DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Washington, DC 20004-2901

December 9, 2014

The Honorable Frank Klotz
Administrator
National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Administrator Klotz:

The Documented Safety Analysis for the Radioassay and Nondestructive Testing (RANT) Shipping Facility at Los Alamos National Laboratory does not adequately identify safety-class controls required under Title 10, Code of Federal Regulations, Part 830, *Nuclear Safety Management*, and Department of Energy Standard 3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses.* Given the significance of the issues detailed in the enclosed report, it is important that the National Nuclear Security Administration (NNSA) evaluate and consider resolving these safety issues prior to resuming operations.

Pursuant to 42 U.S.C. § 2286b(d), the Defense Nuclear Facilities Safety Board requests a report and briefing within 90 days on the NNSA path forward for resolution of safety basis issues identified in the Enclosure for the RANT Shipping Facility.

Sincerely,

Peter S. Winokur, Ph.D.
Chairman

Enclosure

c: Ms. Kimberly A. Davis-Lebak
Mr. Joe Olencz

ENCLOSURE

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

September 29, 2014

MEMORANDUM FOR: S. A. Stokes, Technical Director

COPIES: Board Members

FROM: T. Davis

SUBJECT: Los Alamos National Laboratory—Radioassay and Nondestructive Testing Shipping Facility Safety Basis

This report documents the review of the Los Alamos National Laboratory's (LANL) Radioassay and Nondestructive Testing (RANT) Shipping Facility safety basis by members of staff of the Defense Nuclear Facilities Safety Board (Board). The observations identified in this report were discussed with the Los Alamos Field Office (LAFO) and the LANL contractor, Los Alamos National Security, LLC (LANS), during the month of August 2014.

Background. The RANT Shipping Facility is a Hazard Category 2 nuclear facility used by LANS personnel to load transuranic (TRU) waste, typically either waste drums or standard waste boxes, into TRUPACT shipping containers. This facility has been used for several years to support the LANL TRU program and will be used long-term, in conjunction with the TRU Waste Facility Project, to support the enduring waste mission, including after Area G closure. The RANT Shipping Facility is currently in standby with no TRU waste present, pending the resumption of TRU waste shipments.

Safety Basis. In November 2013, LANS submitted a Documented Safety Analysis (DSA) to LAFO for approval. The DSA supports the long-term facility mission and replaces an older Basis for Interim Operation. In July 2014, LAFO completed its review of the safety basis and documented the basis for approval in a Safety Evaluation Report (SER) with two conditions of approval and two directed actions.

The staff team reviewed the LANS DSA, along with the LAFO SER. The staff team identified significant weaknesses in the hazard analysis (HA), accident analysis, and safety controls, as detailed below. The review revealed inadequate identification and implementation of safety controls to protect the public and worker, which are required under Title 10, Code of Federal Regulations, Part 830, *Nuclear Safety Management* (10 CFR 830) and Department of Energy (DOE) Standard 3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*.

Hazard Analysis.

High Consequence Scenarios Not Carried Forward into the Accident Analysis—Unique and representative potential hazard scenarios that have high consequences to the public are to be included in the accident analysis consistent with DOE Standard 3009. The LANL hazard evaluation process requires analysts to assign a consequence severity category for each event scenario. For the public receptor, high consequence levels are based on challenging the evaluation guideline (25 rem Total Effective Dose Equivalent) for the Maximally Exposed Offsite Individual. The staff review team identified a hazard scenario with high offsite consequence that was mistakenly captured as moderate consequence and a scenario that was inappropriately identified as being bounded by a design basis accident included in the accident analysis. These two accidents (listed below) with potential for high offsite consequences were not properly analyzed for safety-class controls in the accident analysis.

- Crane Failure. The HA identifies a scenario that involves failure of the crane load path, which results in a physical impact and a fire involving TRU waste. The HA identifies this scenario as having a moderate consequence. The staff team believes this event should have high offsite consequences based on the material-at-risk and hazard scenario. Given the high offsite consequences, this hazard scenario should have been further evaluated in the accident analysis; however, the DSA incorrectly concludes that the scenario is bounded by a design basis accident involving a vehicle impact and fuel pool fire inside the RANT building.

- Seismic Impact. The HA postulates multiple seismic events that do not result in building collapse but cause significant impact to TRU waste (crane failure, with and without a subsequent fire). The staff team believes a representative accident scenario should have been carried forward to the accident analysis for these seismic accident scenarios; however, the DSA incorrectly concludes that these scenarios are bounded by a more substantial seismic event that causes the building to collapse. The controls and analysis included for the seismic collapse scenario do not apply for the less-severe seismic events.

Inadequate Controls Identified for High Consequence Scenarios—The HA identifies credited controls for the scenarios discussed above; however, the controls are not adequate to prevent and/or mitigate these scenarios, as detailed below. If these hazard scenarios were carried forward to the accident analysis, as required, the staff team believes the analysis would have identified that these controls are not adequate.

- Crane Failure. The HA postulates the crane failure as an unlikely event in its unmitigated analysis. The HA identifies administrative controls to relocate the facility cranes such that they are not over TRU waste when not in use and employs a critical lift plan for TRU waste lifts that are 12 feet or higher. The HA then concludes that the mitigated frequency of the hazard scenario is beyond extremely unlikely. The crane positioning control is implemented via a reference use procedure, which is not required to be with the worker during the activity. Additionally, these controls do not eliminate many potential initiators for this scenario (e.g., operator error, impacts with

end stops, equipment failure), and therefore the mitigated frequency may not be beyond extremely unlikely.

- Seismic Impact. The HA credits relocating the facility crane to mitigate the consequences of seismic events that do not result in building collapse (e.g., a seismic event consistent with performance category (PC)-2). However, this control does not adequately mitigate the consequences of smaller seismic events described in the HA that could cause crane and facility failures that result in fires involving TRU waste.

- Other Natural Phenomena Hazards. The DSA assumes high wind and snow loading hazard scenarios will not result in dose consequences that exceed 10 rem. Under that assumption PC-2 criteria are appropriate for these external events. However, high wind and snow loading may result in a facility collapse that has the potential for high offsite dose consequences. In accordance with DOE Standard 3009, these events should be analyzed as design basis events in the accident analysis to evaluate the need for safety class controls.

Accident Analysis.

Non-conservative Assumptions—The RANT DSA includes non-conservative assumptions for multiple high consequence accident scenarios in both unmitigated and mitigated analyses, as detailed below. These assumptions may artificially lower the calculated radiological dose consequences, which would affect the selection of safety-class controls.

- Seismic Collapse and Fire.
  - The DSA uses a non-conservative combined airborne release fraction/respirable fraction (i.e., 1×10^{-3} versus the value of 1×10^{-2} identified in Table 4.5-1 of DOE Standard 5506, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities*) for unconfined burning of combustible TRU waste in both the unmitigated and mitigated analyses.

  - The mitigated analysis uses engineering judgment to assume that only a portion of the TRU waste experiences high-energy impact (with the recommended damage ratio identified in Table 4.4.5-1 of DOE Standard 5506). In this case, a less conservative assumption is used in the mitigated analysis without safety controls being credited to support this assumption.

  - The mitigated analysis includes an assumption that only one-third of the waste is subject to the fire insult based on combustible controls; however, TRU waste is collocated and banded closely together at RANT. This assumption is non-conservative, especially during a collapse scenario.

Inadequate Controls—The safety controls identified in the accident analysis do not appear adequate to prevent or mitigate accident consequences for multiple high consequence scenarios, as described below.

- Seismic Collapse with Fire. For a seismic collapse and subsequent fire scenario that involves TRU waste material inside the RANT structure, the DSA identifies Specific Administrative Controls for combustible loading, crane location (i.e., repositioned away from waste when not in use), and container stacking limits. These controls do not prevent potential physical and fire impacts to TRU materials. As a result, a reasonably conservative evaluation of the mitigated consequence would still exceed the DOE evaluation guideline.

- Wildland Fire. The DSA identifies combustible loading separation from TRU waste containers inside and outside the RANT structure as the controls to prevent wildland fire scenarios. However, these controls do not appear adequate to prevent a wildland fire from propagating to the RANT structure and causing a significant facility fire scenario that involves TRU waste inside the facility. Combustible and fuel controls, including vegetation control around the facility, are needed to prevent a wildland fire from propagating to the RANT structure for this accident scenario.

Safety Controls.

Structure—The structural integrity of RANT may not be adequate for natural phenomena hazard events.

- Seismic Safety. The RANT structure is credited to meet PC-2 seismic performance criteria; however, the LANS seismic analysis identifies that the probability of failure may not meet DOE Standard 1020, *Natural Phenomena Hazards Analysis and Design Criteria for DOE Facilities*, requirements even if relaxed by a factor of two as allowed for an existing facility. The LANS evaluation of the RANT structure indicates the annual probability of exceedance is 1.0×10^{-3} to 1.2×10^{-3} versus the DOE Standard 1020 requirement of 1×10^{-3} (including the factor of two relaxation), and therefore may not meet PC-2 requirements.

Vehicle Impact Controls—The Specific Administrative Controls for vehicle entry restrictions and vehicle barriers do not appear adequate to prevent/mitigate the potential impacts on TRU waste stored outside the RANT Shipping Facility structure. Several vehicle types (including heavy trucks) can enter the RANT yard and potentially impact TRU waste containers. During a walkdown of the RANT yard, LANS personnel indicated that portions of the heavy trucks may have to cross the safety class berm to allow the vehicle to turn around. The safety control only precluded the vehicle's gas tank from crossing the berm. Given the limited space in the RANT yard, it is not clear how robust this control will be when implemented. The staff team also notes that smaller vehicles are available for use in the yard and that large trucks are included in the DSA for operational convenience.

The DSA identifies a Specific Administrative Control that requires vehicle barriers to guide the flow of traffic away from containers stored in the yard. The LAFO SER includes two conditions of approval that require LANS to designate vehicle barriers as safety-significant or defense-in-depth design features. However, the barriers provide protection for an accident scenario (vehicle impact and pool fire with TRU waste containers stored in the RANT yard) that results in high unmitigated offsite consequences (approximately 150 rem). The staff review team

believes the vehicle barriers should be credited as safety class, as required by DOE Standard 3009, for protection of the public.

Conclusion. The staff review team identified significant flaws in the hazard and accident analyses, resulting in inadequate identification and implementation of safety controls required by 10 CFR 830 and DOE Standard 3009. These issues were not identified and addressed during the LAFO safety basis review.