DEFENSE NUCLEAR FACILITIES SAFETY BOARD

July 29, 1996

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Lester Clemons

SUBJECT: Trip Report - Review of the Occupational Radiation Protection Program for the Caustic Waste Treatment System and Tap & Direct Drain - July 8-11, 1996

1. **Purpose:** This report documents the results of a visit to the Rocky Flats Environmental Technology Site (RFETS), on July 8-11, 1996, to perform a review of the Occupational Radiation Protection Program (ORPP) for startup operations of the Caustic Waste Treatment System (CWTS), including Tap & Direct Drain (T&D) of tanks to feed CWTS, as an integrated system (CWTS/T&D) in Building 371. The review was performed by Lester Clemons, Jay DeLoach, and James Troan of the Defense Nuclear Facilities Safety Board (Board) staff, and outside expert, Dave Boyd.

2. **Summary:** The major elements of the Occupational Radiation Protection Program at Building 371 (B371) to support the CWTS/T&D startup operation are in place. However, the final design of the T&D process and the development of some of the procedures for the CWTS/T&D startup operations have yet to be completed. In addition, the Board staff observed several poor radiological work practices during a walkdown of the CWTS. Site personnel indicated that similar problems had previously been identified by the Department of Energy (DOE) and Price-Anderson Enforcement Actions were in progress. Concurrent with the Board staff observations, managers at the site delayed selected operations until actions to regain improved radiological controls and work practices were achieved.

3. **Background:** The CWTS is being started up to process actinide solutions drained from six tanks and associated piping in B371. The system is expected to start up and operate continuously for about six months to process an estimated 5,600 liters (1,474 gal) of plutonium-bearing nitrate solutions drained from six select tanks. The plutonium concentrations in the solutions range from 0.2 gm Pu/liter to 9.3 gm Pu/liter of solution. After completion of the select tank draining campaign, the CWTS will operate as needed to eliminate residual liquids drained from other tanks and piping in B371 and possibly solutions generated from solid residue processing.

4. **Discussion:** This review of the ORPP was performed in support of the staff's program review to determine the adequacy of the Authorization Basis for startup of the CWTS/T&D solution stabilization program in B371. Radiological controls documented in the Activity Control Envelope (ACE) for T&D and the Integrated Safety Assessment (ISA) for the CWTS were reviewed. The occupational radiation protection program that supports operations at B371 was developed based on the DOE Rule, DOE Order, and select Standards for occupational

radiation protection and control. The DOE Orders and Standards for the ORPP at the RFETS include but are not limited to, 10CFR835, *Occupational Radiation Protection; Final Rule (Rule)*, issued December 13, 1993; the DOE *Radiological Protection Manual (RCM)*, Revision 1, April 1994; DOE Order 5480.11, *Radiation Protection for Occupational Workers*, December 21, 1988, and other radiological standards. Kaiser-Hill (K-H) submitted the ORPP to DOE as required by the Rule. The ORPP (K-H) requires that subcontractors who provide services onsite be contractually required to follow applicable portions of the Site ORPP that implements 10CFR835 and includes waste management and stabilization activities. K-H stated that they had successfully implemented the Rule. However, the DOE Rocky Flats Field Office (DOE/RFFO) Program Assessment has identified program implementation noncompliances for which an Enforcement Conference was planned.

Potential Radiological Hazards/Mitigation Methods: The most probable hazards discussed in the ACE for T&D operations and in the ISA for CWTS operations include: (1) the accidental spill of plutonium-bearing nitric acid solutions and the potential for release of radioactive materials, (2) the loss of glovebox (GB) integrity from a glove failure, and (3) radiation exposure to workers during installation of the T&D tool, frequent walkdown inspections, filter train change outs, and solution sampling during CWTS operations. The potential for internal as well as external exposure to the workers exists for these hazards.

The methods for mitigating these hazards consists of a combination of engineered design controls and administrative controls and procedures. Examples of engineered design controls are: (1) the shielded gloveboxes and process tanks, (2) the B371 ventilation system designed for Zone I (inside gloveboxes) ventilation area, and Zone II (work area outside gloveboxes) ventilation area, and (3) the Selective Alpha Air Monitor (SAAM) system. Fixed air head (FAH) continuous monitors are also installed to monitor low levels of airborne contamination. The administrative controls and procedures include: (1) frequent walkdowns of the CWTS for early detection of small leaks during CWTS operations; (2) the availability of spill control kits and workers trained in their use; and (3) craft workers trained on full-sized mockups for installation of the T&D tool. Workers have been trained to call in the HAZMAT team in the event that a spill puddle exceeds a 2' x 2' area. The staff believes that these hazard mitigation methods, if appropriately implemented, should provide adequate protection of the health and safety of workers during CWTS/T&D operations.

Radiological Controls: The site has experienced problems in the conduct of radiological controls and practices. DOE/RFFO initiated enforcement actions under the Price-Anderson Act focusing the contractor management attention on the problem. During the week of the staff review, the contractor completed two root cause analyses and a corrective action plan regarding radiological control practices. During the course of walking down portions of B371, the Board staff observed two situations where radiological control work practices were out of compliance and deviated from good work practices. At a zone entrance desk the survey maps for the CWTS area were found to be out-of-date by approximately one week, in violation of Article 554 in the DOE RCM. Similar problems with surveys were highlighted in a Board staff trip report dated February 21, 1996, on conduct of operations in B371. Also, a worker

was observed doffing anti-contamination (Anti-C) clothing inside a posted contamination area in order to don a supplied breathing air suit. There was no indication that the area had been designated as a "clean" change area in the radiological control work area. Apparently due to a culmination of these types of events, Safe Sites of Colorado (SSOC) management directed a joint walkdown of all buildings by SSOC building management, and K-H radiological controls supervisors to verify proper conditions were established and surveys were up to date. SSOC also suspended all supplied breathing air jobs until K-H radiological controls personnel verified that adequate requirements for dress out had been implemented.

Radiation Protection Training and Qualification: The CWTS Core Team personnel completed radiation worker training within the required two-year periodicity. Radiological Control Technicians (RCTs) designated to support the CWTS operation were also current in their qualifications. Eleven personnel were interviewed on radiological controls fundamentals and practices, dose limits, and CWTS hazards and protective features. Overall, personnel level of knowledge was marginal with weaknesses identified in the following areas: explanation and application of derived air concentration (DAC), own lifetime and year-to-date accumulated doses, effects of ionizing radiation on the body, characteristics and sources of different types of radiation in the building, radiological hazards from a spill, units of radiation and contamination, airborne radioactivity area limits and posting, and as-low-as-reasonably-achievable (ALARA) goals and good practices.

Contamination Control: While a program appears to be in place, the staff noted that routine surveys, as discussed previously, were not updated in accordance with local procedures. Contamination of site-issued personal clothing contamination purportedly from radon is a common occurrence; however, formal procedures for differentiating between contamination from radon and other alpha emitters do not exist, which could result in situations where personnel contamination could be overlooked. The combination of the use of site-issued personal clothing containing polyester and detection instrumentation with lower levels of detection results is purported as reason for detection of radon contamination.

Dosimetry: The K-H whole body dosimetry system received DOE Laboratory Accreditation Program (DOELAP) accreditation on March 29, 1996. K-H personnel stated that accreditation was given for all DOELAP categories except for flat slab uranium. During a subsequent review of the K-H dosimetry accreditation documentation, Board staff identified that accreditation was not received in other categories (i.e., moderated neutron, select mixed fields). The K-H technical basis document for external dosimetry indicates that radiation fields at the site include various neutron spectra. The Board staff is evaluating the need for personnel neutron dosimetry during CWTS/T&D operations. Radiation workers entering the B371 area to work the CWTS will wear the accredited whole body dosimeter, and personnel working in glove boxes will be required to wear wrist dosimeters.

5. **Future Staff Actions:** The staff will continue to evaluate the program elements of dosimetry and radiological controls including DOE Enforcement Actions under the Price-Anderson Act.

The staff will also observe the ORR for CWTS/T&D operations and will review the ORR findings on radiation protection.