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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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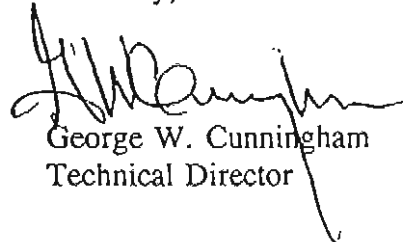
July 5, 1995

Mr. Mark Whitaker, EH-9
Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Mr. Whitaker:

Enclosed for your information and distribution are 20 Defense Nuclear Facilities Safety Board staff reports. The reports have been placed in our Public Reading Room.

Sincerely,



George W. Cunningham
Technical Director

Enclosures (20)

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

April 24, 1995

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: R. Arcaro, Technical Staff

SUBJECT: Review of Implementation of Board Recommendation 92-4 and Hanford Tank Farm Activities

- 1. Purpose:** This report describes a review of Hanford tank farm activities and implementation of Recommendation 92-4. The review was performed on March 21-23, 1995 by R. Arcaro and C. Keilers of the Defense Nuclear Facilities Safety Board's (Board's) technical staff.
- 2. Summary:** The implementation of Board Recommendation 92-4 has been hindered by delay of two significant deliverables: 1) the system requirements review of the Tank Waste Remediation System (TWRS) performed by Department of Energy (DOE) Headquarters team, and 2) the Site-wide Systems Engineering Implementation Plan developed by the DOE-Richland Operations Office (DOE-RL) and Westinghouse Hanford Company (WHC). These two deliverables provide the technical foundation for improvements in the systems engineering of TWRS and the Hanford Site in general.

Improvements in the technical competence of DOE-RL personnel responsible for TWRS are also behind schedule and to date have had no effect.

DOE-RL has concurred with WHC's recommendation to phase out the Multi-function Waste Tank Facility (MWTF) project. Operations without the additional tank space will require strict waste management and close coordination of tank space and waste minimization activities. The decision to phase out the MWTF project may indirectly delay the Cross-site Transfer Line (CSTL) project. The inability to transfer waste from the West Area to the East Area is a current safety issue.

The design review underway for the Tank 106-C Retrieval project is the first independent critical design review to be performed for TWRS projects. Deficiencies noted in the performance of the review, including lack of a formalized closure process, are significant for their impact on future reviews.

3. **Background:** Board Recommendation 92-4 addressed the need for improved technical and managerial competence as well as a rational technical basis for design of the MWTF. DOE's implementation plan includes personnel training commitments to raise the level of competence of personnel at DOE Headquarters, DOE-RL, and WHC responsible for the development of TWRS. It also includes commitments to implement systems engineering in not only the MWTF project but at the Hanford site in general.

4. **Discussion:**

a. Implementation of Recommendation 92-4:

1. TWRS Program Progress: The final report of the headquarters-led review of systems requirements is over two months behind schedule due to the complexity and significance of the review's findings. The review found that the TWRS program baseline is very "assumptive" in nature and that the program poorly manages the risk and uncertainty associated with the assumptions. High level architecture decisions are not firmly based on systems engineering principles or on firm decisions made by headquarters. The program proceeds not only at great financial and programmatic risk but also at some risk to the public and environment from additional delay in remediation of deteriorating high level waste tanks.

Projects continue to be developed despite the lack of an approved technical baseline. This course of action is reasonable if the risk and uncertainty are well understood and appropriate design measures are taken to ensure health and safety requirements are included in development of these projects. However, DOE-RL's and WHC's risk management program has not matured sufficiently to objectively support design of all current projects.

The degree to which the risk and uncertainty are managed varies from project to project. For example, the MWTF project was never fully technically justified and is now being phased out primarily due to budget constraints. In contrast, the Tank Farms Restoration project has continued the systems engineering analysis started by the TWRS organization to a level where project requirements could be developed. This project's systems engineering work appears to have considered the project's life cycle, interfaces with other projects, and flow-down of functions and requirements from the TWRS program. This work shows how systems engineering can be a tool for project development rather than a burdensome paper exercise.

2. **Site Systems Engineering:** The Hanford Site Systems Engineering Implementation Plan is a deliverable required by 92-4. The plan is a critical element of implementation of systems engineering at the site level. This deliverable is over five months behind schedule, although a draft was provided to the Board's staff during this review. The Board's staff believes that the plan is weak in its use of the lessons learned from the systems engineering experience at TWRS. Vital among these lessons is the need for a mechanism by which risk and uncertainty are managed in order to ensure that projects can proceed in the absence of complete information.
3. **Staffing, Training, and Qualification:** Upgrading the technical competence of DOE-RL TWRS personnel is required by the 92-4 Implementation Plan and is planned to be coordinated with similar actions taken in response to Recommendation 93-3. DOE-RL Director of the Office of Training stated his office does not have the funding to implement the site specific initiatives of 93-3 at the site level. Although funded for TWRS activities, the DOE-RL Training Director is reluctant to develop TWRS-specific qualification standards that may ultimately conflict with site level directives. Consequently, progress to date at the TWRS level is poor, and several deliverables are behind schedule.

b. **Tank Farm Activities**

1. **Multi-function Waste Tank Facility:** On January 13, 1995, WHC recommended to DOE-RL that the MWTF project be phased out based on the high project cost and on revised waste volume projections. DOE-RL has concurred with the WHC recommendation to "phase out the project in an orderly manner." The Safe Interim Storage of Tank Waste Environmental Impact Statement (EIS) is being revised to support a preferred alternative to store waste in currently available tanks but maintain the option to build new tanks if necessary.
2. **Cross-site Transfer Line:** A safety issue currently exists in the West Area tank farms independent of the MWTF decision. Hanford presently has no capability to transfer waste from West Area to East Area. DOE-RL and WHC are planning a test of the currently inoperable CSTL in April. If the existing CSTL were to fail its pressure check, DOE-RL reported that it would cease interim stabilization of West Area tanks (saltwell pumping) and reserve the remaining available space to accommodate waste from future leaking tanks. This situation would exist until an alternative method of cross-site transfer becomes available or until the new CSTL is installed (1998).

WHC plans to accelerate the new CSTL but is doubtful of success. The construction of the CSTL is supported by the same EIS that also supports MWTF. The decision to delay MWTF will require DOE-RL and WHC to expand the safety analysis of the EIS to include those actions required to manage the waste volume without additional tanks. Additional delay may be encountered to accommodate design changes required in the absence of MWTF.

3. **Waste Incompatibility:** WHC currently is unable to pump complexant waste within West Area due to waste incompatibility concerns. Plans for emergency pumping of leaking complexant waste in West Area need to be developed. Current emergency pumping plans do not consider the incompatibility issue.
 4. **Tank 101-SY Mixing Pump Reliability:** The decision to phase out the MWTF project hinges on continued active mitigation of Tank 101-SY by use of the mixer pump. The mean time to failure of the mixer pump was reported as eight years. The critical component is lubricating oil which will fail as a result of thermal breakdown. The Board's staff is conducting an independent assessment of the reliability of the mixer pump.
 5. **Tank 106-C Retrieval Critical Design Review:** Retrieval of Tank 106-C is necessary to mitigate the safety issue associated with the tank's high heat waste. The Critical Design Review (CDR) of this project is the first independent design review to be performed for TWRS projects. The following issues indicate that significant improvement is required to ensure the 106-C Retrieval project review and future reviews adequately and objectively evaluate project designs:
 - a. The CDR does not have a formal comment resolution or closure process.
 - b. The initial review was performed without benefit of one-on-one discussions with design engineers.
 - c. The review team appeared not to have full access to all relevant information. In particular, the review team did not have the encasement pipe stress confirmation report done by an independent outside contractor (WHC internal memo 7F820-94-011 dated October 26, 1994).
5. **Future Planned Activities:** The Board staff will continue to follow DOE and WHC progress, including MWTF phase-out plans, the updated waste volume projections, 101-SY mixer pump reliability and replacement plans, and site and TWRS systems engineering.