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MEMORANDUM FOR: Joseph Holonich, Director
Repository Licensing and Quality Assurance
Project Directorate
Division of High-Level Waste Management

FROM: Sher Bahadur, Acting Chief
Hydrology and Systems Performance Branch
Division of High-Level Waste Management

SUBJECT: PHASE I REVIEW OF STUDY PLAN 8.3.1.2.2.8, FLUID
FLOW IN UNSATURATED FRACTURED ROCK
[RITS 411421/TAC L60273]

As requested, we have completed the Phase I review of the Study Plan 8.3.1.2.2.8, Fluid Flow in Unsaturated Fractured Rock (see enclosure). This review was conducted using the Review Plan for NRC Staff Review of DOE Study Plans Revision 1, (December 6, 1990). This study consists of two activities. The objective of the first activity is to develop conceptual and numerical models that describe fluid flow and transport in variably saturated, fractured rock. The models will be applied on both laboratory and field-testing scales. The objective of the second activity (validation of conceptual and numerical models) is to evaluate the applicability of conceptual and numerical models developed under the first activity.

No objection-level concerns have been identified with the work described in this study plan. The DOE did not propose to close any open items with the issuance of this plan, and in fact did not identify any related Site Characterization Analysis (SCA) open items. However, this review has identified SCA open items that are closely related to the study. This study plan is a candidate for a detailed technical review based on criteria 1, 2, and 3 from step 6 of part 4.2 of the Review Plan. This review has shown that the study plan is related to key site-related issues. However, because no field tests will be conducted under this study there should be no adverse effects on repository performance and no irreversible or unmitigable effects on site characterization. There is also no evidence that this study could disrupt characterization schedules.

Although this study is a candidate for a detailed review, it is recommended that such a review not be performed until the NRC receives and reviews the closely related plan for study 8.3.1.2.2.9, "Site Unsaturated-Zone Modeling and Synthesis." Our concern is that the relationships between the present study under review and study 8.3.1.2.2.9 are unclear. The present study involves the development and validation of conceptual and numerical flow models of the unsaturated zone over various scales. As discussed on page 8.3.1.2-341 of DOE's Site Characterization Plan

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(SCP), the models to be developed under this study are mostly to be applied at laboratory and sub-REV (representative elementary volume) scales. The SCP describes study 8.3.1.2.2.9 as developing models for site-scale analyses. It also refers to code testing and code verification. Both studies refer to the development of conceptual and numerical models. In general, it is not clear how work will be coordinated between these studies in the development of conceptual models, code development and verification, and the development, application, and validation of numerical models. It is recommended that any Phase II reviews of studies 8.3.1.2.2.8 and 8.3.1.2.2.9 be performed concurrently.

A list of applicable technical procedures is not provided in the study plan. This is inconsistent with DOE's SCP, which provides a list of technical procedures for each of the two activities (SCP, Volume IV, Part B). The status of these procedures should be requested and received from the DOE before starting a Phase II review of this study.

The review was conducted by Neil Coleman of the Hydrologic Transport Section, who can be reached at 504-2530.

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Enclosure:
 As stated

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