DEFENSE NUCLEAR FACILITIES SAFETY BOARD

December 29, 1994

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: A. Hadjian

SUBJECT: Trenching at Rocky Flats Environmental Technology Site

REFERENCE: Trip Report, A. H. Hadjian to G. W. Cunningham, dated August 19, 1994.

1. **Purpose:** This report consolidates the technical issues related to faulting near Building 371 at the Rocky Flats Environmental Technology Site (RFETS). These issues (location of trench, mapping and dating, interpretations, etc.) were discussed and reviewed during two site trips on September 29 and November 9, 1994, by Defense Nuclear Facilities Safety Board (DNFSB) staff A. H. Hadjian and outside expert P. C. Rizzo.

2. **Summary:** Based on site visits prior to and post trenching, the DNFSB staff believes that the approach used to investigate the issue of faulting is acceptable. However, additional work is needed to support the EG&G - Rocky Flats (EG&G-RF) conclusion that the faulting near Building 371 is not capable. The DNFSB staff has the following concerns:

   a. Work to date has not been adequately reviewed by an independent group,
   b. The fault corridor extending from Building 371 to the trench has not been independently validated, and
   c. Justification of inferred age of the Rocky Flats Alluvium (RFA) has not been provided.

3. **Background:** During investigations of site hydrogeology for contaminant transport mechanisms, anomalous indications were identified by EG&G-RF in the bedrock (approximately 70 million years Cretaceous-age Laramie Formation) underlying the protected area close to Building 371. Since the existence of potential active faults close to Building 371 could significantly impact the seismic hazard for the re-evaluation of the building, EG&G-RF proceeded to investigate these anomalies from a seismic hazard perspective. A contract was awarded to Geomatrix on July 10, 1994, to investigate the potential faulting. For additional background refer to the above reference.

4. **Discussion/Observations:** The September 29, 1994, meeting discussed the ongoing trenching evaluations in particular the findings from six new boreholes drilled to support the investigations to constrain the trenching. Although EG&G-RF interpretations support the existence of a fault in the vicinity of Building 371, the DNFSB staff believe that these interpretations need an independent verification, as the electrical logs used do not provide an unequivocal basis for the interpretations and much depends on the professional judgment of the current EG&G-RF investigator. A strong case was made by the DNFSB team that a review of this work was necessary before locating the trench. A review was subsequently performed by EG&G-RF, Field Operations. In an October 10, 1994, memo, the peer reviewer agrees that the initial interpretations "are reasonable given the quality and distribution of the data. However, I cannot make the firm statement that the fault exists because of the equivocal nature of these correlations." Despite these uncertainties, EG&G-RF proceeded with the trenching at the location that was collectively determined at the September 29, 1994, meeting, based solely on data and interpretation provided by the original investigator.

   The November 9, 1994, site visit was primarily for the purpose of entering the trench for first-hand observations and discussions regarding the conclusions reached by Geomatrix. The trench is about 570 ft. long, 20 ft. deep and 3.5 ft. wide. The overburden, referred to as the RFA, overlies the Cretaceous claystone and siltstone system (Laramie Formation). The interface between these two depositions is an unconformity, i.e. an interruption in the depositional sequence of about 70 million years. In this case the unconformity is an erosional surface that separates younger strata from older rocks. The Cretaceous rock is about 70 millions years old and the inferred age of the RFA is 600,000 plus years old. Geomatrix has decided to use this very sharp unconformity as the marker horizon. Although the deposits below the unconformity show significant fracturing (slickensides - polished and scratched surfaces that result from friction along fault planes), the RFA is undisturbed in the area of the trench. There are no offsets above the unconformity which is interpreted as the absence of fault movement during the last 600,000 plus years. According to the Nuclear Regulatory Commission criteria (10CFR100, Appendix A), faults which have moved more than once in 500,000 years are characterized as capable. To arrive at this conclusion, it is not necessary to locate an offset in the 20 ft. depth of the trench so long as other unequivocal evidence exists of its location being *within* the length of the trench.

   As mentioned above, the age of the RFA is inferred. Direct dating has not been attempted by Geomatrix because it is considered not to be feasible. The dating of the RFA is based on dating of the erosional terraces that have been extensively discussed in the geologic literature of the region. The Verdos Formation, a terrace cut into the RFA, is 600,000 years old based on the age of the volcanic ash found on the terrace.

Without additional effort on the part of RFETS, the trenching will have limited usefulness and considerable doubt will remain regarding the evaluation of seismic hazard for Building 371. The DNFSB staff has the following concerns relative to these investigations and conclusions regarding the activity of the inferred fault at Building 371:

a. The original work has not been adequately reviewed to support the conclusion made as to the existence of a fault in the Cretaceous rocks close to Building 371. The EG&G-RF reviewer of this work, in his memo of October 10, 1994, does not quite subscribe to the conclusions of the original investigator.

b. It has not been conclusively demonstrated that the inferred fault at Building 371, with a dislocation of about 40-50 ft., does in fact extend to within the trench located 1.3 km north of Building 371. The DNFSB staff believes that a detailed review and evaluation of existing data or a high-resolution, shallow reflection survey along several lines crossing the inferred fault between Building 371 and the trench could help eliminate this uncertainty.

c. Documentation of the inferred dating of the RFA has not been provided in sufficient detail and with adequate references. As an alternative, actual in-situ age dating could be performed to substantiate the inferred date of the RFA.

5. **Future Staff Actions:** The DNFSB staff and outside experts will continue to evaluate the issues identified above. It is necessary that confidence is established in the main conclusion regarding fault activity in the vicinity of Building 371 to support the seismic design basis being considered for this facility.