MEMORANDUM FOR: John L. Linehan, Project Director
Repository Licensing and Quality Assurance
Project Directorate
Division of High-Level Waste Management

FROM: Ronald L. Ballard, Branch Chief
Geosciences and Systems Performance Branch
Division of High-Level Waste Management

SUBJECT: PHASE I REVIEW OF STUDY PLAN FOR STUDY 8.3.1.17.4.1, HISTORICAL AND CURRENT SEISMICITY AT YUCCA MOUNTAIN, NEVADA, AND IN THE SURROUNDING REGION

As requested we have completed the Phase I review of the Study Plan for Study 8.3.1.17.4.1, Historical and Current Seismicity, Rev. 0, which addresses seismicity at Yucca Mountain, Nevada, and in the surrounding region (see enclosed). This review was conducted using the Review Plan for NRC Staff Review of DOE Study Plans Revision 1 (December 6, 1990).

The findings of this review consist of two areas of concern, one of which is the failure of the study plan to provide the information required by the Level of Detail Agreement and the other is in regard to methods of "testing" the seismicity (technical issues). We recommend that the study plan be revised and resubmitted for review. A satisfactory response to the enclosed concerns, as determined by a final Phase I review, should preclude the need for a detailed technical review of this study plan.

Ronald L. Ballard, Branch Chief
Geosciences and Systems Performance Branch
Division of High-Level Waste Management

Enclosures:
As stated

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MEMO 8.3.1.17.4.1

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Division of High-Level Waste Management

FROM: Ronald L. Ballard, Chief
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Division of High-Level Waste Management

SUBJECT: PHASE I REVIEW OF STUDY PLAN FOR STUDY 8.3.1.17.4.1. HISTORICAL AND CURRENT SEISMICITY AT YUCCA MOUNTAIN, NEVADA, AND IN THE SURROUNDING REGION

As requested we have completed the Phase I review of the Study Plan for Study 8.3.1.17.4.1., Historical and Current Seismicity, Rev. 0, which addresses seismicity at Yucca Mountain, Nevada, and in the surrounding region (see enclosed). This review was conducted by Michael Blackford using the Review Plan for NRC Staff Review of DOE Study Plans Revision 1 (December 6, 1990).

The findings of this review consist of three areas of concern, one of which is the failure of the study plan to provide the information required by the Level of Detail Agreement regarding the analysis of data acquired through the testing process. The other two concerns regard methods of "testing" the seismicity (technical issues). The study plan appears to ignore a comment made by NRC staff in it's review of the SCP regarding the arbitrary cut-off of magnitude 5.5 for the compilation of seismic data. The other concern with the study plan is that the study area is centered on the Nevada Test Site and not centered on Yucca Mountain, 25-30 kilometers to the south west. We recommend that the study plan be revised and resubmitted for review. A satisfactory response to the enclosed concerns, as determined by a final Phase 1 review, should preclude the need for a detailed technical review of this study plan.

/S/
Ronald L. Ballard, Chief
Geosciences and Systems Performance Branch
Division of High-Level Waste Management

Enclosure: As stated
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*SEE PREVIOUS CONCURRENCE

OFC :	*HLGP	*:HLPD	*:HLGP	:~~HLGP~~
NAME:	MEBlackford/meb/ga	:TVerma	:PSJustus	:~~RLBallard~~
Date:	1/23/91	:1/23/91	:1/23/91	:1/31/91

PHASE I REVIEW: STUDY PLAN FOR ACQUISITION OF HISTORICAL AND CURRENT SEISMICITY DATA AT YUCCA MOUNTAIN, NEVADA, AND IN THE SURROUNDING REGION (S.P. 8.3.1.17.4.1, Rev. 0)

Introduction

The purpose of this study is to compile information on reported and instrumentally recorded earthquakes that characterize the earthquake potential near Yucca Mountain, Nevada. The study contains three activities (i.e., Compile Historical Earthquake Record, Monitor Current Seismicity, and Evaluate Potential for Induced Seismicity at the Site). The study plan was reviewed with respect to (1) DOE/NRC agreements on the content of study plans, (2) identification of objections, (3) closure of NRC open items, and (4) need for a detailed review (see Review Plan for NRC Staff Review of DOE Study Plans, Revision 1, 12/6/90).

Evaluation of Study Plan Relative to the Agreement (Objective 1 and 5)

Criterion 1 -The content of the study plan under review is reasonably consistent, as appropriate for the activities, tests and analyses described, with the Agreement ("DOE Content Requirements for Descriptions of Studies in Study Plans," Attachment B of "Summary of the [May 7-8, 1986] NRC/DOE Meeting on the Level of Detail for Site Characterization Plans and Study Plans").

Attachment 1 is an itemized check list of the study plan content versus the agreement on content resulting from the level of detail meeting. We find that the study plan is not in complete conformance with the aforementioned requirements. The study plan does not consider analyses of the data acquired through the testing process. This lack of consideration is reflected in the absence of those elements of the required content that specifically address analysis. This discrepency is compensated for, to some extent, by an implication that tests described in this study plan will provide necessary input to Investigation 8.3.1.17.3, studies to provide required information on vibratory ground motion that could affect repository design or performance, as well as Study 8.3.1.17.4.5, detachment faults at or proximal to Yucca Mountain and Study 8.3.1.17.4.11, characterization of regional lateral crustal movement. This investigation and these studies are expected to analyze data collected and compiled through the subject study. We recommend that DOE/USGS revise the study plan to state more specifically the nature of this study plan and its relation to other investigations and studies, and re-submit the study for NRC review.

Criterion 2 -All study plan references have been provided when the study plan was issued.

A number of the references cited in the study plan have not been cited in the Site Characterization Plan (SCP). For the most part, the additional references are readily available either from the staff's own resources or through other library facilities. Should the need arise, during further review of this study plan, to obtain an additional reference that is found not to be readily available, it shall be requested from DOE. From a technical standpoint, the aforementioned deficiencies should not hinder further review of the study plan.

Criterion 3 -Open items relative to the QA program of the DOE contractor responsible for the study plan that could call into question the quality of the study plan, have been resolved.

There are no open items in the Yucca Mountain Project - U.S. Geological Survey - Quality Assurance Program Plan, YMP-USGS-QAPP-01, R5, dated May 3, 1989.

Identification of Objections (Objectives 2 through 6)

Criterion 1 -Potential adverse effects on repository performance;

None. Field activities under this study will not alter the site in a way that could affect repository performance. Fieldwork will be limited to the installation and operation of seismographic and related telemetry equipment. The only site impact will be the placement of the equipment.

Criterion 2 -Potential significant and irreversible/unmitigable effects on characterization that would physically preclude obtaining information necessary for licensing;

None. The study as described will not affect the collection of data under other site characterization activities. Data acquisition activities under this study are mostly dependent on data from other studies. These activities include compiling the historical earthquake record for the southern Great Basin, monitoring current seismicity at Yucca Mountain and the surrounding region, identifying earthquakes in the historical record that have been induced by underground nuclear explosions and by the impoundment of Lake Mead, and evaluating the potential for induced seismicity at Yucca Mountain by the excavation of the underground repository.

Criterion 3 -Potential significant disruption to characterization schedules or sequencing of studies that would substantially reduce the ability of DOE to obtain information necessary for licensing;

None. This study cannot disrupt characterization schedules because it is mostly dependent on data from other studies. The field activities under this study should have no impact on the schedules of other activities.

Criterion 4 -Inadequacies in the QA program which must be resolved before work begins.

There are no inadequacies in the USGS QA program that must be resolved before work begins.

Closure of NRC Open Items (Objectives 8 and 11)

Not applicable. DOE did not propose to close any open items with this study plan in its transmittal letter.

Need for Detailed Technical Review

This study plan does not require a detailed technical review in accordance with the five criteria listed under step 6 of Section 4.2 of the Standard Review Plan. However, certain technical issues were noted as part of the Phase I review. A technical issue that we consider significant enough to be relayed to DOE concerns the fact that the study plan appears to ignore a comment made by NRC in its review of the SCP regarding the compilation of seismic data. In the SCP DOE proposes to compile only the time, hypocenter, and magnitude parameters for all the earthquakes studied and to reserve compilation of additional parameters, such as focal mechanism, seismic moment, and spectral amplitudes, among others, to important earthquakes which have a magnitude of 5.5 or greater, or which may have had a substantial impact on the site. Such an arbitrary distinction is probably unnecessary, especially if data are collected in a digital format that readily renders itself to the determination of those parameters reserved for the "important" earthquakes. Such a distinction may be reasonable for the historical earthquakes where the compilation of the additional data would be a formidable task but not for the current seismicity, which is being recorded on media that lends itself to a routine determination of the additional parameters.

A second, less severe, concern with the study plan is that the study area is not centered on Yucca Mountain, but on the Nevada Test Site. This center is about twenty-five to thirty kilometers northeast of Yucca Mountain. As a result, some of the seismicity in the Owens Valley, California area is excluded from the study. In particular, the study plan appears to ignore the great Owens Valley earthquake of 1872, located about 130 kilometers west of Yucca Mountain.

PHASE I CHECKLIST OF STUDY PLAN 8.3.1.17.4.1:
HISTORICAL AND CURRENT SEISMICITY

I. Purpose and Objective

Describe the information to be obtained in the study.
Yes X No ___ N/A ___

Provide the rationale for information to be obtained.
Yes X No ___ N/A ___

II. Rationale for Study/Investigation

Provide rationale for tests and analysis, indicating alternatives considered and options, advantages, and limitations.
Yes X No ___ N/A ___

Describe the constraints for the study, considering:
- potential site impacts,
Yes X No ___ N/A ___

- need to simulate repository conditions,
Yes X No ___ N/A ___

- required accuracy and precision,
Yes X No ___ N/A ___

- limits of analytical methods,
Yes X No ___ N/A ___

- capability of analytical methods,
Yes X No ___ N/A ___

- time required versus time available,
Yes X No ___ N/A ___

- scale of phenomena and parameters,
Yes X No ___ N/A ___

- interference among tests, and
Yes X No ___ N/A ___

- interference between test and ES.
Yes X No ___ N/A ___

III. Description of Tests and Analysis
For Each Type of Test

Note: The activities described in this study plan do not involve testing as such. However, the data gathered as a result of these activities will be regarded as "tests" for the purposes of this checklist.

Describe general approach that will be used.
Yes X No ___ N/A ___

Describe key parameters that will be measured in test and experimental conditions under which the test will be conducted.
Yes X No ___ N/A ___

Indicate number of tests and locations.
Yes X No ___ N/A ___

Summarize test methods if non-standard procedure, summarize steps of test, how it will be modified, and reference technical procedure.
Yes X No ___ N/A ___

Indicate level of QA and provide rationale for any tests not QA level.
Yes X No ___ N/A ___

Reference the applicable specific QA requirements applied to tests.
Yes ___ No X N/A ___

Specify tolerance, accuracy, and precision required in tests.
Yes X No ___ N/A ___

Indicate range of expected results and basis for those results.
Yes X No ___ N/A ___

List equipment requirements, briefly describing special equipment.
Yes X No ___ N/A ___

Describe techniques to be used for data reduction and analysis.
Yes X No ___ N/A ___

Describe representativeness of tests, indicating limitations and uncertainties that apply to use of results.
Yes X No ___ N/A ___

Provide illustrations of test locations.
Yes X No ___ N/A ___

Discuss relationship of tests to set performance goals and confidence levels.
Yes X No ___ N/A ___

For Each Type of Analysis

Note: Since this study plan appears to be limited to data gathering and compilation activities, reserving analysis for other investigations and studies, the following checklist items are marked as "not applicable."

State purpose of analysis, indicate conditions to be evaluated and describe any uncertainty analysis.
Yes ___ No ___ N/A X

Describe methods of analysis, including analytical expressions and numerical models to be used.
Yes ___ No ___ N/A X

Reference the technical procedures document that will be followed during analysis.
Yes ___ No ___ N/A X

Indicate levels of QA applied.
Yes ___ No ___ N/A X

Identify data input requirements.
Yes ___ No ___ N/A X

Describe expected output and accuracy.
Yes ___ No ___ N/A X

Describe representativeness of analytical approach, indicating limitations and uncertainties that apply to results.
Yes ___ No ___ N/A X

IV. Application of Results

Briefly discuss where results from study will be used for support of other studies.
Yes X No ___ N/A ___

Refer to specific performance assessment analyses.
Yes X No ___ N/A ___

Describe where information from study will be used in construction equipment and engineering system design and development.
Yes X No ___ N/A ___

Describe where information from study will be used in planning other characterization activities.
Yes X No ___ N/A ___

V. Schedules and Milestones

Provide durations of, and interrelations among, principal activities associated with this study.
Yes X No ___ N/A ___

List key milestones including decision points associated with study activities.
Yes X No ___ N/A ___

Describe timing of study relative to other studies and other program activities.
Yes _X_ No ___ N/A ___

Provide dates for activities for the study plan: reference Section 8.5 in SCP.
Yes _X_ No ___ N/A ___

Document Name:
8.3.1.17.4.1

Requestor's ID:
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Author's Name:

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