



Department of Energy
Office of Civilian Radioactive Waste Management
Yucca Mountain Site Characterization Office
P.O. Box 98608
Las Vegas, NV 89193-8608

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QA: N/A

AUG 10 1994

Joseph J. Holonich, Chief
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Division of Waste Management
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

U.S. DEPARTMENT OF ENERGY (DOE) RESPONSES TO U.S. NUCLEAR
REGULATORY COMMISSION (NRC) COMMENTS ON STUDY PLAN 8.3.1.17.4.3,
"QUATERNARY FAULTING WITHIN 100 KM OF YUCCA MOUNTAIN, INCLUDING
THE WALKER LANE" (SCPB: 8.3.1.17.4.3)

Enclosed are DOE's responses to one comment and two questions
from NRC's review of the subject study plan (enclosure 1).
Enclosure 2 contains the responses to these comments and
questions.

The NRC comment suggests that planned geophysical surveys be
expanded. DOE believes that the suggested expansion would not be
cost-effective because the likelihood of generating the desired
information is very low. Further, it is assumed that random
seismic events of the kind and magnitude represented by the
Little Skull Mountain earthquake will occur periodically in the
area, and that these events are taken into account in our seismic
risk analysis and ground motion studies. Specific responses to
the comment and questions are in Enclosure 2.

If you have any questions, please contact Thomas J. Bjerstedt at
(702) 794-7590.

AMSL:TWB-4542

for Stephan J. Brocoun
Stephan J. Brocoun
Assistant Manager for
Suitability and Licensing

Enclosures:

1. Ltr, 9/2/93, Holonich to
Shelor, w/encl
2. Responses to NRC Comments

Joseph J. Holonich

-2-

AUG 10 1994

cc w/encls:

C. A. Kouts, HQ (RW-36) FORS
C. E. Einberg, HQ (RW-36) FORS
R. R. Loux, State of Nevada, Carson City, NV
Cyril Schank, Churchill County, Fallon, NV
D. A. Bechtel, Clark County, Las Vegas, NV
J. D. Hoffman, Esmeralda County, Goldfield, NV
Eureka County Board of Commissioners, Eureka, NV
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

1-346702

SEP 02 1993

Mr. Dwight E. Shelor, Associate Director
for Systems and Compliance
Office of Civilian Radioactive Waste Management
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, D. C. 20585

Dear Mr. Shelor:

SUBJECT: REVIEW OF U.S. DEPARTMENT OF ENERGY (DOE) STUDY PLAN "QUATERNARY FAULTING WITHIN 100 KM OF YUCCA MOUNTAIN, INCLUDING THE WALKER LANE"

On February 16, 1993, DOE transmitted the study plan, "Quaternary Faulting Within 100 km of Yucca Mountain, Including the Walker Lane" (Study Plan 8.3.1.17.4.3) to the U.S. Nuclear Regulatory Commission for review and comment. NRC has completed its review of this document using the Review Plan for NRC Staff Review of DOE Study Plans, Revision 2 (March 10, 1993). The material submitted in the study plan was considered to be consistent, to the extent possible at this time, with the revised NRC-DOE "Level of Detail Agreement and Review Process for Study Plans" (Shelor to Holonich, 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's documents related to site characterization (Consultation Draft Site Characterization Plan and the Site Characterization Plan for the Yucca Mountain site). The conduct of the activities described in this study plan will have no significant adverse impacts on repository performance and no objections to the activities described in this study plan were identified.

As part of its study plan review, the NRC staff 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 comment and two questions (Enclosure). The comments and questions will be tracked by the NRC staff as open items similar to Site Characterization Analysis (SCA) comments and questions.

In addition, the staff has several minor observations that DOE may wish to take into consideration in future revisions to the study plan. They are as follows:

- The Table of Contents, under section 3.2.1, is not consistent with the subsection titles found in the text.

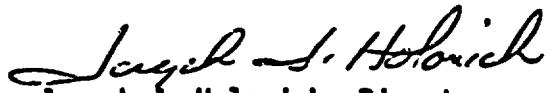
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ENCLOSURE /

- The final paragraph of section 1.2 states that information is needed so that facilities will be designed such that "damage due to ground shaking during earthquakes will not be excessive." Some clarification of the definition of "excessive" damage would be beneficial.
- In the list of references, the citations for Bender and Perkins, 1987, and for Evans and Oliver, 1987, are incomplete.

If you have any questions concerning this letter, please contact Charlotte Abrams (301) 504-3403 of my staff.

Sincerely,



Joseph J. Holonich, Director
Repository Licensing and Quality Assurance
Project Directorate
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

cc: R. Loux, State of Nevada
T. J. Hickey, Nevada Legislative Committee
C. Gertz, DOE/NV
M. Murphy, Nye County, NV
M. Baughman, Lincoln County, NV
D. Bechtel, Clark County, NV
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C. Schank, Churchill County, NV
L. Bradshaw, Nye County, NV

**Study Plan 8.3.1.17.4.3 Quaternary Faulting Within 100 km of Yucca Mountain,
Including the Walker Lane**

COMMENT 1

The June 29, 1992, Magnitude 5.6 Little Skull Mountain earthquake was approximately 20 km southeast of the center of the proposed perimeter drift outline. The areal extent of the geophysical surveys shown on Figure 2.2-1 does not appear to be sufficient to encompass the Little Skull Mountain region.

BASIS

- This concern was originally identified in the Phase I review of Study Plan 8.3.1.4.2.1, "Characterization of Vertical and Lateral Distribution of Stratigraphic Units Within the Site Area" (letter from Holonich to Roberts, dated December 14, 1992).
- Knowledge of the geologic structure responsible for the earthquake may be significant in assessing the seismic hazard of the site.
- Expansion of the geophysical surveys may provide a better understanding of the geologic structure which may have triggered the earthquake.
- In its March 22, 1993, letter (Shelor to Holonich), DOE indicated that the geographic area included within Study Plan 8.3.1.4.2.1 is not sufficiently large to encompass the Little Skull Mountain earthquake region.
- The March 22, 1993, letter further stated that the June 29, 1992, earthquake area would be covered in other preclosure tectonics studies such as Study Plan 8.3.1.17.4.1 (Historic and Current Seismicity) and Study Plan 8.3.1.17.4.3 (Quaternary Faulting Within 100 km of Yucca Mountain).
- It does not appear to the staff, during its re-evaluation of the above two preclosure tectonics study plans, that the areal extent of the geophysical surveys described within these study plans is sufficient to identify the geologic structure in the Little Skull Mountain earthquake area.

RECOMMENDATION

DOE should consider extending the areal extent of the geophysical surveys to cover the Little Skull Mountain area in order to identify the geologic structures associated with recent earthquake activity in that area.

ENCLOSURE

REFERENCES

DOE, Letter from D. Shelor, DOE, to J. Holonich, NRC; Subject: U.S. Department of Energy's responses to three comments from the U.S. Nuclear Regulatory Commission's Phase I review of Study Plan 8.3.1.4.2.1, "Characterization of Vertical and Lateral Distribution of Stratigraphic Units within the Site Area," March 22, 1993.

NRC, Letter from J. Holonich, NRC, to J. Roberts, DOE; Subject: Phase I review of U.S. Department of Energy (DOE) study plan "Characterization of Vertical and Lateral Distribution of Stratigraphic Units Within the Site Area," December 14, 1993.

**Study Plan 8.3.1.17.4.3 Quaternary Faulting Within 100 km of Yucca Mountain,
Including the Walker Lane**

QUESTION 1

What are the criteria for identifying faults or lineaments that have the potential for producing significant ground motion at the site?

BASIS

- Section 3.2.1.3 states, "Detailed work will only be done on those faults or lineaments that have the potential for producing significant ground motions at the site or that have a direct bearing on the current tectonic framework of the Yucca Mountain region."

RECOMMENDATION

Provide the criteria that will be used to determine which faults meet the stated conditions.

**Study Plan 8.3.1.17.4.3 Quaternary Faulting Within 100 km of Yucca Mountain,
Including the Walker Lane**

QUESTION 2

Why have no previous shallow seismic reflection (mini-sosie) surveys been referenced in the study plan, and how will the new lines described in the study plan be correlated with existing information?

BASIS

- Section 3.2.1.5 discusses shallow seismic reflection and seismic refraction surveys across the Beatty scarp.
- Harding (1988) conducted seismic reflection surveys across the Beatty and Crater Flat scarps.

RECOMMENDATION

Explain how the new seismic lines will be correlated with the work of Harding (1988).

REFERENCE

Harding, S.T., 1988, Preliminary results of high-resolution seismic-reflection surveys conducted across the Beatty and Crater Flat fault scarps, Nevada, in M.D. Carr and J.C. Yount, Geologic and Hydrologic Investigations of a Potential Nuclear Waste Disposal Site at Yucca Mountain, southern Nevada: U.S. Geological Survey Bulletin 1790, p. 121-128.

**U.S. Department of Energy Responses to
U.S. Nuclear Regulatory Commission Comment/Questions
on Study Plan 8.3.1.17.4.3
(Quaternary Faulting Within 100 km of Yucca Mountain,
Including the Walker Lane)**

Comment 1:

The June 29, 1992, Magnitude 5.6 Little Skull Mountain earthquake was approximately 20 km southeast of the center of the proposed perimeter drift outline. The areal extent of the geophysical surveys shown on Figure 2.2-1 does not appear to be sufficient to encompass the Little Skull Mountain region.

Response:

The nature of the faulting at Little Skull Mountain (LSM) is being addressed as part of Study 8.3.1.17.4.4, "Quaternary Faulting Proximal to the Site Within Northeast-Trending Fault Zones," and most particularly as part of the planned studies for the Mine Mountain fault system. In addition, aftershock studies have helped define the depth and orientation of the fault. Several fault splays are present in this area, and because there was no surface rupture associated with this earthquake, it is unlikely that shallow-looking geophysical methods could identify and characterize the responsible fault. It is assumed that random seismic events of the kind and magnitude represented by the LSM earthquake will occur periodically in the vicinity of Yucca Mountain, and these are being taken into account in our seismic risk analysis and ground motion studies.

Question 1:

What are the criteria for identifying faults or lineaments that have the potential for producing significant ground motion at the site?

Response:

Section 3.2.1.7 of Study Plan 8.3.1.17.4.3 states that fault and lineament data compiled from existing information and as collected in Activity 8.3.1.17.4.3.2 will be used to determine which of these features is the most critical to the potential repository site and, hence, requires the most intense investigation. Criteria for study represent the first cut at defining criteria to identify faults or lineaments having the potential for producing significant ground motion. There is also the important feedback that is provided from preliminary seismic hazard evaluations and the field program that gathers the data. The most important fault parameters to be considered in this identification are length of the fault or lineament and their distance from the site, which leads to a determination of maximum acceleration expected at the site. Other criteria that will be used in identifying potentially significant faults, particularly in the selective examination of specific faults, are the estimated recurrence interval and maximum magnitude earthquake, as derived from age and offset of sedimentary markers. Faults and lineaments that are most critical to the potential repository site also will be identified using the results of seismic hazard assessments.

Question 2:

Why have no previous shallow seismic reflection (mini-sosie) surveys been referenced in the study plan, and how will the new lines described in the study plan be correlated with existing information?

Response:

Previous shallow seismic reflection surveys are referenced in the study plan in Section 3.1.5, page 3-5. If and (or) when new shallow seismic surveys are conducted, the results will be checked and calibrated using those performed by Harding (1988).