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## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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August 29, 2000

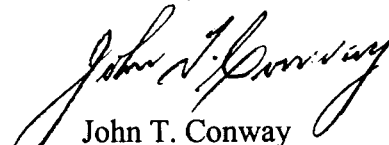
The Honorable Madelyn R. Creedon  
Deputy Administrator  
for Defense Programs  
Department of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585-0104

Dear Ms. Creedon:

The Defense Nuclear Facilities Safety Board (Board) has been following with interest the potential for flooding at Los Alamos National Laboratory (LANL) subsequent to the Cerro Grande fire. As noted by the Board's staff in the enclosed report, LANL is responding swiftly to the threat with flood control and mitigation measures designed to protect defense nuclear facilities and to minimize the impact of flooding on the public.

However, the Board notes that the Department of Energy's (DOE) involvement in selection, design, and construction of the flood control projects has been limited. The Board encourages DOE to be thoroughly engaged to ensure the adequacy and appropriateness of measures taken now and after the current rainy season. Though LANL may be responsible for coordinating and reviewing projects, DOE, as owner, needs to confirm that LANL has committed adequate staff or outside experts as needed, and that the reviews are both timely and technically thorough. It is also important that DOE ensure the adequacy of quality control of the various projects, such as the Pajarito Canyon dam. Close involvement by DOE is needed to be able to comprehensively evaluate the potential safety impact of flood mitigation activities on defense nuclear facilities.

Sincerely,

  
John T. Conway  
Chairman

c: Mr. Mark B. Whitaker, Jr.

Enclosure

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

## Staff Issue Report

August 9, 2000

**MEMORANDUM FOR:** J. K. Fortenberry, Technical Director

**COPIES:** Board Members

**FROM:** D. Ralston

**SUBJECT:** Flood Mitigation Measures at Los Alamos National Laboratory

The staff of the Defense Nuclear Facilities Safety Board (Board) recently reviewed the flood mitigation measures at Los Alamos National Laboratory (LANL) following the Cerro Grande wildfire. Staff members F. Bamdad, J. Blackman, A. Hadjian, A. Jordan, and D. Ralston participated in this review.

The Cerro Grande wildfire in May 2000 burned about 7,500 acres of Department of Energy (DOE) property, as well as thousands more acres in the hillsides above LANL. In areas that burned, infiltration and interception of precipitation have been significantly reduced because of the increased soil hydrophobicity and decreased vegetative cover, resulting in substantially greater runoff and likelihood of flooding. The monsoon season for the region lasts from July 1 until the end of August, typically bringing 36 percent of the annual precipitation.

To address flooding concerns immediately, LANL established an Emergency Rehabilitation Team (ERT), headed by the Deputy Director for Operations, to coordinate all flood mitigation and control efforts. The priorities established by the ERT are (1) protection of public safety; (2) protection of worker safety; (3) protection of facilities, infrastructure, and materials; and (4) minimization of off-site transport of contamination. Recognizing the need for expertise in flood control, DOE and LANL have retained the U.S. Army Corps of Engineers to assess conditions, recommend flood mitigation measures, and construct any needed major flood control structures.

The watersheds of greatest concern based on burn severity and on the presence of vulnerable facilities or historic contamination are the focus of rehabilitation efforts. Three canyons and their vulnerabilities top the list: Pajarito Canyon with Technical (TA)-18, Los Alamos Canyon with TA-41 and TA-2, and Pueblo Canyon with Diamond Drive and town utilities. All three, as well as several other canyons, also have contaminated sediments that could potentially wash downstream. The ERT is coordinating projects aimed at reducing peak flows in each watershed, using the 6 hour, 100 year precipitation event as a design basis for protection of facilities.

The defense nuclear facilities at greatest risk of damage due to flooding are at TA-18. The Army Corps of Engineers has recommended construction of a 70 foot flood retention structure in Pajarito Canyon upstream of TA-18. The dam is designed to retain the predicted

runoff from the 6 hour, 100 year storm and release the accumulated water through a 42 inch conduit within about 1½ days. The dam is intended to reduce the peak flow expected at TA-18 from approximately 2,500 ft<sup>3</sup>/seconds to about 500 ft<sup>3</sup>/seconds.

The hydrologic models used by LANL and the Army Corps of Engineers to calculate peak flows and water surface elevations are still hampered by uncertainty in their input parameters and results. Modeling of the flow expected from a recent (June 28) rainfall greatly underpredicted the actual flow. At TA-18, the anticipated peak flow for the .69 inch rainfall was 11 ft<sup>3</sup>/seconds, compared with an actual flow of 150 ± 30 ft<sup>3</sup>/seconds. Additionally, the response at TA-18 was much quicker than expected, 2 hours instead of the 4 hours calculated. The models were recalibrated based on the above observations, and the design height of the dam was increased from 50 to 70 feet to maintain capacity for the 100 year storm. The models are hampered not only by uncertainty in the postfire hydrologic conditions, but also by limited field data from precipitation and stream flow gages for calibration. The rainfall around Los Alamos is typically intense but highly localized; however, the precipitation and storm gaging network around LANL is sparse, particularly in the slopes uphill from the site.

In addition to the dam, LANL has installed about 1000 feet of sheet piling 5 feet in height to protect Kiva 1 and Solution High-Energy Burst Assembly at TA-18, and is completing a diversion channel to increase the stream capacity. The Army Corps of Engineers is armoring road crossings in canyons upstream of TA-18 so they will act as small retention basins. DOE is requiring an Unreviewed Safety Question Determination (UDQD) to assess the impact of a potential flood and of the mitigative actions at TA-18. Given the pace of dam construction, the results of this USQD will be needed as soon as possible.

In Los Alamos Canyon, LANL removed about 700 m<sup>3</sup> of contaminated sediment, relocated radioactive materials, demolished or removed threatened facilities (including the cooling tower and evaporator at the old Omega West reactor), and evacuated TA-41 structures except for essential personnel. Upstream in Los Alamos Canyon, the Army Corps of Engineers has drained the Los Alamos Reservoir and cleared the spillway, and is armoring the dam. In Pueblo Canyon, an 86 inch culvert has been installed at the Diamond Drive road crossing. Additionally, the ERT hopes to control runoff by hydroseeding the slopes above LANL, raking and seeding burned areas of laboratory property, and removing debris from culverts. To protect personnel, the Emergency Operations Center controls access to the canyons, and threatened facilities have established evacuation procedures in the event of substantial rain.

At the time of the staff's visit, DOE had little active involvement in reviewing the flow calculations or the design and planned construction of the dam above TA-18. DOE's involvement in decision making appeared to be only very high-level, without engagement in details. DOE is apparently relying on LANL to make key decisions and to review the design and construction of the dam and other flood control measures. DOE does not appear to have:

- Conducted an independent review of flow calculations, or seen that LANL has an adequate precipitation and stream gauging network to calibrate the models.

- Ensured that LANL has adequate staffing to review the overall project and the dam design, including outside experts if needed.
- Confirmed that the LANL reviews are technically complete and timely.
- Ensured that quality control will be maintained during construction of the dam.

Greater involvement by DOE in reviewing short- and long-term activities would increase assurance that the flood mitigation measures will be appropriate and sufficient. Close involvement by DOE is needed to be able to comprehensively evaluate the potential safety impact of flood mitigation activities on defense nuclear facilities.