



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

AUG 19 1994

Mr. Ronald A. Milner, Acting Director
Office of Program Management and Integration
Office of Civilian Radioactive Waste Management
U.S. Department of Energy, RW 30
1000 Independence Avenue
Washington, D.C. 20585

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Dear Mr. Milner:

**SUBJECT: REVIEW OF THE U.S. DEPARTMENT OF ENERGY (DOE) STUDY PLAN
ON "EXCAVATION INVESTIGATIONS, REVISION 1" (8.3.1.15.1.5)**

On May 4, 1994, DOE transmitted the subject study plan to the Nuclear Regulatory Commission for accelerated review and comment. The NRC staff has completed its review of the subject study plan using the "Review Plan for the NRC Staff Review of DOE Study Plans, Revision 2" (dated March 10, 1993). Based on its review of the study plan, the staff considers the material submitted to be generally consistent, to the extent possible, at this time, with the revised NRC-DOE "Level of Detail Agreement and Review Process for Study Plans" (letter from Shelor to Holonich; dated March 22, 1993).

A major purpose of the review is to identify concerns with studies, tests, or analyses that, if started, could cause significant and irreparable adverse effects on the site, the site characterization program, or the eventual usability of the data for licensing. Such concerns would constitute "objections," as that term has been used in earlier NRC staff reviews of DOE documents related to site characterization (e.g., "Consultation Draft Site Characterization Plan" and the "Site Characterization Plan (SCP) for the Yucca Mountain Site"). It does not appear that the conduct of the activities described in this study plan will have adverse impacts on repository performance and the review of this study plan identified no objections with any of the activities proposed.

As part of its study plan review, the NRC staff also determines whether or not detailed comments or questions are warranted. The NRC staff's review of the subject study plan has resulted in the identification of one question. The enclosed question will be tracked by the NRC staff as open items similar to those previously raised by the NRC staff in its 1989 Site Characterization Analysis (SCA).

Additionally, in light of the review of this and other related study plans (e.g., "Laboratory Thermal Expansion Testing" (8.3.1.15.1.2) and "Laboratory Thermal Properties" (8.3.1.15.1.1)), the staff is concerned about the continuing need for improved technical integration and coordination of similar information-gathering activities and procedures. The NRC staff identified this concern earlier, in its SCA, following the review of DOE's 1988

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AUG 19 1994

Mr. Ronald A. Milner

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SCP. The NRC staff expects DOE to address this concern in future SCP Progress Reports.

If you have any questions concerning this letter, please contact Michael P. Lee at 301/415-6677.

Sincerely,
/s/
Joseph J. Holonich, Chief
High-Level Waste and Uranium Recovery
Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

- cc: R. Loux, State of Nevada
- T.J. Hickey, Nevada Legislative Committee
- J. Meder, Nevada Legislative Counsel Bureau
- C. Schank, Churchill County, NV
- D. Bechtel, Clark County, NV
- J. Hoffman, Esmeralda County, NV
- L. Fiorenzi, Eureka County, NV
- B. Mettam, Inyo County, CA
- M. Baughman, Lincoln County, NV
- R. Williams, Lander County, NV
- V. Poe, Mineral County, NV
- L. Bradshaw, Nye County, NV
- M. Murphy, Nye County, NV
- P. Niedzielski-Eichner, Nye County, NV
- F. Sperry, White Pine County, NV
- R. Nelson, YMPO
- D. Weigel, GAO
- W. Barnard, NWTRB

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AUG 19 1994

Mr. Ronald A. Milner

3

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AUG 19 1994

**STUDY PLAN 8.3.1.15.1.5
EXCAVATION INVESTIGATIONS, REVISION 1**

Question

Since neither additional data nor analytical methods are cited which would provide the means to extrapolate the data to be collected in this study, to the time periods of interest, it is not clear that the study plan will acquire all the data needed for the stated purpose. Hence, the data collected in this study plan might be insufficient to validate the geomechanical constitutive model given the small time and spatial scales for testing and the larger time and spatial scales involved in the application of the model and given that, other data and analytical methods are not cited. Thus, how will these limited data accomplished the goal of validation?

Basis

The study plan indicates that the data to be gathered will be used to validate the constitutive models describing the mechanical behavior of rock.

The scope of this study plan is discussed in Section 8.3.1.15.1.5 of the SCP (pp. 8.3.1.15-45 to 8.3.1.15-52). The SCP states that "... data will contribute to validation of computer codes to be used to calculate mechanical responses, as well as contributing to empirical evaluations related to nonradiological health and safety ..." (p. 8.3.1.15-50). Although other study plans are cited, additional data do not appear to provide the support for extrapolating results over long time periods. This study plan does not cite Section 8.3.5.20 of the SCP, which addresses validation of models and on which the NRC staff commented extensively.

The study plan is clear that it relates to both the pre- and post-closure requirements for repository performance. In particular, this study plan is intended to gather information needed to show compliance with the requirements of 10 CFR 60.111, 60.112, 60.122, and 60.133 (Section 1.2.2). Some of the concerns addressed are safety of the mined facility during operation, maintenance of the retrieval option for the required period, and determination of the extent of excavation-induced damage to rocks around emplacement drifts (Section 1.2.1).

The data to be gathered will account for rock behavior for the limited duration of the proposed experiments; such times are "a few weeks to several months" (Section 2.3.3), or in selected cases a few years.

Application of the models will be for the time period, at least, up to permanent closure. Extrapolation to longer times may be necessary to demonstrate compliance with 10 CFR 60.112. The means of extrapolating data for these longer times is not addressed in justifying the data collection in this study plan.

Validation of the constitutive models for rock properties will require extrapolation, in time, of the data gathered in these tests; direct application of the data derived from the proposed tests will be unable, alone, to validate the models for the time period of interest.

AUG 19 1994

Other issues relating this study plan to validation of models, and bearing on the sufficiency of the data collected, are not discussed or cited. These include: (1) How will data be partitioned, so that some data are used to determine constants in the constitutive models, while other data are used to confirm predictions with those models?; (2) How will data obtained over limited time and space scales be extrapolated to larger scales, considering that many properties of geologic media are scale dependent?; and (3) What role will peer review play in the validation process and is this an appropriate role (Section 3.3.7)?

Recommendation

DOE should explain how these limited data will accomplish the goal of validation. Alternative responses include: (1) acquisition of data, described in other study plans, for longer time periods; (2) analysis methods, described in other study plans, for using limited-scale data to validate models; or (3) expansion of the data collected in this study plan.