



Department of Energy
Washington, DC 20585

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Mr. Joseph J. Holonich, Director
Repository Licensing & Quality Assurance
Project Directorate
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

References: (1) Ltr, Roberts to Holonich, dtd 12/21/92
(2) Ltr, Roberts to Holonich, dtd 1/21/93

Dear Mr. Holonich:

The transmittal of Study Plans 8.3.4.2.4.3, "Characterization of the Geomechanical Attributes of the Waste Package Environment," and 8.3.1.2.2.4, "Characterization of the Yucca Mountain Unsaturated Zone in the Exploratory Studies Facility," provides the basis to explicitly address Site Characterization Analysis (SCA) open items, Questions 17 and 57. The administrative record for Questions 17 and 57 in the enclosures consist of: (1) the U.S. Department of Energy's (DOE) December 14, 1990, SCA responses; (2) the U.S. Nuclear Regulatory Commission's (NRC) July 31, 1991, evaluation of these responses; and (3) a supplemental response with further explanation or additional information to resolve the open items.

On the basis of the information in the enclosure, DOE regards SCA Questions 17 and 57 as resolved.

If you have any questions, please contact Mr. Chris Einberg of my office at 202-586-8869.

Sincerely,

John P. Roberts for
Dwight E. Shelor

Associate Director for
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Office of Civilian Radioactive
Waste Management

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Enclosures:

1. Administrative Record for
SCA Question 17
2. Administrative Record for
SCA Question 57

cc w/enclosures:

- C. Gertz, YMPO
- T. J. Hickey, Nevada Legislative Committee
- R. Loux, State of Nevada
- D. Bechtel, Las Vegas, NV
Eureka County, NV
Lander County, Battle Mountain, NV
- P. Niedzielski-Eichner, Nye County, NV
- W. Offutt, Nye County, NV
- C. Schank, Churchill County, NV
- F. Mariani, White Pine County, NV
- V. Poe, Mineral County, NV
- J. Pitts, Lincoln County, NV
- J. Hayes, Esmeralda County, NV
- B. Mettam, Inyo County, CA
- C. Abrams, NRC

ENCLOSURE

SCA Question 17 and DOE Response (12/14/90)

NRC Evaluation of DOE Response (7/31/91)

Supplemental Response Relevant to SCA Question 17

Section 8.3.1.15 Performance and Design Parameters, Tentative Goals, and Characterization Parameters for Thermal and Mechanical Properties Program, Table 8.3.1.15-1, pages 8.3.1.15-2/13

QUESTION 17

What activities are planned to investigate the effects of radiation on thermal and mechanical rock properties?

BASIS

o The response to NRC CDSCP Question 51 implies that no direct investigations of radiation effects on thermal and mechanical properties are planned. The DOE response gives no indication as to how the radiation effects will be evaluated in terms of potential rock damage or deterioration.

o The SCP (p. 6-205) states that "the effects of radiation on thermal and mechanical rock properties have been identified as needed information in issue 4.4." However, an activity to investigate this effect has not been included in the SCP.

RECOMMENDATION

Activities planned to evaluate the potential for rock damage induced by radiation should be presented in SCP updates.

RESPONSE

Scoping studies of the effects of radiation are currently being incorporated into Study Plan 8.3.4.2.4.3 (Mechanical Attributes of the Waste Package Environment). The planned study includes, but is not limited to investigation of the effect of radiation on mechanical properties, such as compressive strength and fracture toughness, and on thermal properties and thermal expansion.

REFERENCES:

DOE (U.S. Department of Energy), 1990. Study Plan 8.3.4.2.4.3, Revision 0, Mechanical Attributes of the Waste Package Environment, Yucca Mountain Site Characterization Project Office, Las Vegas, Nevada. (In Preparation)

Section 8.3.1.15 Performance and design parameters, tentative goals, and characterization parameters for thermal and mechanical properties program, Table 8.3.1.5-1, pp. 8.3.1.15-2/13

SCA QUESTION 17

What activities are planned to investigate the effects of radiation on thermal and mechanical rock properties?

EVALUATION OF DOE RESPONSE

- o DOE states that "Scoping studies of the effects of radiation are currently being incorporated into Study Plan 8.3.4.2.4.3."
- o Progress toward resolution of the question will be deferred until DOE's submittal and subsequent NRC review of the referenced study plan.
- o The NRC staff considers this question open.

Supplemental Response Relevant to SCA Question 17

Study Plan 8.3.4.2.4.3 (Characterization of the Geomechanical Attributes of the Waste Package Environment) addresses the investigation of the effects of radiation on near-field thermal rock and mechanical properties. The number of radiation-dependent tests is noted in Table 2-1. A discussion of the number of radiation-dependent tests is included at the end of Section 2.2.1. The radiation-dependent tests are discussed in detail in Sections 3.3.1 and 3.3.2. In addition, the rationale (Section 2.2) for the Study Plan and its component activities discuss the testing and effect of the radiation on the rock.

ENCLOSURE

SCA Question 57 and DOE Response (12/14/92)

NRC Evaluation of DOE Response (7/31//91)

Supplemental Response Relevant to SCA Question 57

Section 8.4.2.2.2 Drilling-related activities, (Multipurpose borehole activity), page 8.4.2-74 Exploratory shaft facility testing operations, layout constraints, and zone of influence (Activity: Multipurpose borehole testing near the exploratory shafts), page 8.4.2.-145 Section 8.4.2.3.1.

QUESTION 57

How has the effect of drilling of possibly three multipurpose boreholes (including a borehole between ES-1 and ES-2) been considered with respect to (i) design flexibility of Upper Demonstration Breakout Room due to potential interference, and (ii) interference with underground testing at the main test level?

BASIS

- o The SCP (p. 8.4.2-145, third paragraph) states that "The holes are planned . . . complying with the 10 CFR 60.15 requirement that, to the extent practical, shafts and boreholes be located where large, unexcavated pillars are planned." The upper demonstration breakout room and the main test area layout need to be planned to meet this requirement.
- o It is not clear if the effect of drilling the proposed three multipurpose boreholes on the flexibility of locating upper demonstration breakout room has been considered.
- o The holes are planned to be at least two drift diameters away from any mined openings in the dedicated test area in the ESF. Due to the potential for deviation of the borehole from verticality during drilling, the maximum expected deviation should be considered in selecting borehole locations.
- o The SCP (p. 8.4.2-145) states that "A decision on the need for a third multipurpose borehole would be made on the basis of additional analyses before constructing ES-2." This borehole would be drilled between ES-1 and ES-2. However, potential interference between this third borehole and underground layout of ESF has not been considered in the SCP.

RECOMMENDATION

It is recommended that the SCP updates evaluate the influence of the location of multipurpose boreholes on (i) design flexibility of Upper Demonstration Breakout Room due to potential interference, and (ii) interference with underground testing at the main test level.

RESPONSE

The effect of drilling the multipurpose boreholes on the design of the Exploratory Shaft Facility (ESF) has been provided for in the ESF Title I design and the Design Acceptability Analysis. Regarding the potential for interference at the main test level, the locations of the multipurpose boreholes described in the Site Characterization Plan (SCP) were selected to be well away from excavated openings and outside any experiment influence zones. If the design of the ESF or the layout of the boreholes is modified, the borehole siting criteria in the SCP (pages 8.4.2-145 through 8.4.2-147)

would be applied. Note that these criteria apply to all three possible boreholes and that they take into account the expected deviation of the boreholes from vertical.

Regarding interference with the upper demonstration breakout room (UDBR), the siting constraints, which are described in study plan 8.3.1.15.1.5 (Excavation Investigations), the Subsystems Design Requirements Document, and the SCP (page 9.4.2-111), dictate the range of possible orientations of the drift, they do not, however, constrain the absolute direction of the drift from the shaft or the length and direction of the access drift connecting it to the shaft. The siting constraints for both the UDBR and the multipurpose boreholes can be met without conflict. Again, these constraints would be applied to any design changes.

REFERENCES:

DCE (U. S. Department of Energy), 1989. Study Plan 8.3.1.15.1.5, "Excavation Investigations." Yucca Mountain Project Office, Las Vegas, Nev.

Subsystems Design Requirements Document

Section 8.4.2.2.2 Drilling-related activities, (Multipurpose borehole activity), p. 8.4.2-74 Exploratory shaft facility testing operations, layout constraints, and zone of influence (Activity: Multipurpose borehole testing near the exploratory shafts), p. 8.4.2-145 Section 8.4.2.3.1

SCA QUESTION E7

How has the effect of drilling of possibly three multi-purpose boreholes (including a borehole between ES-1 and ES-2) been considered with respect to (i) design flexibility of Upper Demonstration Breakout Room due to potential interference, and (ii) interference with underground testing at the main test level?

EVALUATION OF DOE RESPONSE

- o DOE response states that the boreholes in the SCP were selected to be well away from excavated openings and outside any experiment influence zones. DOE's response further states that the siting constraints for the Upper Demonstration Breakout Room (UDBR) and the multi-purpose boreholes can be met without conflict.
- o DOE has not substantiated its statement that the locations for three multi-purpose boreholes given in the SCP would be sufficiently far from excavated openings or experiments taking into account possible hole deviation.
- o DOE's response does not address the issue of flexibility in locating the UDBR. If three boreholes are drilled prior to shaft sinking, the possible orientations for the UDBR are greatly reduced.
- o Progress toward closure of this question can be made if DOE provides details of degree of flexibility in orienting the UDBR. A diagram of the location of the multi-purpose boreholes and underground excavations and experiments may be used for this purpose. Possible hole deviations and potential interferences should be considered.
- o The NRC staff considers that DOE's response to this question is incomplete and therefore considers this question open.

Supplemental Response Relevant to SCA Question 57

The NRC has questioned how the effect of drilling of possibly three multipurpose boreholes (including a borehole between ES-1 and ES-2) has been considered with respect to (i) design flexibility of the Upper Demonstration Breakout Room due to ~~potential interference, and (ii) interference with underground~~ testing at the main test level.

Activity 8.3.1.2.2.4.9 (Multipurpose Borehole Testing) in Study Plan 8.3.1.2.2.4 (Characterization of Yucca Mountain Percolation in the Unsaturated Zone) was originally planned to monitor and evaluate hydrologic and engineering interference effects from Exploratory Shafts 1 and 2 on tests in these shafts. The activity was also planned to monitor interference effects between tests in the shafts, to sample perched water (if encountered), and to confirm engineering and hydrologic properties on which the ESF design is based.

Under the current ESF design with two ramps and an optional shaft, the DOE is no longer planning testing in a scientific shaft. Consequently, the testing planned in Activity 8.3.1.2.2.4.9 has been deleted from Study Plan 8.3.1.2.2.4 and from Revision 10 of the Site Characterization Program Baseline (YMP/CM-0011). Because these boreholes are no longer planned as part of the site characterization program, the DOE considers SCA Question 57 closed.