DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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November 15, 1994

The Honorable Thomas P. Grumbly
Assistant Secretary for Environmental Management
Department of Energy
Washington, DC 20585

Dear Mr. Grumbly:

Enclosed for your information and use is a report issued by our staff concerning the management of low level radioactive waste at the Idaho National Engineering Laboratory.

Mr. Wallace Kornack of the Defense Nuclear Facilities Safety Board Staff will be available to provide any additional information you may require.

Sincerely,

John T. Conway
Chairman

c: The Honorable Tara O'Toole, EH-1
Mr. John Wilcynski, ID Operations Office
Ms. Jill Lytle, EM-30
Mr. Mark Whitaker, EH-6

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

September 13, 1994

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Steven Stokes

SUBJECT: Trip Report - Review of Transuranic and Low-Level Waste Management at the Idaho National Engineering Laboratory, August 1-4, 1994

1. **Purpose:** This report documents a visit by the Defense Nuclear Facilities Safety Board (DNFSB) Staff (Dominic Napolitano, Mark Sautman, and Steven Stokes) to the Idaho National Engineering Laboratory (INEL) on August 1-4, 1994, to review management of transuranic and low-level waste.

2. **Summary:** Transuranic (TRU) waste and low-level waste (LLW) practices at the Radioactive Waste Management Complex (RWMC) were reviewed to determine potential safety issues associated with the retrieval of TRU waste from above ground earthen covered storage, the Pit 9 remediation demonstration project, and existing low-level waste practices.

   The condition of waste packages in Pit 9 is not expected to be good due to the emplacement practices used in the late 1960's, and the length of time that the packages have been in the ground. Therefore, significant levels of environmental contamination are believed to exist. Recovery operations will be technically challenging and have the potential to be dose intensive if the proper design, training, and work planning activities are not performed adequately. Department of Energy-Idaho (DOE-ID) believes that the completion and subsequent review of the safety analysis report and operational readiness activities will establish the DOE's ability to ensure this facility can be safely remediated.

   The draft performance assessment (PA) completed by Department of Energy-Idaho (DOE-ID) for the RWMC demonstrates compliance with performance objectives contained in DOE Order 5820.2A, *Radioactive Waste Management*. However, the sensitivity analysis performed in the PA identifies the potential for exceeding the performance objectives. Since this sensitivity analysis does not account for radionuclides emplaced before 1984, the dose estimates may even be less conservative than those reported in the draft PA.

The cessation of operations at the Waste Experimental Reduction Facility (WERF), while allowing for continued waste generation, has resulted in large backlogs of LLW awaiting treatment. Significant amounts of waste are currently stored outdoors with minimal protection from the environment. The DNFSB Staff believes that initiation of properly conducted compaction and size reduction operations could considerably reduce the potential for environmental contamination.

3. **Background:** INEL's waste management activities are focused at the RWMC. RWMC operations, primarily land burial of radioactive wastes, were initiated in 1952 and continue to the present day. Current RWMC activities are focused on: (1) the continued storage and retrieval of TRU wastes; (2) preparation of TRU waste for permanent disposal at the Waste Isolation Pilot Plant (WIPP); (3) treatment and disposal of LLW and mixed-LLW; and (4) resolution of disposal issues associated with greater than class-C wastes and other wastes not suitable for shallow land burial or disposal at WIPP.

4. **Discussion/Observations:**

a. Transuranic Waste (TRU) Management:

TRU program scope. The scope of the TRU waste program at INEL, relative to other DOE Sites, is enormous. The current estimate of the contact-handled TRU (CH-TRU) waste inventory stored at all DOE sites is 103,940 m^3 (1993 estimate). Of this total, 61.8 percent is stored at INEL (64,235 m^3). The majority of the TRU wastes are mixed wastes (95 percent) and, therefore, require management under the Resource Conservation and Recovery Act (RCRA) as well as DOE Order 5820.2A, *Radioactive Waste Management*.

An additional category of LLW, alpha low-level waste (α-LLW), which contains TRU radionuclide concentrations between 10 nCi/gram and 100 nCi/gram of waste matrix, exists as a result of restrictions placed on shallow land disposal of TRU radionuclides. EG&G personnel stated that these restrictions are the result of an environmental pathways analysis which was done to assess the RWMC's ability to meet performance objectives contained in DOE Order 5820.2A. As a result, α-LLW must be stored until an acceptable disposal option is developed. Since α-LLW is estimated to represent 42 percent of the total stored TRU inventory, the impact of its extended storage is not trivial. EG&G personnel stated that this issue cannot be resolved until DOE-Headquarters makes a decision on its disposition.

1. Retrieval activities: The retrieval enclosure over pads 1 and 2 is currently under construction and is scheduled for completion in December 1996. Two new RCRA compliant storage modules have been completed with another five scheduled for completion in August 1995. The Safety Analysis Report (SAR) for the storage

modules has been completed and approved by DOE. The current authorization basis for the storage modules, as a result of this analysis, allows unvented drums to be placed in the new modules. However, the DNFSB Staff was told that INEL plans to vent all drums prior to storage in these facilities. Operation of the storage modules is awaiting completion of the operational readiness review.

Current drum venting procedures require drum removal from the retrieval trench and transportation to the drum venting facility. Retrieval equipment, modified with protective blast shielding, is used to handle the unvented drums, and precautions are also taken to ensure that personnel are not allowed near operations involving unvented drums. INEL personnel have retrieved unvented drums from the existing storage configurations safely on three occasions. Additionally, EG&G has evaluated the safety of vent clips, permeable gaskets, and carbon filters. With the exception that some carbon filter corrosion has been noted, their results indicate all three venting methods are adequate for safe removal of vented drums.

2. Pit 9 Remediation: Pit 9 was used to store wastes from November 1967, to June 1969. Pit 9 wastes are primarily classified as TRU with the primary isotope being Pu-239 (27 Kg of Pu-239 is estimated to be in the pit). The primary waste form, sludge from Rocky Flats processing activities, is contained in 55 gallon drums, however, significant quantities of processing equipment and empty contaminated drums were also disposed (there were over 6000 drums and boxes disposed of in Pit 9).

   This project is being managed by the environmental restoration program as part of compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as a demonstration project. The current conceptual design consists of waste retrieval within a double contained structure built over the pit. Wastes requiring treatment would be removed using remotely operated equipment and placed in a processing unit. The removed contaminants would be treated using physical separation, chemical extraction, and stabilization processes. Wastes selected for treatment will be >10 nCi/g TRU or exceed RCRA delisting levels as specified in the record of decision for this project. Wastes that are <10 nCi/g TRU and do not exceed RCRA delisting levels will be returned to Pit 9 for disposal as LLW. The subcontractor will be required to meet the existing waste acceptance criteria for the disposal of LLW.

   The condition of waste containers in Pit 9 is not expected to be good. None of the drums were vented. The disposal practices used, dumping drums off the back of trucks into the pit, increases the likelihood of breached drums. Current estimates are that ~70% of all drums and 100 percent of wooden boxes no longer provide

waste containment. Pressurization of the intact drums is also a potential issue. The current design specifications require the subcontractor to complete a safety analysis report and conduct an operational readiness review in compliance with existing DOE Orders prior to the commencement of retrieval activities.

b. Low-Level Waste (LLW) Management:

1. INEL uses shallow land burial as its primary means of LLW disposal: Greater confinement disposal vaults are used for Naval Reactor waste. LLW is stored in plywood boxes and stacked in a burial pit. Natural soil is used as backfill to reduce void space and a cover is placed over the waste. INEL does not segregate waste in a manner similar to commercial facilities as required by 10 C.F.R. Part 61. Inventory limits, with the exception of α-LLW discussed above, have not been established for the RWMC, and the current pit design does not employ a drainage system.

   Existing commercial site suitability criteria could not be met at the RWMC due to flooding which has occurred from snow melt. As a result of this flooding, a dike system has been constructed. No flooding has occurred at the RWMC since its construction.

2. Waste Experimental Reduction Facility: Waste treatment in this facility consists of incineration, size reduction using plasma arc torch cutting, and compaction. Each of these operations is independent of the other. All WERF operations were suspended in 1991 due to conduct of operations, configuration control, and safety documentation problems. Since that time, these problems have been addressed and plant modifications have been completed to provide RCRA complaint storage and new size reduction facilities. A recent Operational Readiness Review was completed by DOE, and the contractor is currently correcting prestart findings. While current plans are to initiate size reduction and compaction operations in the fall of 1994, no date has been set for initiation of incinerator operations. Size reduction and compaction would have a favorable impact on reducing the large backlog of waste that has accumulated since cessation of WERF operations. Since a large majority of these are stored outdoors with minimal protection from the environment, the treatment and disposal of these wastes would eliminate the potential for environmental contamination.

3. Performance Assessment (PA): INEL is developing a PA in compliance with DOE Order 5820.2A. Currently, a draft PA has been prepared, however, it has only been preliminarily reviewed by DOE's Peer Review Panel to determine its technical adequacy. DNFSB Staff review of the draft PA indicates that performance

objectives appear to be met. However, the 25 mrem/yr protection of the public from all pathways objective is only marginally met due to a predicted dose of 17 mrem/yr in the period after institutional control. Review of the sensitivity analysis in the draft PA revealed a range of all pathways doses after institutional control of 9.5 to 29 mrem/yr. Since this sensitivity analysis does not account for radionuclides emplaced before 1984, the dose estimates may be less conservative than reported in the draft PA. Additionally, by dividing the source term arbitrarily by time of emplacement (pre-1984 or post-1983), INEL cannot show that the design of existing or planned disposal facilities is sufficient to keep dose rates to the public below performance objectives outlined in DOE Order 5820.2A.

DOE-ID has taken a unique perspective on determining the impact from the totality of waste operations at the RWMC. Since INEL has been placed on the National Priority List and is subject to CERCLA, the remedial investigation/field study process is used to determine the safety and health significance of waste disposed at the RWMC. A Remedial Investigation/Field Study (RI/FS) for Pad A, related to organic contamination in the vadose zone, has been completed and an RI/FS for RWMC's Pits and Trenches is scheduled to begin within the next 8-9 months (this study has an approximate duration of 40 months). The scope of the Pits and Trenches RI/FS includes burial grounds that will have been operated between 1952 and 1997 (this will represent the entire buried source term at INEL when the record of decision is issued). This approach is unique in that the study will be used to make remediation and closure decisions related to both past and existing low-level waste disposal facilities. A performance assessment is also being completed. This study will assess waste disposed from 1984 to 2020 and measure compliance with performance objectives contained in DOE Order 5820.2A and assist in active pit closure decisions. Discussions with DOE-ID personnel indicate that if the results of the two studies conflict , i.e., the risk assessment portion of the RI/FS finds that the consequences of operating existing facilities exceeds public health and safety criteria established in CERCLA while the PA indicates that performance objectives are being met, the continued operation of existing facilities will be reassessed. If this approach is fully implemented, the technical staff sees this as a positive step towards a systematic approach to evaluating the totality of low-level waste disposal operations.

5. **Future Staff Actions:** Staff activities will focus on the safety aspects of the Pit 9 remediation project, retrieval of TRU wastes, restart of the WERF, a more detailed review of safety analysis reports related to these activities, and a more detailed review of the draft performance assessment for the RWMC.