DEFENSE NUCLEAR FACILITIES SAFETY BOARD

October 22, 1993

MEMORANDUM FOR: G. W. Cunningham

COPIES: Board Members

FROM: A. De La Paz

SUBJECT: Savannah River Site - Review of Preparations for the Decontamination and Decommissioning (D&D) of the Separations Equipment Development (SED) Facility and R-Reactor

1. **Purpose:** This memorandum provides the Defense Nuclear Facilities Safety Board (DNFSB) staff comments resulting from a review of the preparations for the decontamination and decommissioning (D&D) of the Separations Equipment Development (SED) facility within the Savannah River Technology Center (SRTC) and R-Reactor. The review was conducted on June 1-3, 1993, by A. De La Paz, H. Massie, and S. Stokes.

2. **Summary:** Due to the calculated risk to on-site workers and to the public, the Department of Energy Savannah River Operations Office (DOE-SR) and the Westinghouse Savannah River Company (WSRC) are attempting to complete the D&D of the SED Facility by 1996. The critical path is currently the need to characterize the location and form of ^{239}Pu in the SED facility. The lack of both funding and a well-planned systems approach has the potential to delay the project.

   Regarding the D&D of the R-Reactor, the DNFSB staff notes that the D&D efforts are in the early preplanning stages. No driving force currently exists to actually D&D the facility. The R-Reactor has been shut down since 1964.

   The waste management activities associated with the D&D of both the SED Facility and R-Reactor do not yet exist. DNFSB staff concerns include: (1) lack of an integrated plan for waste disposal and (2) lack of characterization data.

3. **Background:** The SED facilities are laboratory facilities which processed isotopes of plutonium and uranium and tested plant-scale prototype units. These facilities are located in Building 773-A in the main administration area. Six of the prototype units remain in place. Construction of the SED facilities was completed in 1971. All prototype units were shut down by 1978. These units have remained essentially unchanged since that time. The units are suspected to contain significant quantities of ^{239}Pu. The initial phase of the D&D project will include removal of portions of the prototype units in order to use far-field gamma ray measurement techniques to more accurately assay the quantity and location of the plutonium, and subsequently store these units safely until disposition of the material. The Office of Environmental Restoration within the

Department of Energy (DOE) Office of Environmental Restoration and Waste Management (EM-40) is the headquarters office responsible for the D&D of the SED facility.

The SED facility waste management requirements are associated with the decontamination and disposal of contaminated equipment (glove boxes and separations equipment). The equipment is considered to be contaminated with transuranics (TRU) and will therefore require disposal pursuant to existing TRU waste handling procedures.

The R-Reactor was shut down in 1964. In the time since then, many of the reactor system components have been scavenged for use at the other Savannah River Site (SRS) reactors. Minimal resources have been applied on actual planning efforts for D&D. The environmental restoration of the R-Reactor seepage basins contaminated in 1957 by a melted fuel assembly present several unique safety issues. These are associated with the removal of relatively large amounts of fission products that are tightly bound to the soil and deposited over a relatively small area.

4. **Discussion:** This section details specific DNFSB staff comments related to the SED facility and R-Reactor D&D Programs.

   a. SED Facility:

      1. The SRTC (which the SED is a part of) does not have and never had a DOE-approved authorization basis. DOE Order 5480.21, *Unreviewed Safety Questions*, defines the authorization basis as "those aspects of the facility design basis and operational requirements relied upon by DOE to authorize operation." Section 9.a.(8) of the order requires that each program secretarial office (PSO) "establish the authorization level for each facility under their responsibility." Documentation provided subsequent to the meeting indicates that DOE-SR has, with a few exceptions, this authority. DOE-SR considers the draft Safety Analysis Report (SAR), draft Operational Safety Requirements (OSRs), and the draft Basis for Continued Operation (BCO) as the authorization basis for the facility. On July 7, 1993, DOE-SR directed that the SRTC draft SARs and OSRs be "marked approved for interim use" and SRTC "continue operation" subject to these draft documents, along with "additional constraints." DOE-SR also directed that WSRC prepare a "basis for interim operation" (BIO) document per the requirements of DOE Order 5480.23, *Nuclear Safety Analysis Reports*, by November of this year. The DNFSB staff noted that DOE-SR and WSRC stated that the draft SARs and OSRs were submitted to DOE-SR in September 1992. Yet, the DNFSB staff were informed that no formal comments have been provided to WSRC by DOE-SR on these documents.

      2. The DNFSB staff toured the SED facility areas. There was evidence in the facility that the areas were not ready to commence D&D operations. Examples include the fact that at least two of the supply filters for a glove box were heavily loaded and

damaged. This particular glove box is suspected of containing gram quantities (approximately 30 grams) of ^{239}Pu. The supply filters separate glove box air from the room air. In addition, the DNFSB staff noted that the last posted calibration for a continuous air monitor was from the late 1980s and thus did not appear to be current. Also, there appeared to be no local alarm annunciator to notify personnel to evacuate the room in the event of the presence of airborne contamination.

3. WSRC has performed an unreviewed safety question evaluation (USQE) for the removal of the six SED facility prototype units for assay and interim storage. This USQE (per the WSRC 11Q Manual) is an abbreviated version of the process as described in Attachment IV-I to DOE Order 5480.21. The process being used can lead to a less thorough review for a USQE.

4. The SRTC SAR and SED Risk Assessment assume that the maximum off-site dose receptor is located at the site boundary which is approximately one-half mile from the SRTC. However, there are no restrictions to the public to drive up adjacent to the SRTC. The DNFSB staff believes that the "maximum off-site individual" (MOI) would be more appropriately located in the parking lot adjacent to the F-Wing of the SRTC. It is also important to note that full time occupancy is not an issue since the dose to the MOI are of two-hour duration only.

5. One of the key assumptions of the SED unit removal criticality safety evaluations is that the plutonium is strongly bound to the alumina spheres in the units. Removal and inspection of a unit in the past indicated that this was the case. However, there appears to be no formal documentation of this inspection. Such documentation would aid in forming a strong basis for this assumption which is used in the criticality safety evaluation.

6. The waste management activities necessary to support D&D of this facility are not yet established. Based upon the schedule provided and the knowledge that no planning has been performed beyond the project's first phase, and prior to the selection of the preferred disposal alternative, it is difficult to demonstrate that a systematic approach to waste management is being applied. Waste characterization is currently underway and consists of assaying process equipment to determine plutonium content. The results of the assay program will determine waste management requirements.

7. The standards program for the SED D&D project seemed inadequate. No guidance seemed to be provided by EM-40 on standards for D&D of nuclear facilities. However, WSRC appears to be moving forward in developing standards applicable to the SED D&D project.

8. In response to questions from the DNFSB staff regarding the As Low As Reasonable Achievable (ALARA) program, WSRC stated that the WSRC ALARA committee

would be reviewing the work packages and procedures for the SED characterization work. Review of the work packages and procedures *after* they are prepared is not in accordance with good ALARA practice. It is important to note that subcontractors also prepare work packages and procedures.

9. The risk assessment for the removal, assay, and storage of the units states that a fire is not a credible risk. The risk assessment states that the facility has no "collection" of combustibles. Also, equipment brought in will be kept under control and precautions taken to prevent a fire. These statements appear to be based solely on qualitative arguments and not on a detailed hazards assessment.

b. R-Reactor:

1. The waste management requirements for the R-Reactor and the other reactors are not fully defined. Several key programs have recently been identified that are required to adequately manage wastes. Foremost among these are the management of cadmium safety rods, lead, underground storage tanks, resin beds, waste water derived from leakage into contaminated spaces due to deteriorating facilities, and highly radioactive reactor components.

2. During the R-Reactor tour, the DNFSB staff noted that a large equipment storage site has been established behind the R-Reactor. This site contained trailers full of equipment stored in a haphazard manner. Since the area was marked as a radiation area, inquiries were made as to the inventory of equipment and the surveys performed to clear the equipment for storage. The nature of the storage, either in open air or in poorly contained packages, precludes long-term storage if this equipment is to be maintained in a serviceable manner. This suggests that the materials may be waste or excess material rather than useful material.

3. The DNFSB staff noted that D&D planning had only recently started for the SRS reactors. It was stated by WSRC that no regulatory driving force exists to complete the D&D of any of the reactors. However, DOE-SR and WSRC are beginning planning efforts for the transition of the reactors to D&D. In addition, DOE-SR has made significant progress in determining the standards available for D&D of reactors.

4. The DNFSB staff learned that the radiation levels of the R-reactor tank are estimated to be around 325 rad/hour. Little work appears to have been accomplished by DOE-SR and WSRC in characterizing the source term of the reactor tank. WSRC subsequently indicated that they estimated that approximately 32,000 Curies of ^{60}Co were in the reactor tank stainless steel. There appears to be little information for other potential radionuclides. A complete radionuclide characterization of the reactor tank is necessary to be able to fully assess the preferred disposal alternative.

5. **Future Staff Actions:** The DNFSB staff will continue to review developments in DOE's execution of the SRS SED and Reactors D&D programs as they occur and consistent with the DNFSB's direction and priorities.