b(d), the Board requests a report within 90 days of receipt of this letter outlining actions taken or planned by WRPS and ORP to address the work planning and control deficiencies detailed in the enclosed report.

Sincerely,

A handwritten signature in black ink, appearing to read "John E. Mansfield", with a long horizontal flourish extending to the right.

John E. Mansfield, Ph.D.  
Vice Chairman

Enclosure

c: Mr. Glenn S. Podonsky  
Ms. Shirley J. Olinger  
Mr. Mark B. Whitaker, Jr.

## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

### Staff Issue Report

January 25, 2010

**MEMORANDUM FOR:** T. J. Dwyer, Technical Director

**COPIES:** Board Members

**FROM:** R. Verhaagen

**SUBJECT:** Activity-Level Work Planning, Hanford Tank Farms

This report documents a series of reviews conducted by the staff of the Defense Nuclear Facilities Safety Board (Board) of the Hanford Tank Operations Contractor, Washington River Protection Solutions, LLC (WRPS). Three separate reviews were performed: (1) the observation of a combined Phase I and II Integrated Safety Management System (ISMS) verification conducted by the Department of Energy (DOE), (2) the examination of how Integrated Safety Management (ISM) is implemented to protect workers from activity-level work hazards, and (3) the surveillance of conduct of operations in the Tank Farms. Also examined was the effectiveness of DOE's Office of River Protection (ORP) in its oversight of these critical areas. The reviews were conducted by members of the Board's staff R. Verhaagen, J. MacSleyne, S. Lewis, R. Arnold, C. Roscetti, T. Hunt, and R. Quirk, assisted by outside experts D. Volgenau and D. Boyd.

**Observations.** The approach used by DOE to conduct the ISMS verification resulted in a missed opportunity for DOE to improve WRPS's implementation of ISM. The staff's review of work planning and control revealed an incomplete ISM system description, deficiencies in the implementation of the ISMS, and inconsistencies with the core functions of ISM as defined in DOE Policy 450.4, *Safety Management System Policy*. The staff observed instances in which the expectations of DOE's Office of Environmental Management (EM) for planning work, as stated in testimony during a public hearing held by the Board on November 24, 2009, were not being met. The consequences of these deficiencies were directly evident in planning issues observed in the field during reviews of both work planning and conduct of operations.

Specific observations from the staff's reviews are summarized as follows.

**ISMS Verification.** DOE conducted a combined Phase I and II ISMS verification of WRPS in August 2009. An 11-member DOE verification team was charged with conducting this verification in 2 weeks. The staff observed the verification team as they conducted interviews, observed work, and discussed issues in their daily meetings. The staff also interviewed verification team members to determine the level of preparation and effectiveness of their

observations. The report issued by the verification team identified shortfalls in the verification, the most significant of which were as follows:

- Limited resources prevented a pre-visit by the entire verification team for training, development of the review plan, and tailoring of the Criteria and Review Approach Documents.
- Guidance for conducting ISMS verifications in DOE-HDBK-3027-99, *ISMS Verification Team Leader's Handbook*, is outdated and requires significant revision.

The staff agrees with the above observations, but questions the approach the verification team selected to accomplish the verification. The existing guidance states that for a combined verification to be effective, members of the verification team focusing on the implementation portion of the review must understand the implementing mechanisms. The verification team emphasized the evaluation of implementation (Phase II verification) over the review of the adequacy of the procedures, policies, and manuals of practice used to implement ISM (Phase I verification). This approach, likely a direct result of the manpower and time constraints placed on the verification team, is heavily reliant on the ability to link field observations of performance issues back to gaps in the implementing policies and procedures. WRPS has identified a need to move from an expert-based system to a more defined standards-based system. Deficiencies or gaps in the implementing directives and processes are not necessarily revealed through performance-based observations of an experienced workforce. Concerned about the thoroughness of the review of Phase I elements, the Board's staff performed subsequent reviews of work planning and control and conduct of operations.

**Work Planning and Control and Conduct of Operations.** Weaknesses in the current system used to plan and execute work result in less than adequate work instructions to ensure worker safety. The ISMS description does not include a complete description of the processes used to plan and conduct work. Instead, it focuses almost exclusively on the process used for the development of work instructions. It does not clearly describe the processes used to develop technical procedures. It does not include a reference to the directives that are used for developing operational acceptance test plans that can control activity-level work. In addition, there are discrepancies between work planning and control processes in the ISMS description and those in the institutional-level directives. These gaps in the ISMS description result in incomplete instructions for work planning and execution. These incomplete instructions contribute directly to the deficiencies in the implementation of ISM at the activity level that were identified during these reviews by the Board's staff. These deficiencies in the ISMS and their consequences are outlined below according to the core elements of ISM.

*General Work Planning and Control*—In a statement to the Board during a public hearing held on November 24, 2009, Dr. Inés R. Triay, Assistant Secretary for Environmental Management, stated, “EM line management believes worker involvement is fundamental to ensuring safety improvement.... An important example of worker participation is work planning and control; where crafts, engineers, subject matter experts, and others work together to fully identify hazards and effective controls.” Observations by the staff revealed multiple instances in which work planning is conducted in stovepipes and does not fully leverage this team approach.

During the development of technical procedures, worksite hazard analyses and verification walkdowns are performed by single individuals who then pass along their work for others to review. Radiological Control and Industrial Hygiene develop their plans independently of the worksite hazard analysis. This contributes directly to the staff's observations that work packages are not integrated, do not clearly identify all hazards and their controls, and require multiple revisions before they can be successfully performed.

*Define the Scope of Work*—Contractor directives governing operations and maintenance work activities are complicated and poorly written and do not provide complete instructions for work planners and planning teams on how to plan work. Consequently, work planners, supervisors, subject matter experts, and workers have become accustomed to relying primarily on their knowledge and experience instead of trying to comply fully with approved work planning and control directives. Work packages and operating procedures do not clearly delineate the steps to be followed and cannot always be performed as written. The consequences of these deficiencies have been (1) the need for multiple changes to procedures and/or (2) work being accomplished not in strict compliance with the written procedures. For example:

- The staff observed the installation of a densitometer in a double-shell tank. The bolts specified by the engineering drawing could not physically be installed, so workers substituted threaded studs. The drawing specifications were not changed or approved to reflect this substitution, and the bill of materials was not updated. As a result, insufficient material was brought into the field, preventing complete installation of the densitometer.
- The staff observed the removal of a shield plug from a double-shell tank. The procedural steps could not physically be performed in the sequence written. Workers completed the work using their own sequence of steps.
- The procedure used to transfer waste from one tank to another as part of an operational acceptance test was started and stopped numerous times and was significantly changed at least five times for various reasons.

A contributing factor to these observed instances in which work procedures were ostensibly ready for field use and had been fully approved but could not be performed as written is evidence of a verification and validation process that is not fully effective. The staff observed that verification and validation of procedures is normally performed by a single individual. It is not customary for a planning team comprised of representatives from the appropriate disciplines to perform the walkdown for verification together. Not only has this process led to incomplete and inaccurate work instructions, but it is contrary to ORP's Site Action Plan in response to Commitment 23 of the Implementation Plan for the Board's Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*. Identified as an Opportunity for Improvement (WPC-CH2-OFI-2), the action plan states, "Tank farm field work organizations should perform final pre-job walk-downs with the work team prior to work execution as required by the work control procedure."

The Worksite Hazard Analysis (WHA), Job Hazard Analysis (JHA), Safety Plan, and many other important checklists are prescribed for use with the planning directives. How these checklists are actually to be used, who is to complete them (individual and/or team), and when they are to be completed are not clearly articulated. In addition, most of the checklists lack signature blocks or an indication of who completed the form, thus permitting a lack of rigor, informality, and loss of accountability.

*Analyze the Hazards, and Develop and Implement Controls*—The contractor’s ISMS description lists “identify hazards” as a core ISM function instead of “analyze hazards.” This error directly contributes to the inadequate hazard analyses the staff observed. Some work planners and planning teams were not familiar with the hazard analysis tools found in DOE Guide 440.1, *Implementation Guide for Use with 10 CFR Part 851, Worker Safety and Health Programs*. The hazard analysis process credited by the ISMS does not directly apply to the development of technical procedures. To further confuse matters, TFC-ESHQ-S\_SAF-C-02, *Job Hazard Analysis*, directs the preparer of a procedure to perform the JHA and a WHA in accordance with the processes described in two additional procedures, one of which does not address the JHA process and the other of which redirects the preparer back to TFC-ESHQ-S\_SAF-C-02.

The hazard analysis process implemented according to TFC-ESHQ-S\_SAF-C-02 and credited by the ISMS description does not ensure complete identification and analysis of activity-level hazards and specification of controls. As discussed, WRPS uses a WHA checklist to identify worksite hazards and their controls. In addition to the WHA, radiological monitoring plans and industrial hygiene sampling plans are developed to support the work. There is no requirement or formal process to ensure that (1) the processes are coordinated, (2) the specified controls are evaluated and deconflicted, or (3) the specified controls are adequately dispositioned. As a result, no single document is developed that documents all hazards and controls associated with a given work package; therefore, it is not readily ascertainable that all hazards have been identified or that appropriate controls have been implemented. The following are some examples of areas in which the WHA process is inadequate:

- The WHA for a waste transfer from one tank to another does not identify that there are radiological hazards despite the need for a 104-page Radiological Monitoring Plan.
- Multiple WHAs reviewed by the staff list heat stress as a hazard when temperatures at the worksite are well below freezing and cold temperature controls would have been more appropriate. This indicates that hazard analyses are not evaluated for changing conditions prior to authorizing work.
- The WHA for obtaining a sample from a tank has “working with chemical” selected as a hazard with no further description or discussion of the chemical expected to be encountered. The specified controls are vaguely stated as “obtain MSDS [material safety data sheets] and review controls” and “PPE [personal protective equipment].” It is not clear what specific controls are required for what specific hazards.

These weaknesses in the hazard analysis raise additional concern because planning procedures allow high-risk work to be planned as minor work that requires only a WHA to identify hazards and controls.

The process used by WRPS to change technical procedures does not always ensure that potential new hazards introduced by the change have been adequately analyzed. The staff reviewed a procedure for recirculation and transfer of waste between two double-shell tanks that had been changed multiple times, including:

- Changes had been made following the positive determination of an unreviewed safety question.
- Changes were made to incorporate two justifications for continued operations.
- A change had been made that added radiological monitoring steps and altered the Radiological Monitoring Plan.
- Changes had been made that altered valve lineups and pump operating parameters.

Subsequent to these changes, no worksite hazard analysis was conducted, no verification and validation was performed, and not all of the subject matter experts that had approved the initial package were included in the review and approval of the changes. It is not clear whether these deficiencies were due to inadequate instructions for making changes or the procedures for making changes were not followed.

*Perform the Work*—WRPS workers are highly skilled and experienced and are accustomed to procedures that do not work and a less than rigorous change process. As a result, they do not stop when procedures fail to work as written but complete their tasks by applying their experience. This situation was noted by the ISMS verification team and the staff during the ISMS verification. The staff also observed instances of procedural noncompliance during the conduct-of-operations review:

- A Technical Safety Requirement compliance procedure used quarterly to functionally test AW Farm Monitoring and Control System Transfer Leak Detectors could not be performed as written. This is a continuous-use procedure and therefore is required to be performed step by step with the procedure open at the worksite. To complete this functional test, operators performed steps not included in the procedure.
- Contrary to a procedural step requiring immediate notification of the shift manager, a field work supervisor instructed an operator to notify the shift manager of an alarmed level detector after the procedure had been completed. This violation of procedure was corrected by the staff's escort, who is also a qualified senior supervisor watchstander.

- Steps contained in a previously completed work instruction did not include sufficient detail for workers to fill a system expansion tank. Work was suspended for a few hours while the system engineer reviewed system drawings to determine the correct fill location.
- A differential pressure gage was not checked by a worker to verify adequate ventilation as required by a procedure. Instead, only a fan was verified to be running.

*Feedback and Continuous Improvement*—Several external and internal reviews have revealed that this ISM function has been identified as requiring improvement. WRPS has been responsive to outside direction to improve this core function but clearly must expend additional effort to achieve this improvement. As an example of the extent of the deficiencies in this area, a significant lesson learned from the Tank S-102 waste spill in 2007 was that waste transfers should not be conducted at night without adequate lighting. During the staff's review, a waste transfer from one tank to another was conducted at night without adequate lighting. This was a direct result of the lack of instructions in the work package to turn on or to verify adequate lighting before the operation commenced. Feedback and improvement is recognized as a weak area of work planning and control across the DOE complex. WRPS and the DOE complex can be expected to benefit from participation in the ISM and Quality Assurance subgroup of the Energy Facility Contractor's Group as it attempts to tackle this difficult problem.

*DOE Oversight*—Discussions with ORP personnel revealed that they recognize the inadequacy of their oversight and assessment of WRPS in the area of activity-level work planning and control. They have placed a pronounced emphasis on work planning and control and conduct of operations in recent months. This emphasis has included issuing the contractor a letter of concern dated September 28, 2009, regarding its development and use of work instructions. Of note, a concern is more significant than a normal DOE finding for a violation of a requirement, and requires the contractor to identify the root causes.

Until recently, ORP had no staff members dedicated to oversight of activity-level work planning and control for operations and maintenance in the tank farms. ORP's oversight and assessment of WRPS in the work planning and control arena had been focused primarily on the extensive presence of ORP Facility Representatives (FRs), who's primary role is to observe operations. To enhance its knowledge base, ORP recently hired an experienced subject matter expert to help oversee the contractor's activity-level work planning and control at the tank farms and to assist the FRs in this crucial area.

Following these actions by ORP and input following the staff's reviews, WRPS has initiated corrective actions that include significant revisions to the work planning and execution processes. The implementation of these changes, and training on these changes to the work planning teams is expected to be completed in March 2010. The staff agrees that these WRPS and ORP actions are a step in the right direction, but any efforts will be effective only if the contractor's ISMS description is revised to ensure completeness.