Department of Energy
Washington, DC 20585

NOV 1 1993

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, Shelor to Linehan, dtd 12/14/90
(2) Ltr, Bernero to Bartlett, dtd 7/31/91

Dear Mr. Holonich:

On December 14, 1990, the U.S. Department of Energy (DOE) sent its responses to objections, comments, and questions presented in the U.S. Nuclear Regulatory Commission's (NRC) Site Characterization Analysis (SCA) (Reference 1). The NRC staff evaluated these responses, and on July 31, 1991, closed some of the items and created open items of the remainder (Reference 2). The open items identified above have been addressed through actions and progress in the program.

Enclosures 1 and 2 summarize the administrative records with respect to SCA Comment 75 and Question 1.

DOE believes that the response provided addresses SCA Comment 75 and Question 1 and that these open items should be closed.

If you have any questions, contact Chris Einberg of my staff at (202) 586-8869.

Sincerely,

John P. Roberts for

Dwight E. Shelor
Associate Director for
Systems and Compliance
Office of Civilian Radioactive
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Enclosures:
1. Administrative Record for
   Comment 75
2. Administrative Record for
   Question 1

cc: w/ enclosures
R. Dyer, YMPO, w/o enclosures
R. Loux, State of Nevada
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C. Abrams, NRC

SCA Comment 75 and DOE Response (12/14/90)

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

Additional Information Relevant to SCA Comment 1 Open Item

ENCLOSURE 1

Section 8.3.4.2.4.4 Study 1.10.4.1: Engineered barrier system field tests (p. 8.3.4.2-57)

Section 8.3.5.7 Issue resolution strategy for Issue 4.1: Can the higher-level findings required by 10 CFR Part 960 be made for the qualifying condition of the preclosure system guideline and the disqualifying and qualifying conditions of the technical guidelines for surface characteristics, rock characteristics, hydrology, and tectonics? (p. 8.3.5.7-11.)

Section 1.8.1.1 Geomorphology (p. 1-325).

Section 1.8.1.4 Seismology and seismicity (p. 1-335).

Section 1.8.1.7 Mineral and hydrocarbon resources (p. 1-342).

COMMENT 75

The term "geologic setting" is cited frequently throughout the SCP in reference to diverse subject areas comprising the "geologic setting;" however, the term itself has neither been defined (see SCP, Volume VIII, Part B: Glossary and Acronyms) nor used consistently, that is, the component natural systems have not been systematically identified and described in plans to characterize them.

BASIS

- Given the complexity of the natural systems (this includes the geologic, hydrologic and geochemical subsystems) of the region in which a geologic repository operations area is or may be located, each subsystem must be evaluated separately, using the technical information considered appropriate for that component system.

- The NRC's evaluation of the adequacy of the technical information relative to any component system of the geologic setting is directly dependent upon the dog's definition and description of that natural system component as well as a depiction (appropriate figures) of the geographic extent (both laterally and vertically) of that component system.

- There is no clear definition of the term "physical domain" (Table 8.3.1.8.8) documenting how it relates to "Geologic setting" as used in 10 CFR Part 60.

- The SCP basis underlying the 70 km limit (Section 8.3.1.8.5) on volcanic activities (a natural system within the geologic setting) is not clear, but appears to exclude the Lunar crater volcanic field from consideration.

- Because of public comments received on a draft GTP on "anticipated processes and events and unanticipated processes and evens," the NRC staff is re-evaluating its position on the definition of the geologic setting. A proposed rulemaking to clarify the issue of the determination of anticipated processes and events and unanticipated processes and

events, including redefinition of the term geologic setting and the concepts underlying the term, is currently being prepared. For purposes of site characterization, the 10 CFR 60.2 definition of the geologic setting should be broadly interpreted.

RECOMMENDATIONS

- Describe the site characterization plans for identification of the natural component systems (such as volcanic, seismologic, mineral resources, geochemical) making up the geologic setting of the region in which the geologic repository operations area is or may be located.

- Describe the plans for characterizing the interacting or interdependent components that form each of the above natural systems and provide the bases for such descriptions.

- Define and depict the plans for characterizing the geographic extent (this includes the vertical as well as the lateral dimensions) of each of the above components of the natural systems making up the geologic setting.

- Describe the characterization plans aimed at identification, description, and developing schedules for any investigations, studies, and activities necessary to define each of the above components of the natural systems.

REFERENCES

U.S. Nuclear Regulatory Commission, "Disposal of High-Level Radioactive Wastes in Geologic Repositories," Federal Register, Vol. 48, No. 120, June 21, 1983, 28194-28229.

RESPONSE

The term "geologic setting" has intentionally not been given a standard definition in the Site Characterization Plan (SCP) because it is specifically defined on a case-by-case basis, depending upon the objectives of an individual investigation or study. As specified in the comment, the U.S. Nuclear Regulatory Commission itself is re-evaluating its definition of the term "geologic setting," and suggests a broad interpretation of the term for purposes of site characterization. Thus, the Project specifically defines the term for different investigative elements of the SCP; the specific meaning of the term should be readily apparent within the context of the individual investigation.

The term "physical domain" is essentially a tectonic term referring to a three-dimensional spatial element of the earth, in which physical processes are operative within the constraints of specified boundary conditions. The term is not directly related to the term "geologic setting," as used in 10 CFR Part 60. See response to Comment 46 for further explanation.

Section 8.3.4.2.4.4 Study 1.10.4.1: Engineered barrier system field tests (p. 8.3.4.2-57).

Section 8.3.5.7 Issue resolution strategy for Issue 4.1: Can the higher-level findings required by 10 CFR Part 960 be made for the qualifying condition of the preclosure system guideline and the disqualifying and qualifying conditions of the technical guidelines for surface characteristics, rock characteristics, hydrology, and tectonics? (p. 8.3.5.7-11).

Section 1.8.1.1 Geomorphology (p. 1-325).

Section 1.8.1.4 Seismology and seismicity (p. 1-335).

Section 1.8.1.7 Mineral and hydrocarbon resources (p. 1-342).

SCA COMMENT 75

The term "geologic setting" is cited frequently throughout the SCP in reference to diverse subject areas comprising the "geologic setting;" however, the term itself has neither been defined (see SCP, Volume VIII, Part B: Glossary and Acronyms) nor used consistently, that is, the component natural systems have not been systematically identified and described in plans to characterize them.

EVALUATION OF DOE RESPONSE

- DOE indicates that the term "geologic setting" is not amenable to a standard definition, that the term is study/investigation-dependent and that the specific meaning of the term should be readily apparent within the context of the subject under discussion.

- DOE indicates that the term "geologic setting" is indirectly defined within the different investigative elements of the SCP (study plans and investigations).

- In its response to the question of the definition of "geologic setting," DOE has indicated that the definition is subject-specific and "the meaning of the term should be readily apparent within the context of the individual investigation." However, in the NRC staff's evaluation of two volcanic-related study plans where definition of the "geologic setting" is appropriate, DOE's definition of the term is not readily apparent. In fact, the term "geologic setting" does not appear within either study plan.

- DOE has indicated (1) that it will "define" geologic setting on a case-by-case basis and (2) that the definition will be based upon the objective of the investigative element (study plan or investigation) under consideration.

- DOE's meaning of "physical domain" is presented in its response to this NRC comment. An expansion of this meaning is also found in NRC Comment 46. Within its response(s) DOE indicates that the term "physical domain"

is not directly related to the term "geologic setting" as used in 10 CFR Part 60.

- DOE has not responded to the NRC's comment regarding the SCP basis underlying the 70 kilometer limit on volcanic activities (a natural system within the geologic setting).
- It is unclear how DOE intends to meet requirements that depend upon the use of the term "geologic setting."
- Closure of this comment must await NRC staff review of the individual investigations (unspecified by DOE) that contain the specific meaning of the term "geologic setting."
- The NRC staff considers this comment open.

ADDITIONAL INFORMATION FOR COMMENT 75

In the Site Characterization Plan (SCP), the word "region" was generally used instead of the term "geologic setting." For the purposes of the SCP, a geologically meaningful region proved to be the southern Great Basin. The DOE considers the term region, as used in the SCP, to be consistent with the term "geologic setting."

Specific areas of study within the geologic setting will vary in size depending on the natural system (geologic, hydrologic, and geochemical) and the condition or processes that are being evaluated in the study. For example, the SCP Study Plan 8.3.1.17.4.3 (Quaternary Faulting Within 100 km of Yucca Mountain, Including the Walker Lane) proposes an area of investigation of 100 km for the regional study of Quaternary faults. This area was considered sufficient for the study of potentially significant faults (i.e., faults that could be relevant earthquake sources for seismic hazard studies and/or could affect long-term performance of the proposed repository) in the region. Conversely, SCP Study 8.3.1.17.4.6 (Quaternary Faulting Within the Site Area) investigates Quaternary faults within and adjacent to the controlled area of the proposed repository.

The NRC has now reviewed and accepted all study plans that provide data for regional investigations of the Yucca Mountain site. In one case, the NRC correctly questioned the basis for the 70 kilometer limit on studies of volcanism in the SCP. The DOE has reconsidered this limit, and the selection of volcanic fields for study will now be based on several criteria, including a location in the Basin and Range geologic province or marginal areas rather than a radius of proximity to the Yucca Mountain site (see Study Plan 8.3.1.8.5.1, Characterization of Volcanic Features, Revision 1, page 49). In all other cases, the NRC has accepted the proposed regional extent of the investigations.

To meet the requirements of 10 CFR Part 60 that relate to the geologic setting, the DOE has identified regional investigations in the SCP to evaluate conditions and processes outside of the controlled area. These investigations serve two purposes: (1) to enhance the understanding of the natural systems of the geologic setting, and (2) assess potential impacts of these conditions and processes on the natural systems within the controlled area over the period of performance of the proposed repository. The results of these studies will allow an evaluation of the extent to which the geologic setting, together with the engineered barrier system, provide reasonable assurance that the 10 CFR Part 60 performance objectives related to isolation will be met.

SCA Question 1 and DOE Response (12/14/90)

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

DOE Proposed Resolution (12/16/91)

NRC Evaluation of DOE 12/16/91 Proposed Resolution (5/5/93)

Additional Information Relevant to SCA Question 1 Open Item

ENCLOSURE 2

Section 8.3.1.17.4.9.3 Activity: Evaluate variations in the nature and intensity of Quaternary faulting within 100 km of Yucca Mountain through morphometric and morphologic analysis

Section 8.3.1.17.4.12.1 Activity: Evaluate tectonic processes and tectonic stability at the site

QUESTION 1

The SCP lists many surficial mapping projects, some of which are currently ongoing or are near completion. How does the DOE plan to integrate these various mapping tasks and the resultant information?

BASIS

o The SCP provides only a listing of mapping studies and provides little information as to how information obtained from one study may provide input or be integrated with each other.

o Individual mapping studies and activities will be conducted by investigators from Los Alamos National Laboratory, Sandia National Laboratories, and the U.S. Geological Survey resulting in the potential for non-integrated investigations and products.

o Map scales for studies and resultant maps do not appear to be compatible (e.g., Tectonic geomorphology, 8.3.1.17.4.9, a 1:20,000 and Surficial deposits mapping, 8.3.1.5.1.4.2, at 1:24,000).

o Many mapping studies appear to cover overlapping areas (e.g., Activities 8.3.1.5.1.4.2 and 8.3.1.16.1.1.1).

o Map scales do not appear to be appropriately detailed to provide information necessary to the study (e.g., Quaternary faulting, 8.3.1.17.1.6, at 1:24,000).

RECOMMENDATION

Consider developing a program to integrate mapping studies to provide integrated products at scales appropriate in detail to fulfill the objectives of the proposed activities.

RESPONSE

Maps are used to spatially portray different kinds of data. At Yucca Mountain, map products are planned to illustrate the distribution of geologic materials and features and hydrologic characteristics and features. The Project is developing a Geographic Information System (GIS) as a part of its Technical Data Base. The GIS will store and maintain digital versions of maps pertinent to all aspects of the Yucca Mountain Project along with the attributes of the features portrayed as spatial information. Integration of data from maps will take place during synthesis activities that call for the assessment and interpretation of multiple kinds of data. For example,digital

versions of the geomorphic map, site flood and debris hazards map, and the Quaternary fault map of Yucca Mountain will be combined and evaluated in order to assess the effects of future tectonic activity on future erosion at Yucca Mountain (Study 8.3.1.6.3.1). Similarly, data from the surficial geology map will be assessed with other collected data in order to evaluate the effect of future climate change on future erosion at Yucca Mountain (Study 8.3.1.6.2.1.).

The map scale for the main surficial deposits map of Yucca Mountain will be 1:12,000 (Study Plan 8.3.1.5.1.4., Analysis of the paleoenvironmental history of the Yucca Mountain region). Derivative maps may be made at smaller or larger scales depending upon the kinds and distribution of data to be illustrated. Larger scale maps may be made of small areas to illustrate detailed geologic or hydrologic relationships for specific reports (e.g., a map of exposed fault patterns for a specific fault study) that are not unambiguous at a scale of 1:12,000.

Since all of the maps produced for the Project will be stored in digital form, they can, within reasonable ranges, be displayed, combined, and output at scales other than that at which they were originally compiled.

Section 8.3.1.17.4.9.3 Activity: Evaluate variations in the nature and intensity of Quaternary faulting within 100 km of Yucca Mountain through morphometric and morphologic analysis

Section 8.3.1.17.4.12.1 Activity: Evaluate tectonic processes and tectonic stability at the site

SCA QUESTION 1

The SCP lists many surficial mapping projects, some of which are currently ongoing or are near completion. How does the DOE plan to integrate these various mapping tasks and the resultant information?

EVALUATION OF DOE RESPONSE

- DOE indicates that integration of map data will take place during synthesis activities but provides neither text, figures, tables nor schedules demonstrating that such synthesis will take place on a continuing basis and at frequent intervals.

- As demonstration of the above point, SCP Figure 8.3.1.6-6, p. 8.3.1.6-29 (Schedule information for studies in Site Program 8.3.1.6, erosion), indicates that interface (transfer of such information) is not scheduled for the erosion program until approximately four years into the initiation of data-gathering for the four erosion studies.

- DOE indicates a willingness (intent) to integrate the mapping studies and to provide integrated products at scales appropriate in detail to fulfill the objectives of the proposed activities but does not provide details relative to how such integration is to take place, and does not identify which investigators will be linked.

- DOE's schedule for integration, if based, for example, on that identified on the above SCP Figure 8.3.1.6-6, is insufficient to assure that the various elements of the mapping program will be integrated effectively.

- The key to the integration of the mapping studies is the Geographic Information System (GIS) which should link the various DOE investigators and hopefully others (including the NRC) as well, on a continuing basis, thus permitting instant availability (access) of data at all times.

- DOE does not indicate that the GIS will link the various investigators and does not indicate when the GIS will be operational and available to these investigators.

- Closure of this question must await NRC staff evaluation of an unspecified DOE plan or plans that address the integration of the mapping tasks.

- The NRC staff considers this question open.

Enclosure 2

SECTION 8.3.1.17.4.9.3 ACTIVITY: EVALUATE VARIATIONS IN THE NATURE AND INTENSITY OF QUATERNARY FAULTING WITHIN 100 KM OF YUCCA MOUNTAIN THROUGH MORPHOMETRIC AND MORPHOLOGIC ANALYSIS

SECTION 8.3.1.17.4.12.1 ACTIVITY: EVALUATE TECTONIC PROCESSES AND TECTONIC STABILITY AT THE SITE

SCA Question 1

The SCP lists many surficial mapping projects, some of which are currently on-going or are near completion. How does the DOE plan to integrate these various mapping tasks and the resultant information?

Evaluation of DOE Response

- On page 2-7 of DOE Progress Report 6, it is indicated that DOE believes that SCA Question 1 is resolved based on information provided in a letter dated December 16, 1991.
- In the Roberts to Linehan letter dated December 16, 1991, DOE indicates that mapping was being performed at a scale of 1:12,000 or larger, that the data would be compiled on 1:24,000 base maps, and that a Geographic Information System (GIS) is being developed to depict various data at different scales.
- Informal discussions have indicated that any GIS may be years away from the point where the staff will have easy access to DOE compiled data.
- In order to make early judgments on the adequacy of DOE's investigations and the ability to meet 10 CFR Part 60 requirements regarding siting and design, the staff will need accurate geologic maps depicting the location of Quaternary faults compiled at scales of 1:24,000 and larger.
- Study Plan 8.3.1.17.4.2 indicates that fault locations on a 1:24,000 scale map will be located within 24 meters on the ground. This accuracy is not adequate to provide the staff with sufficient information to make judgments regrading the adequacy of siting and design measures.
- Although DOE has indicated that a GIS is being developed, when this system will be emplaced and how the staff will access it is still an open question.
- The staff considers Question 1 to remain open.

Department of Energy
Washington, DC 20585

December 16, 1991

I-322252

Mr. John J. Linehan, Acting Director
Repository Licensing and Quality
Assurance Project Directorate
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Linehan:

This is in response to the U.S. Nuclear Regulatory Commission (NRC) comment on the U.S. Department of Energy (DOE) Study Plan 8.3.1.17.4.6, "Quaternary Faulting within the Site Area," as conveyed via NRC letter dated October 3, 1991 (Linehan to Shelor).

In its Phase I review, NRC found no objections to the DOE beginning work described in this study plan. The DOE would like to address the aspect of the NRC letter pertaining to the study plan's selected scale for fault mapping. The NRC wanted the DOE to consider mapping faults at a scale of 1:12,000 rather than at 1:24,000 as specified in Section 2.1.2.1 of the study plan.

The primary purpose of mapping faults at 1:24,000 is to highlight their potential interconnectivity. This characteristic is made more apparent at smaller map scales. Producing fault maps at larger scales in a geologic terrain where little bedrock exposure and much alluvial cover exists will not proportionately increase the number or length of known, as opposed to inferred, fault traces that are able to be mapped. Scott and Bonk's 1984 map of the eastern part of the site area will have companion maps to the west and south that are to be published by the U.S. Geological Survey (USGS) at a scale of 1:12,000.

The fault mapping under Study Plan 8.3.1.17.4.6 is being done on 1:12,000 scale aerial photographs and, in some cases, on 1:6,000 scale low sun angle aerial photographs where these are available. This information will then be compiled onto a 1:24,000 base map. The aerial photographs upon which mapping in the field takes place are part of a data records package, according to the USGS study plan technical procedure GP-01, and are not lost to subsequent examination. The USGS believes that there is no loss of information in mapping faults at 1:24,000. This is a pragmatic scale for the area being studied and the ratio of exposed to covered faults. The purpose for specific mapping should be the determinant of an appropriate scale, and not an arbitrary decision to produce uniform mapped products across the

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Yucca Mountain Site Characterization Project's (YMP) various field activities.

The NRC letter also mentioned several Site Characterization Analysis (SCA) open items with respect to this question of mapping scale. The implications of SCA Question 1 on the NRC comment on Study Plan 8.3.1.17.4.6 can be addressed herein. The other cited SCA comments, however, have little bearing on the study plan comment. The DOE has reviewed SCA Question 1, the DOE response, and the NRC reaction to our response in the enclosure to the NRC letter to DOE (Bernero to Bartlett; dated July 31, 1991). The DOE still regards its response to SCA Question 1 as adequate for the stated concern.

Although different studies and activities are gathering mappable data that often cover overlapping areas, the scales used for these maps are determined by the purpose for which the data is being mapped. DOE is uncertain of the NRC concept of integration with respect to mapped products. If the NRC concern rests with DOE's ability to depict various data at different scales, then our response to Question 1, which indicates that an Integrated Graphic Information System (IGIS) is being developed, should adequately address the concern. The IGIS will store mapped data in digital format for reproduction at whatever scale is needed. If, however, the NRC perceives that a lack of integration of mapped data exists in the YMP because of the fact that various studies or activities plan to produce or publish maps at different scales, then the DOE is uncertain how to respond to NRC's concern in SCA Question 1. On the basis of our response to SCA Question 1, and the amplification of that response herein, we believe the NRC's concern expressed in Question 1 should be considered closed.

Should you have any technical questions or concerns in this regard, please contact Thomas W. Bjerstedt at (702) 794-7590 or FTS 544-7590. Please address any other questions to Sharon Skuchko of my office at (202) 586-4590.

Sincerely,

John P. Roberts
Acting Associate Director for
Systems and Compliance
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ADDITIONAL INFORMATION FOR QUESTION 1

In a December 16, 1991, reply to NRC's Phase I comments on Study Plan 8.3.1.17.4.6 (Characterization of Quaternary Faulting in the Site Area), the DOE proposed to resolve Site Characterization Analysis (SCA) Question 1. In Enclosure 2 from a May 5, 1993, letter containing comments and questions on Site Characterization Progress Reports 6 and 7, the NRC did not agree that the basis to resolve Question 1 was provided.

Two separate technical concerns, we believe, have become commingled with respect to SCA Question 1. The first is map scales and their appropriateness for maps resulting from neotectonic studies. The second is integration of mapped products in general. The former concern was apparently voiced as an example of the latter concern.

With respect to neotectonic mapping scales, maps produced from Study 8.3.1.17.4.6 (Quaternary Faulting Within the Site Area), will be published by the USGS at scales of 1:24,000 and 1:12,000. Smaller scale maps showing faults will be produced at 1:24,000 to depict faults over larger areas, while larger scales will be used in areas proximal to the potential repository block, or where prospective surface facilities could be located. The December 16, 1991, letter stated that companion maps to the 1:12,000 map published by Scott and Bonk (1984) were to be made to the west and south of the area covered by their map. The base maps used in the field to perform all mapping for Study 8.3.1.17.4.6 are at a scale of 1:12,000. Base maps used by the field geologist are part of the records package resulting from the preparation of geologic maps. Please see USGS Technical Procedure GP-01, Revision 0, which was sent to the NRC (Shelor to Holonich, dated February 24, 1993). In some cases, aerial photography at 1:6,000 will be used to supplement the 1:12,000 scale base maps. After USGS and the DOE approve a map for publication, the base maps and any aerial photography used for map preparation will be available in the Yucca Mountain Site Characterization Project Office (YMPO) Technical Data Management System, and would be identified in the corresponding quarterly update of the YMPO Technical Data Catalog.

The NRC On-Site Representative and NRC staff recently completed an Appendix 7 interaction on April 29, 1993, to discuss the capabilities of YMPO's Technical Data Management System/GIS System. Again, on August 10-11, staff visited Denver and Las Vegas to better understand our 3-D geologic modeling capability, and access to it via ARCVIEW. We also believed that the ACNW tour of the YMPO GIS facilities on October 22, 1992, was highly productive. The NRC is purchasing their own GIS system. Therefore, we are surprised that the NRC appears to be so skeptical that the GIS system is the appropriate tool for integration of spatial data on YMP.

The GIS is YMPO's main integration tool for spatial data. This system will be the platform for all maps in the Technical Data Base for the site characterization program. A list of available maps in the GIS will be compiled into a GIS catalog, the first edition of which will be distributed in fiscal year 1994. Even though YMP is using a GIS system, YMP also intends to publish maps using standard publication outlets, at scales that are appropriate for the purpose of the mapping. In addition, the YMP Site Atlas shows the location of site characterization activities, is revised annually, and is distributed to the NRC. The maps in the Site Atlas will be linked to the GIS catalog for easy reference. The geologic data plotted on published maps, for example the 1:24,000 and 1:12,000 scale maps to be published by the USGS as part of Study 8.3.1.17.4.6, can then be digitized for storage in the GIS. This spatial data is then available for call-up for other GIS-produced maps at customized scales.

The NRC will be able to have read access to various layers of data through the ARCVIEW system. Because of the high cost of sending data of this type electronically to Washington, D.C. (i.e., new cable lines would have to be installed), it is unlikely that the NRC would be able to have real-time (the minute it is entered) on-line access to the GIS data. However, various data layers can be installed on the NRC's ARCVIEW system once it is in place (e.g., geology, hydrology, location of drillholes, trenches, etc.), and the layers can be updated at various intervals. The question of NRC access to YMPO's GIS is a separate issue from NRC understanding and acceptance of the GIS system as an appropriate integrating tool for site characterization map data, which is the primary concern to which we are responding.

DOE believes that both concerns (neotectonic map scales and integration tools for spatial data) from NRC's May 5, 1993, evaluation of DOE's December 16, 1991, response to SCA Question 1 have been addressed, and that Question 1 should be resolved.