

MAY 30 1990

MEMORANDUM FOR: N. King Stablein, Senior Project Manager  
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Project Directorate  
Division of High-Level Waste Management

FROM: John W. Bradbury  
Hydrologic Transport Section  
Geosciences & Systems Performance Branch

SUBJECT: ACCEPTANCE AND START-WORK REVIEWS OF STUDY PLAN FOR  
MINERALOGY, PETROLOGY, AND CHEMISTRY OF TRANSPORT  
PATHWAYS (S. P. 8.3.1.3.2.1) (PPSAS L64329 411432)

As requested, I have completed the acceptance and start-work reviews for the Study Plan for Mineralogy, Petrology, and Chemistry of Transport Pathways. The results of these reviews are provided here. This study plan contains five activities, all of which were submitted for review:

- 8.3.1.3.2.1.1. Quantitative mineralogy of the host rock and along transport pathways
- 8.3.1.3.2.1.2. Internal stratigraphy for the candidate host rock
- 8.3.1.3.2.1.3. Chemical variability in the host rock and along transport pathways
- 8.3.1.3.2.1.4. Role of fractures as past transport pathways and evidence for paleo-water table(s)
- 8.3.1.3.2.1.5. Statistical evaluation of mineralogic, petrographic, and chemical data

It should be noted that the SCP and the Yucca Mountain Project Technical Status Report (NVO-334-1) indicates that this study plan consists of three activities (not five). Further, the DOE Progress Report (#1) does not reflect the change from three to five activities. While the work described in the study plan appears to be consistent with that described in the SCP, the effects of this reorganization is beyond the scope of the acceptance/start work review and would be evaluated as part of a "detailed" review.

#### Acceptance Review

The acceptance review was conducted using section 4.2 (Review Guide for Acceptance Reviews) of the draft Review Plan for NRC Staff Review of DOE Study Plans and Procedures, December 22, 1987.

The criteria used for the acceptance review are as follows:

- o The study plan content is substantively consistent, as appropriate for studies, tests, and analyses described, with the agreement on content resulting from the level of detail meeting (NRC-DOE meeting on the level of detail for site characterization plans (SCP) and study plans, May 7-8, 1986).

- o All study plan references have been provided or are readily available, as from a technical library, when the study plan was issued. (This does not include procedures, which are to be selectively requested during the detailed technical review.)

Attached is an itemized review of the study plan content versus the agreement on content resulting from the level of detail meeting (content requirements as defined by enclosure 4, attachment B of the meeting summary). Based on this review, the study plan meets the criteria for acceptance.

#### Start-Work Review

The start-work review was based on Criteria 1, 2, and 4 from section 5.2 (Review Guide for the Start-Work Review) of the draft Review Plan for NRC Staff Review of DOE Study Plans and Procedures, December 22, 1987.

The criteria used for the start-work review are:

- o Appropriate consideration should be given to the potential effects of the studies, tests, and analyses on the capability of the site to isolate high-level waste. If potential effects exist, the study plan should include an acceptable discussion of preventative/mitigative measures.
- o The description of the planned studies, tests, and analyses should include appropriate consideration of interferences with other studies, tests, and analyses and/or construction of the exploratory shaft facility. Other constraints on the studies, tests, and analyses should be adequately considered.
- o If any planned studies, tests, or analyses require the use of radioactive material, this requirement should be identified, and the quantities to be used and any plans for retrieval should be adequately discussed.

With respect to criterion 1, I found no indications that the work described in this study would compromise the capability of the site to isolate high-level waste. This study plan involves only analytical work to be performed in the laboratory. The methodology for collection of the samples to be analyzed under this study plan, however, could affect the capability of the site to isolate high-level waste. This methodology will be described in a separate study plan on Systematic Acquisition of Site-specific Information.

With respect to criterion 2, I found no evidence for interference with other studies, tests, and analyses. Although the planned work involves destructive analyses, it is apparent that the core will be split leaving material for other studies and archiving.

With respect to criterion 3, the use of radioactive material in studies, tests and analyses is not planned. Thus, the study plan meets criterion 3.

Based on the review, I recommend that the NRC inform the DOE that work can start on this study plan.

Recommendations Regarding Detailed Technical Review

I recommend that a detailed technical review be performed on this study plan. This recommendation is based on the fact that work in this study is potentially important to NRC licensing concerns with respect to radionuclide transport along groundwater pathways, and that changes to the SCP construct of the study plan need to be evaluated.

In addition, I recognize that the majority of the samples to be analyzed in this study will come from core collected in the separate study on Systematic Acquisition of Site-specific Subsurface Information. Careful consideration with regard to criterion 1 of the Start-Work Review is anticipated on review of this other study plan, which includes the Systematic drilling program. Furthermore, I note that "Prototype tests for the collection of samples are presently underway to address the representativeness of core, shaft, and outcrop samples. The results of these prototype tests will be used to guide the methodologies for collection of samples in this Study" (p. 16). I recommend that the NRC request that the DOE provide a description of these tests and results, if any.



John Bradbury  
Hydrologic Transport Section  
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cc: J. Linehan

Acceptance Review of Content of Study Plan 8.3.1.3.2.1  
Mineralogy, Petrology, and Chemistry of Transport Pathways

John W. Bradbury, Hydrologic Transport Section  
May 22, 1990

I. Purpose and Objective

- o Describe the information to be obtained in the study.

Yes  No  N/A

- o Provide the rationale for information to be obtained.

Yes  No  N/A

II. Rationale for Study/Investigation

- o Provide rationale for tests and analyses, indicating alternatives considered and options, advantages, and limitations.

Yes  No  N/A

- o Provide the rationale for the number, location, duration, and timing of tests, considering uncertainties, and identify obvious alternatives.

Yes  No  N/A

The approach to sampling will be stepwise. Initially 1000 whole rock and 800 fracture samples will be analyzed in the first stage of the systematic drilling program. A second stage of this program will depend on the results of the first stage analyses.

- o Describe the constraints for the study, considering:

- Potential site impacts

Yes  No  N/A

- Need to simulate repository conditions

Yes  No  N/A

- Required accuracy and precision

Yes  No  N/A

- Limits of analytical methods

Yes  No  N/A

- Capability of analytical methods

Yes  No  N/A

- Time required versus time available

Yes  No  N/A

- Scale of phenomena and parameters

Yes  No  N/A

- Interference among tests

Yes  No  N/A

- Interference between tests and ES

Yes  No  N/A

### III. Description of Tests and Analyses

For Each Type of Test

The work described in this study plan does not include testing. Only analytical work is described. Therefore, all entries in this section are judged not applicable (N/A).

- o Describe general approach that will be used.

Yes  No  N/A

- o Indicate number of tests and locations.

Yes  No  N/A

- o Describe key parameters that will be measured in test and experimental conditions under which test will be conducted.

Yes  No  N/A

- o Indicate number of tests and locations.

Yes  No  N/A

- o Summarize test methods, if non-standard procedure, summarize steps of test, how it will be modified, and reference technical procedure.

Yes  No  N/A

- o Indicate level of QA and provide rationale for any tests not QA level.  
Yes \_\_\_ No \_\_\_ N/A x
- o Reference the applicable specific QA requirements applied to test.  
Yes \_\_\_ No \_\_\_ N/A x
- o Specify tolerance, accuracy, and precision required in test.  
Yes \_\_\_ No \_\_\_ N/A x
- o Indicate range of expected results and basis for those results.  
Yes \_\_\_ No \_\_\_ N/A x
- o List equipment requirements, briefly describing special equipment.  
Yes \_\_\_ No \_\_\_ N/A x
- o Describe techniques to be used for data reduction and analysis.  
Yes \_\_\_ No \_\_\_ N/A x
- o Discuss representativeness of test, indicating limitations and uncertainties that apply to use of results.  
Yes \_\_\_ No \_\_\_ N/A x
- o Provide illustrations of test locations.  
Yes \_\_\_ No \_\_\_ N/A x
- o Discuss relationship of test to set performance goals and confidence levels.  
Yes \_\_\_ No \_\_\_ N/A x

#### For Each Type of Analysis

- o State purpose of analysis, indicate conditions to be evaluated and describe any uncertainty analysis.  
Yes x No \_\_\_ N/A \_\_\_
- o Describe methods of analysis, including analytical expressions and numerical models to be used.  
Yes x No \_\_\_ N/A \_\_\_

- o Reference the technical procedures document that will be followed during analysis.  
Yes  No  N/A
- o Indicate levels of QA applied.  
Yes  No  N/A
- o Identify data input requirements.  
Yes  No  N/A
- o Describe expected output and accuracy.  
Yes  No  N/A
- o Describe representativeness of analytical approach, indicating limitations and uncertainties that apply to results.  
Yes  No  N/A

#### IV. Application of Results

- o Briefly discuss where results from study will be used for support of other studies.  
Yes  No  N/A
- o Refer to specific performance assessment analyses.  
Yes  No  N/A
- o Describe where information from study will be used in construction equipment and engineering system design and development.  
Yes  No  N/A
- o Describe where information from study will be used in planning other characterization activities.  
Yes  No  N/A

#### V. Schedules and Milestones

- o Provide durations of and interrelationships among principal activities associated with this study.  
Yes  No  N/A
- o List key milestones including decision points associated with study activities.

Yes  No  N/A

- o Describe timing of study relative to other studies and other program activities.

Yes  No  N/A

- o Provide dates for activities for the study plans; reference section 8.5 in SCP.

Yes  No  N/A

Dates are expressed in terms of fiscal years after inception of the study plan.

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