

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

November 29, 1994

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Mark T. Sautman

SUBJECT: Savannah River Site - Waste Management Review Trip Report
(October 18-21, 1994)

1. **Purpose:** This report documents a visit by Defense Nuclear Facilities Safety Board (DNFSB) staff to the Savannah River Site (SRS) to review transuranic and low-level waste issues. The review was conducted on October 18-21, 1994, and included DNFSB staff members Steven Stokes and Mark Sautman.
2. **Summary:** During the course of this review, the DNFSB staff noted the following key items:
 - a. Water intrusion in vented drums stored outside will require that over four thousand drums of transuranic waste be dewatered and repacked. The order of the dewatering is based on potential for spillage rather than possible hydrogen buildup. The staff is also concerned with the accuracy of assay data in the waste database and the potential for accidental use of inaccurate data.
 - b. Certification of SRS low-level waste (LLW) generators in compliance with Department of Energy (DOE) Order 5820.2A, *Radioactive Waste Management*, is proceeding as currently scheduled with the final generators being certified in March 1995.
 - c. The Low Activity Vault has begun operations with the receipt of waste in September 1994. The Department of Energy's Office of Environmental Management (DOE-EM) has required that an addendum to the existing E-Area Vault (EAV) performance assessment be completed that incorporates the dose from the existing burial grounds which is associated with that from the EAVs. This analysis is scheduled for completion in April 1995.
 - d. Closure of the existing LLW burial grounds is progressing in accordance with both the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Current activities are related to characterization of groundwater and soil to determine if remedial activities are necessary. Complete closure is not scheduled until after a Record-of-Decision which is scheduled for mid-1999.

- e. Review of the certification status of In-Tank-Precipitation (ITP) revealed that although they are on schedule to be certified, they currently do not have written waste characterization or certification plans which are required to meet the DOE Order. Until ITP waste streams are certified, ITP waste operations will continue to use procedures from other tank farms that are applicable to ITP waste generation activities. In addition, ITP continues to comply with the current compliance schedule agreement (CSA) related to this deficiency.
3. **Background:** The SRS buried transuranic (TRU) waste on-site until 1974. This waste is considered to be disposed and is currently part of the Environmental Restoration Program. Since 1974, TRU waste has been retrievably stored for eventual shipment to the Waste Isolation Pilot Plant (WIPP). Containers of TRU waste are stored above-grade under soil covers (pads 1 - 6), uncovered (pads 7 - 13), or under fabric enclosures (pads 14 - 17). While SRS has only 8.5 percent of the total volume of contact handled TRU in the defense complex, it contains nearly 60 percent of the total alpha activity because of the large amount of Pu-238 present. The waste is primarily job control waste, such as paper, plastic, and clothing, and is packaged in 55-gallon drums or carbon steel boxes. The boxes and drums on pads 7 - 19 are installed with carbon composite filters to allow gasses to escape. Although the drums on pads 1-6 do not have vent filters, they are equipped with permeable gaskets. Concrete culverts are used to store drums of higher activity waste.

Historically, the SRS has used shallow land burial to dispose of low-level waste. The E-Area Burial Grounds, which have operated since 1953, have accumulated over 600,000 cubic meters of waste, excluding mixed waste, and have reached nearly 99 percent of their capacity. SRS has constructed the E-Area Vaults, a greater confinement disposal system, to replace the Burial Grounds.

4. **Discussion:**

- a. Transuranic Waste (TRU) Management:

1. Water Intrusion in Filter Vents: In 1987, WIPP informed SRS that water could enter drums through the carbon composite filter when the filter and drum lid were covered with water. Water intrusion accelerated corrosion of the drums, reducing the estimated lifetime of the drums to between four and seven years. In addition, filter vent corrosion can reduce the amount of hydrogen diffusing through the vent by up to 85 percent. SRS responded by visually inspecting and X-raying over 10,000 drums that were stored uncovered. Forty-four hundred drums were found to contain up to two gallons of water (waste acceptance criteria is 0.55 gallons) and 40 percent of the filter vents showed corrosion. Five drums were breached, but these did not result in any environmental contamination.

Drums containing water are being stored outside until they can be dewatered and repacked. Sixty percent of the wet drums have been dewatered so far, with the remainder to be completed by March 1995. The dry drums were moved to covered storage. The drum dewatering schedule is prioritized according to the potential for spills during drum handling and doing the easiest first. The DNFSB staff believes that dewatering the drums exhibiting the most severe filter corrosion could prevent further possible accumulation of hydrogen because of partially clogged filters and radiolysis of water.

2. FB-Line Assays and TRU Waste Database: In 1985, the FB-line assay system was found to be biased low by 43 percent on average. This mostly affected assays for drums with more than ten grams of Pu. In addition, waste assay values were incorrectly calculated between 1987 and 1992, resulting in a 6 to 12 percent error per waste cut. Several assay assessments and criticality reviews were performed after each incident to determine the root causes and any impacts to safety. Although the TRU Waste Program personnel were informed of the corrected assay values, the SRS waste database has not been revised. SRS personnel stated that the corrected data were instead placed into a new database to avoid overestimating their inventory. Furthermore, the incorrect data were provided to DOE for use in its Integrated Database and these data have not been corrected. Although SRS personnel stated that the incorrect data were not used in any safety evaluations, the DNFSB staff is concerned that the existence of multiple databases with different activities could allow this to occur. As a result of DNFSB staff inquiries, SRS is currently preparing a recommendation to DOE-SR regarding updating its database.
3. TRU Retrieval Projects: SRS is planning to start retrieving in mid-1998 nearly nine thousand 55-gallon drums from pads 2 - 6 that are in direct contact with the soil. Each drum will be overpacked and then stored under cover until WIPP is ready. SRS wants to retrieve the drums because postponement of retrieval could worsen the condition of the drums. These drums contain low-activity waste and were placed under soil cover between 1974 and 1985.

The drums to be retrieved have permeable gaskets. Past experiments by SRS on similar drums found that hydrogen concentrations in the headspace gas periodically cross into the explosive range. Oxygen concentrations, however, dropped to under 5 percent within a year of waste emplacement in the drum. During retrieval, the drums will be assumed to contain an explosive concentration of hydrogen. Inside of a glovebox, the drums will be vented with a non-sparking drill bit and the headspaces will be purged of any hydrogen. The DNFSB staff believes that the ability of this glovebox process to safely vent and purge potentially explosive drums will be essential to worker safety. The drums will also be overpacked to

prevent the spread of contamination. Experimental drum corrosion results, however, indicate that buried drums are expected to have maintained their integrity, although the drums could fail if dropped.

b. Low-Level Waste (LLW) Management:

1. Waste Certification: Compliance with DOE Order 5820.2A LLW requirements concerning waste certification have been a significant problem at the Savannah River Site. At the time of the last DNFSB staff waste management review at SRS, only one generator, the Replacement Tritium Facility, had developed an adequate waste certification program. Fortunately, some improvement has been made in the number of generators with approved waste certifications. At the time of this review, seventeen out of the 46 total generators at SRS have been certified and the remaining generators are on schedule to be certified by March 1995.
2. Performance Assessments (PA): During the last DNFSB staff waste management review, concern over the lack of a PA for the old burial grounds and, thereby, the lack of compliance with DOE Order 5820.2A, resulted in the generation of a compliance schedule agreement related to this topic. This document has since been approved by DOE headquarters. DOE's approach is to compensate for the deficiency by: (1) limiting the amount of waste placed into the burial grounds until the opening of the new E-Area Vaults (EAV); (2) perform a formal risk assessment and remedial investigation for the burial ground complex to determine remedial action and closure needs [note: these studies are done under both Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authority due to different regulatory status of several units within the burial ground complex], and; (3) complete an addendum to the existing EAV PA that incorporates the dose from the existing burial grounds which is associated with that from the EAVs. However, this addendum will not address the entire source term of the burial ground complex. The analysis will include only the component of dose from burial grounds that overlaps with the EAV's in space and time. Additionally, the performance objectives and requirements of DOE Order 5820.2A will be included in the "To-Be-Considered" category as Applicable or Relevant and Appropriate Requirements (ARARs) under the CERCLA closure for the existing burial grounds.
3. E-Area Vaults: The Low Activity Vault recently began operations subsequent to the DOE authorized start-up in September 1994. Full operation of the EAVs will begin with the completion of all generator certifications (scheduled for 3/95).

- c. CERCLA: As mentioned above, closure of the existing burial grounds will be completed under authority of RCRA and CERCLA. The following activities represent key components of the technical assessment leading to facility closure: (1) site characterization activities (initiated in August 1994 and continuing into early 1997); (2) a RCRA facility investigation and CERCLA remedial investigation and treatability studies are scheduled for completion in mid-1998; (3) the corrective measures study/feasibility study is scheduled for completion in late-1998, and; (4) the proposed plan with resulting Record-of-Decision is scheduled for completion in mid-1999.

SRS has developed a very preliminary model for the closure of the burial ground complex. This model consists of placing clay caps on all existing burial units and the development of a network of groundwater monitoring wells and soil borings to monitor the movement of radionuclides and hazardous components. The network of monitoring wells and soil borings would be required to be fully operational into the future. Additionally, the technical basis behind the Record-of-Decision would be revisited every 5 years to determine if additional action is required. Some key assumptions behind this preliminary model are the land use for the site (industrial use rather than residential) and the location of exposed individuals for the risk assessment. Due to the nature of the RCRA/CERCLA process, significant modification of this preliminary model may occur due to public and regulator involvement.

- d. In-Tank-Precipitation (ITP). A review of ITP's compliance with the waste characterization and certification requirements of DOE Order 5820.2A was completed. ITP does not have approved waste characterization or certification programs and is not scheduled to be fully compliant with DOE Order 5820.2A until March 1995. However, ITP does operate in the manner prescribed by the existing compliance schedule agreement related to waste certification. Fortunately, the waste forms generated at ITP are virtually identical to other tank farm wastes and ITP uses procedures for waste characterization and handling that are identical to those that have been through the certification process for the other tank farms. ITP personnel stated that plans for waste characterization and certification were currently being drafted and are on schedule to support the certification schedule mentioned above. These documents have been requested by the DNFSB staff for review.
5. **Future Staff Actions:** Follow up staff activities will focus on the implementation of Recommendation 94-2, the safety aspects of TRU waste retrieval, the updating of the TRU waste database, closure of the existing burial grounds, and the performance assessment for the E-Area Vaults.