DEFENSE NUCLEAR FACILITIES SAFETY BOARD

May 4, 1994

MEMORANDUM FOR: G.W. Cunningham, Technical Director

COPIES: Board Members

FROM: Dominic S. Napolitano

SUBJECT: Los Alamos National Laboratory - Low-Level Waste Management Review Trip Report (April 11-14, 1994)

1. **Purpose:** This report documents the Defense Nuclear Facilities Safety Board (DNFSB) staff's (M. Helfrich, A. Jordan, J. McConnell, D. Napolitano, and S. Stokes) observations regarding the Los Alamos National Laboratory's (LANL) management of low-level radioactive waste.

2. **Summary:** The low-level waste requirements of DOE Order 5820.2A, *Radioactive Waste Management*, are general and allow contractors to define the specifics of Order implementation. Additionally, this Order does not require contractors to meet commercial standards as specified in 10 CFR 61 and applicable Nuclear Regulatory Commission (NRC) Branch Technical Positions. This situation deviates from DOE's policy as given in SEN-35-91, *Nuclear Safety Policy*, which states, in part: "Adherence to appropriate national and international standards in the design, construction, operation, and decommissioning of DOE's nuclear facilities and activities is necessary for the successful implementation of the Department's nuclear safety policy." In view of this, LANL's implementation of Order 5820.2A lacks the use of pertinent commercial standards in the areas of design and operation.

   In addition, Order 5820.2A, as interpreted by DOE-EM, does not require LANL and other DOE sites to account for waste buried prior to 1988 when assessing a disposal facility's radiological impact. Since pre-1988 waste is a potentially significant contributor to public dose, the DNFSB staff believes that by disregarding its effect, it is not possible to assess the true long-term health consequences of a disposal facility.

   The group responsible for operations of the waste disposal facility at LANL has recently undergone changes in management, and appears to be in the process of developing a program to meet current DOE Order requirements. In addition, the new management has informally incorporated several commercial requirements into its program regarding the emplacement of waste and is considering the adoption of some commercial practices into its Waste Acceptance Criteria. However, the low-level radioactive waste management program at LANL is not currently in compliance with the requirements of

Department of Energy (DOE) Order 5820.2A, and there is no firm schedule for achieving compliance. In particular, the Performance Assessment appears to be far from issuance, a situation which may delay any needed engineered modifications, and the requirements for a waste certification program have not been met.

3. **Background:** The Los Alamos National Laboratory disposes of its low-level waste via shallow land burial. The disposal site is located in Technical Area-54 (TA-54), which is adjacent to the site boundary. At present there are two operating radioactive waste disposal trenches, and construction of more trenches is planned in the near future.

4. **Discussion:** The following text highlights the significant observations made by the DNFSB staff.

   a. Performance Assessment - A Performance Assessment (PA) is a comprehensive report which estimates the dose consequences of low-level waste disposal. It is required by DOE Order 5820.2A, and is used not only to show compliance with public health and safety requirements but also to develop engineered modifications and waste acceptance criteria for a disposal site. At present, LANL's Performance Assessment accounts for only a fraction of its buried waste in its source term. DOE-Albuquerque has given guidance to the Lab stating that as it interprets the Order, only waste buried after 1988 (the year of Order issuance) must be considered. Subsequent discussions with the chairman of DOE's Performance Assessment Peer Review Panel (the organization responsible for technical approving a PA) confirmed that this is the guideline under which the Panel and DOE have operated complex wide.

   Using the *Integrated Data Base for 1991* and information provided by LANL CST-7, the percentage of the source term considered in the PA can be estimated. LANL has been disposing of radioactive waste since 1944. Between 1944-1988 LANL disposed of about 1,068,600 curies of waste. Compared to the 89,000 curies disposed of between 1988 and the present, LANL's performance assessment will consider less than 7.3% of its undecayed source term (approximately 20% on a decayed basis assuming typical DOE waste). Since past waste disposal practices at LANL and other sites were generally less stringent than present standards, and since its pre-1988 source term is much larger than that of post-1988 operations, the pre-1988 waste has a greater potential for radiological impact. Thus, the DNFSB staff believes it is not possible to demonstrate that long-term health effects of the entire disposal system will meet the public health criteria of Order 5820.2A without considering the complete source term.

   LANL's Performance Assessment is still far from issuance. Work began on the

document in 1988 and its timely completion has suffered from employee and management turnover, funding problems, and difficulties in the selection of an appropriate groundwater model. A draft PA is scheduled to be delivered in June 1994 to LANL's Waste Management Group for internal review. This extended schedule considerably delays incorporation of PA ramifications into the waste acceptance criteria and any necessary engineered modifications.

b. Waste Characterization/Certification - LANL's waste characterization program is largely driven by Resource Conservation and Recovery Act requirements and disposal space conservation. Waste generators provide information concerning chemical and radionuclide content, volume, mass, and compactiblity. LANL does not require any information on the physical stability of waste packages as is expected at commercial facilities. Commercial standards, 10 CFR 61, state that certain wastes must maintain physical stability, the specifics of which (compressibility, thermal resistance, radiation resistance, etc.) are presented in the NRC Branch Technical Position on Waste Form. Without this data, it is difficult to determine if waste packages will degrade causing disposal unit subsidence and allowing leaching of long-lived radionuclides.

LANL's waste certification program does not meet the requirements of DOE Order 5820.2A, which states that both generators and disposers are responsible for assuring compliance with waste acceptance criteria. The Order tasks disposers to perform periodic audits of generator certification practices. At present, LANL does not have an auditing program and instead relies on a declaration signed by a generator which states that he is in compliance with the waste acceptance criteria.

c. Site Suitability and Design - LANL's low-level waste disposal program hinges largely on the concept that the hydrogeology of the area essentially precludes groundwater contamination, because the dominant geologic formation, tuff, has a very low permeability and moisture content. Additionally, there is a large vertical distance, approximately 1000 feet, between the bottom of a disposal pit and the water table. However, groundwater contamination may not be the primary concern for LANL. The disposal site is located on a narrow mesa top and trenches are constructed such that their walls can be 50 feet from the mesa's edge. Thus, horizontal movement of leachates could lead to weeping through the canyon walls. This is particularly pertinent since the mesa is adjacent to the site boundary. The Performance Assessment is the appropriate vehicle in which to address this issue.

Presently there are two open low-level waste trenches at LANL. One (opened in 1994) is dedicated to receiving the equivalent of NRC Class C waste (those waste

packages with large concentrations of long-lived radionuclides), and the other (opened in 1990) receives the remainder of the waste. The trenches are approximately 60' x 80' x 700'. These trenches are unlined and their floors are sloped to a French drain. The infiltration covers are minimal, consisting of only 3 feet of crushed tuff beneath 0.5 feet of soil, and unlike commercial disposers, LANL does not mound its cover materials. The NRC Branch Technical Position on Design and Operation of Low-Level Waste Facilities, states that "the cover should be mounded to facilitate drainage..." LANL facility management stated that since there is no evidence that infiltration has historically been a problem, mounding covers would contribute little. However, LANL has had difficulty reaching a consensus on a model to describe rates of infiltration and transport of radionuclides in the tuff. As such, LANL's less conservative practices presently lack a theoretical basis.

d. Operations - The present facility management has incorporated some elements of commercial practice into operations. Specifically, LANL uses the NRC definition of Class C waste to determine emplacement requirements. If a waste package is Class C (presently about 3% of LANL's low-level waste), it is segregated from the other waste and placed at a depth of 5 meters below grade as is required by 10 CFR 61 for commercial disposers. This recent use of commercial standards is encouraging, but it has not been incorporated into the standard operating procedures. After discussions with the DNFSB staff, the facility management indicated that it would be wise to formalize these practices.

LANL's emplacement of waste deviates significantly from commercial standards with regard to waste compaction. Most disposers compact waste, then repackage it, and then dispose of it. In contrast, after LANL stacks its waste in the trench, it uses a bulldozer to compact the waste in place. This practice deforms the waste package and thus does not meet standards for commercial disposal. The NRC states, in 10 CFR 61, that "waste must be emplaced in a manner that maintains package integrity during emplacement..." The NRC Branch Technical Position on Design and Operation of Low-Level Waste Disposal Facilities also states that, "it is the staff's position that improper waste handling and random waste placement are inconsistent with the goals of 10 CFR 61."

5. **Future Staff Actions:** The DNFSB staff intends follow waste management activities at LANL closely, particularly examining the emplacement of high specific activity low-level waste, the risks of stored transuranic waste retrieval, and the development of LANL's performance assessment.