DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004
(202) 208-6400

April 14, 1997

The Honorable Alvin L. Alm
Assistant Secretary for Environmental Management
Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585-1000

Dear Mr. Alm:

During your February 27, 1997, briefing to the Defense Nuclear Facilities Safety Board (Board) on Hanford "persistent issues," Department of Energy-Richland Field Office described its actions to improve configuration management at the Hanford Site. In preparation for this briefing, our staff prepared the enclosed report for the Board. It is provided for your review and use. If you have any questions, please do not hesitate to contact me.

Sincerely,

John T. Conway
Chairman

c: The Honorable Tara O'Toole
Mr. Mark B. Whitaker, Jr.
Mr. John Wagoner

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

February 24, 1997

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: P. Gubanc and D. Ogg

SUBJECT: Recent History of Configuration Management Problems at the Hanford Site and Contributing Causes

1. Purpose

This report documents observations made by Defense Nuclear Facilities Safety Board (Board) Hanford Site Representatives P. Gubanc and D. Ogg during the past 12 months regarding Hanford configuration management problems and their contributing causes.

2. Summary

During the past 12 months, a succession of events and near-misses have raised concern about the existing documentation and knowledge basis for the configuration of systems and equipment at Hanford (i.e., "as-built" drawings and labeling for compressed gas, liquid, and electrical systems). In many instances, these systems are associated with Hanford defense nuclear facilities, and in several cases problems have been identified with *newly installed* as well as old systems. Inadequate system knowledge endangers both the workers and the facilities, causes inefficiency in conducting work, and degrades the workforce's confidence in their ability to perform work safely.

There is sufficient evidence to suggest that the configuration management problem at Hanford is site-wide and has systemic contributors that are not being aggressively pursued by the Department of Energy-Richland (DOE-RL) and its contractors in an integrated fashion. Failure to deal with these problems as a collective whole has resulted, and will continue to result, in shallow corrective actions that do not address the root causes. The contributors include weak construction management practices, poor understanding of and compliance with engineering procedures, and a general lack of coordination between DOE-RL and its contractors in dealing with configuration management issues.

3. Background

Many of the existing facilities and systems at Hanford were constructed in the 1950s or earlier, and have since been modified many times, often without the attendant funding and support needed to update drawings, labeling, and maintenance and operating procedures. In some cases, even compliance with basic safety codes (e.g., the National Electric Code) has been neglected. As a result, facility operations and maintenance are conducted in one of three modes:

- All drawings and labels are considered suspect. This results in extensive system walkdowns for even minor operations, which in turn results in frustrated workers and excessive costs.

- Drawings and labels are supplemented by the knowledge of long-tenured employees who know which drawings and labels are or are not reliable. This mode is only as reliable as the quality and continued presence of these key employees. (In the last 2 years, Hanford has reduced its workforce by over 5,000 employees, many of whom took early retirement.) This mode also breeds contempt for written instructions, which the workers know to be incorrect or incomplete.

- Work is conducted with trust in the correctness of drawings and labels. This is often a basic assumption of new or inexperienced employees, including subcontractor workforces. (In the last several years, Hanford has endeavored to "outsource" a variety of services to reduce costs and vitalize the local economy.)

None of the above methods is fully effective at protecting against unknown or mislabeled system configurations. In the last mode listed, the workers may be proceeding at considerable risk because the drawings and labels that are assumed to be accurate are not reliable. The examples cited below illustrate the extent to which these problems are encountered.

4. Discussion

Evidence of a Site-Wide Configuration Management Problem. The following examples demonstrate that inadequate configuration management is a problem that creates hazards for both facility and worker safety across the Hanford Site.

Tank Waste Remediation System (TWRS) 701-A Near-Miss—On June 10, 1996, fans that had supposedly been deenergized started as workers prepared to conduct maintenance. Subsequent review found that construction forces had turned over the project to operations without completing operational testing, as-built drawings, procedures, and adequate labeling, or specifying maintenance requirements.

Pacific Northwest National Laboratory Excavation Near-Miss—On October 16, 1996, a backhoe contacted an energized 440 volt cable during excavation. The as-built drawing showed the cable to be much deeper than was encountered, and did not reflect a recent cable routing modification.

Tank Farm Ventilation Loss—On January 9, 1997, ventilation was lost to the 102-AZ tank (ventilation is used to mitigate the buildup of flammable gases in the headspace). Investigation revealed that the ventilation loop seal had been filled with raw water when the operator improperly repositioned the loop seal fill line valve. The operator thought he was operating an isolation valve that the as-built drawing showed to be in the same cabinet. The isolation valve does not physically exist.

DOE-RL Assessment of Work Completion—DOE-RL Assessment Report AS 96-15, dated October 1996, reviews contractor work controls as related to configuration management. It identifies problems at the K-Basins, the 300 Area Process Sewer, the Plutonium Finishing Plant, and the PUREX facility. The report concludes that these problems indicate weaknesses in processes used by Westinghouse Hanford Company (WHC) for procedure change control, verification of labeling, and verification of the accuracy of as-built drawings. WHC's work processes were adopted essentially unchanged by Fluor-Daniel Hanford (FDH). DOE-RL issued a letter on November 7, 1996, formally requesting FDH to address the concerns cited in the report.

Evidence of Weak Construction Management Practices. When existing systems are modified or new systems are installed, it is essential that the following actions be completed prior to attempting to operate the system: (1) creation or revision of system drawings that depict the as-built condition; (2) labeling of systems and components in accordance with the labeling conventions used by the facility (e.g., RW may mean "raw water" or "radioactive waste"); (3) development and approval of maintenance requirements and procedures; (4) revision of safety documentation to reflect any new hazards that may be introduced and any additional controls for those hazards; (5) development and approval of operating procedures incorporating hazard controls; and (6) testing of the system and its procedures to ensure functionality and adequacy. These responsibilities are often divided between the construction and operations organizations, but they must all be performed before construction can be considered complete. The following examples illustrate that poor construction management practices can manifest themselves as configuration management hazards during operations and maintenance.

TWRS Flammable Gas Sample Truck—In November 1996, a recently modified sampling truck failed the DOE-RL readiness review. A primary criticism was that the safety-class systems had not been controlled to maintain their safety pedigree. A follow-up review by DOE-RL in December 1996 revealed loose parts and fasteners inside the "field-ready" exhauster assembly. The truck was modified by site fabrication services (the same contractor that provides construction services). On January 6, 1997, DOE-RL issued a letter to FDH requesting a broader review of final inspections on nuclear safety-class systems.

Project W-320 Delay—Project W-320 is a $70 million capital project to install the equipment necessary to retrieve waste from tank C-106 and resolve the high-heat safety issue. In December 1996, 1 month after the intended operational start date, the project was delayed 1 year. The TWRS contractor conducted a detailed review to "rebaseline" the project. The contractor's Baseline Change Request for Project W-320, TWR-97-025, dated January 10, 1997, notes that (1) the initial project baseline did not include provision for documenting in the facility configuration drawings any changes to facilities resulting from the project, (2) inadequate configuration control drawings for the AY-102 and C-106 tanks are not being corrected by ongoing projects that are modifying these facilities, (3) the initial baseline schedule did not reflect the content of the project testing and Operational Readiness Review plans, and (4) the test procedures had been released prematurely. There is no reason to believe that other on-site

construction projects are immune to the shortcomings of Project W-320, especially in view of that project's high visibility and capital cost.

DOE-RL Review of Configuration Management for Spent Fuel—A DOE-RL white paper prepared in January 1997 makes the following observations regarding configuration management for the spent nuclear fuel (SNF) program: (1) there is no procedure in place for accomplishing the as-built process for validation of systems and drawings, (2) Assurance Inspectors (AIs) use drawings that may not be sufficiently detailed, and (3) AIs are not planning to conduct the kind of rigorous inspection that is expected. This review was conducted by a DOE-RL employee who has over 20 years of experience in the construction and repair of naval vessels and 7 years of experience in the auditing of Hanford Site work practices.

Construction Inspection—The AI group is the contractor organization that provides oversight of site construction projects, inspects for conformance with design specifications and life safety codes, and ensures that project as-built drawings are accurate and complete. A DOE-RL white paper issued in January 1997 concludes: ". . . the current situation results in the contractual distancing of RL from the AI contractor, lack of specific requirements and expectations for performance of AI, and status quo for a potential conflict of interest within FDNW [Fluor-Daniel Northwest]." FDNW currently provides both construction services and AI for the Hanford Site, and is often tasked to inspect and accept its own work on the government's behalf. A DOE-RL letter dated January 27, 1997, requested the site integrating contractor to demonstrate the independence of the AI function. FDH issued its response on February 14, 1997, and is undergoing DOE-RL review.

Evidence of Poor Understanding of and Compliance with Engineering Procedures. All of the examples cited above include direct or indirect violations of standard engineering practices and procedures that are intended to ensure worker and facility safety. The following examples provide specific instances in which a failure to follow established procedure was the principal cause of the problem.

Falsification of Engineering Documentation—On October 28, 1996, a tank farm engineer forged the "release stamp" (which documents technical review and approval) on an Engineering Change Notice (ECN) for a tank flammable gas monitor heat trace. The engineer did this to expedite a procurement that he considered more important than conforming to engineering procedure. The contractor's quality assurance organization discovered the falsification, and corrective actions were taken. Follow-up review by the tank farms contractor found no other examples of falsified engineering documents.

Electrician Burned by Unexpected 480 Volt Arc—On January 11, 1997, an electrician burned his hand when the supposedly deenergized 480 volt cable he was installing shorted from phase to phase. The site utility contractor's investigation report, dated January 27, 1997, states that the proper electrical drawings were not used for the tagout. Lack of procedural compliance played an important role in the events leading to the injury. Workers failed to follow several

procedures, including work control, lock and tag, and prejob briefing procedures, as well as engineering practices for ECNs.

Evidence of Poor Integration in Dealing with Configuration Management Problems. Configuration management problems at Hanford are recognized to varying degrees within DOE-RL and its contractor organizations. Unfortunately, this attention is diffuse in quality and focus, and does not converge on the common elements of the problems noted above (e.g., the pivotal role of the site's architect engineering/construction management contractor, FDNW). In particular, each of the following DOE-RL offices currently has activities under way with various site contractors:

- *DOE-RL Assistant Manager for Facility Transition*—tasked FDH to demonstrate the adequacy of AI by FDNW.

- *DOE-RL Assistant Manager for Waste Management (AMW)*—informally challenged Duke Engineering Services Hanford to develop a strategy for ensuring adequate as-built drawings for the SNF project; tasked FDH to take corrective action in response to DOE-RL Assessment Report AS 96-15.

- *DOE-RL Assistant Manager for TWRS*—funded Lockheed Martin Hanford Company, through FDH, to reconstitute the project for upgrading TWRS labeling and drawings; is reviewing for approval the Project W-320 baseline change request to correct major shortcomings in construction management in the original project baseline.

- *DOE-RL Director for Environment, Safety, and Health*—informally asked FDH to look into configuration management problems; tasked FDH to develop corrective actions regarding final inspection of nuclear safety systems; with AMW, asked FDH to assess the rigor of engineering procedural compliance and the quality of as-built drawings and labeling.

5. Future Staff Actions

The Board Hanford Site Representatives will continue to monitor this area and report to the Board as appropriate. The Site Representatives consider that additional detailed review by the Board's headquarters staff would be appropriate.