DEFENSE NUCLEAR FACILITIES SAFETY BOARD

January 4, 2002

MEMORANDUM FOR: J. Kent Fortenberry, Technical Director
FROM: R. T. Davis/ T. D. Burns
SUBJECT: SRS Report for Week Ending January 4, 2002

H-Canyon: One of the H-Canyon criticality scenarios involves a leak to the cell floor that evaporates before reaching the sump and results in a significant accumulation of material. The H-Canyon Double Contingency Analysis (DCA) defenses for this scenario include periodic cell flushing and inspection. Because of questions about flush adequacy last fall, WSRC committed to visually observe the next scheduled flush for all cells. Last week, WSRC discovered that only one of the two flush valves have been used for two cells in H-Canyon because of a valve problem for each cell. These valves were tagged as inoperable in 1994. This DCA flush defense, which was implemented in 1996, is not adequate without using both flush valves. Fissile material transfers in these cells have been suspended pending implementation of a response plan for this issue, which includes appropriate flushing of these cells.

When this DCA defense was established, it appears that the readiness assessment process did not adequately verify appropriate implementation of this defense. WSRC reviewed other DCA defenses and identified several other improvements that will be implemented to ensure operability of criticality defenses (e.g., verification of blanks and isolation valves). WSRC is also evaluating whether site-wide procedural changes are necessary to ensure operability of equipment that support DCA defenses.

During the critique, WSRC also identified that seven of the twelve cell flushes that were visually observed (with both flush valves operational) did not result in a complete flush of the cell floor. These cells were dispositioned informally as adequate. DOE-SR and WSRC concluded that a formal acceptance criteria is appropriate. Additional procedural controls during material transfers will be implemented for the seven cells until the criteria is established and implemented.

Evaporator Feed Qualification: In 1999, unexpected solids formation (sodium aluminosilicate (NAS) and sodium di-uranate) in the 2H evaporator raised criticality concerns and resulted in a two year outage. WSRC concluded that the solids formation was due to the mixing of high silica content DWPF recycle waste with high aluminum content Canyon waste prior to feeding to the evaporator. To prevent similar problems in the other evaporators, WSRC has only processed higher silica feed in the 2H evaporator. Co-precipitation of sodium di-uranate is assumed to be due to the NAS formation since sodium di-uranate was present in the evaporator feed prior to the introduction of DWPF recycle and had not previously formed solids.

SRTC research has led to a more thorough understanding of the chemistry associated with NAS formation, and a predictive model for NAS formation based on concentrations of aluminum, silicon, and hydroxyl ions has been developed. Based on this new data, WSRC has submitted a JCO revision to DOE-SR that would allow qualification of feed with high silica content (i.e., DWPF recycle) for concentration in the 2F and 3H evaporator systems. The JCO credits periodic sampling to ensure concentration limits derived from the SRTC predictive model are not exceeded. Periodic visual pot inspections are also required.

The ability to process high silica feed in the 2F and 3H evaporators would add significant operational flexibility to the HLW tank farms. However, the mechanisms associated with co-precipitation of sodium di-uranate are still not well understood. Though the current assumption regarding the dependence of co-precipitation on NAS formation does not appear unreasonable, a conservative path forward should be pursued until it is verified.