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U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

EXPLORATORY SHAFT DESIGN AND CONSTRUCTION - RESPONSE TO INFORMATION REQUEST FROM THE NUCLEAR REGULATORY COMMISSION (NRC), APRIL 14, 1983, AND STATUS OF COMMITMENTS RESULTING FROM NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS (NNWSI) PROJECT/NRC MEETING OF AUGUST 27-28, 1985

- References:
- (1) Letter, Seth M. Coplan to Dr. Donald L. Vieth, dated April 14, 1983
 - (2) Letter, Dr. Donald L. Vieth to John J. Linehan, dated June 7, 1985
 - (3) NNWSI/NRC Meeting Summary, Observations, Agreements and Open Items, dated August 27-28, 1985
 - (4) Letter, John J. Linehan to Dr. Donald L. Vieth, dated November 25, 1985
 - (5) Letter, T. O. Hunter (Sandia) to D. T. Oakley (Los Alamos), "Performance Analysis Studies to be Used in Determining Quality Assurance Levels for the Exploratory Shaft Design and Construction Activities," July 2, 1985 (Transmitted to NRC by letter, D. L. Vieth to J. J. Linehan, July 15, 1985)

The purpose of this letter is to provide a further response to NRC's letter of April 14, 1983, requesting information on the exploratory shaft construction and sealing (Reference 1) and to provide the status of the Agreements and Open Items which resulted from the NNWSI Project/NRC meeting on the same subject held on August 27 and 28, 1985 (Reference 3). The participants of this meeting discussed a preliminary response (Reference 2) to your initial information request. In addition, this letter considers the formal comments of NRC on the NNWSI Project preliminary response (Reference 4).

In the NNWSI Project's June 7, 1985, letter and supporting reference documents, and the U.S. Department of Energy's (DOE) Project presentations at the August 27-28 meeting with NRC, DOE presented its preliminary conclusion that the ability of the repository to meet NRC regulations is not significantly affected either by the degree of rock damage which can be anticipated near the exploratory shaft (ES) using planned excavation methods or by the quality of the liner.

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John J. Linehan

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This conclusion was based on the results of a performance analysis (Reference 5) study done by the Project. The proposed construction controls evolved from this conclusion. In addition, the Project stated that testing and exploration to be performed are described in the "Exploratory Shaft Test Plan" which is not yet available for NRC review. The Project did not address several of NRC's requests for information since the information requested has not yet been developed. The construction of a second exploratory shaft was not explicitly addressed in the study, although the conclusions for the first shaft apply equally to the second shaft.

It should be noted that the scope of the performance analysis study (Reference 5) is to provide a basis for the determination of the quality levels to be applied to the exploratory shaft design and construction. The study, therefore, is limited to consideration of rock damage during construction, the role of the shaft liner, and the role of the shaft internals.

Enclosure 1, NNWSI Project responses to NRC's April 14, 1983, request for "Information Necessary Regarding Exploratory Shaft Construction and Sealing" updates the Project's preliminary responses of June 7, 1985 (Reference 2) and will be utilized by the Project as the basis for tracking and documenting further development of information on the subjects.

Enclosure 2, Status of Open Items resulting from the NNWSI Project/NRC meeting on August 27-28, 1985, correlates the Open Items with the subject of Enclosure 1.

The Agreements resulting from the August 27-28 meeting are discussed in Enclosure 3, "Status of Agreements." No further tracking of these items appears to be necessary.

Table 1 of this letter shows the correlation of information requests and Open Items of the August 1985 meeting and summarizes the status of each information item. The Open Items will be tracked using Table 1.

In summary, the NNWSI Project will revise its performance analysis study (Reference 5) considering the NRC's comments. Conclusions which result from the revision will be the basis for the NNWSI Project Exploratory Shaft Facility Quality Assurance Program and construction controls. The conclusions of the revised study and the Project's plans for design and construction will be discussed at a second meeting between the Project and NRC, to be held later this year. The NNWSI Project Exploratory Shaft Test Plan (ESTP) will be transmitted to NRC and will be the subject of an NNWSI Project/NRC technical meeting which will also be scheduled for later this year.

If you have questions on this subject, please contact J. Szymanski at FTS 575-1503.



Donald L. Vieth, Director
Waste Management Project Office

WMPO:JSS-1161

Enclosures:

1. Responses to NRC's April 14, 1983 request to NNWSI Project.
2. Status of Open Items resulting from the August 27-28 meeting.
3. Status of Agreements
4. Table 1

cc w/encl:

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Enclosure I

Responses to NRC's April 14, 1983,
request to NNWSI Project,
"Information Considered Necessary Regarding
Exploratory Shaft Construction and Sealing."

(These responses are an update of the NNWSI Project's June 7, 1985,
transmittal to NRC.)

I. Shaft and Seal Design Considerations

- a) Provide an analysis of the potential effects of construction of the exploratory shaft on long-term sealing capabilities of the rock mass and identify factors that determine the nature and extent of such effects
- b) Describe how the selected excavation technique and shaft design accounts for limitations and uncertainties in long term sealing considerations
- c) Provide design specifications for the shaft construction and show how they deal with the factors affecting sealing
- d) Describe the seal design and materials
- e) Discuss the selected locations of any planned explorations or testing to be performed along the length of the shaft. Include discussion of data on sealing characteristics to be gathered and the limitations and uncertainties associated with the data.
- f) Provide drilling history and results of geotechnical testing from the principal borehole, G-4

Response:

- a) The preliminary performance analysis study (Letter Report, Hunter to Oakley, 7/2/85) will be revised and transmitted to the NRC by October 3, 1986. The revised study will address the NRC concerns expressed at the August 27-28, 1985, meeting and in the November 25, 1985, letter. See Agreements 2, 3, and 4 of Enclosure III.
- b and c) The design specifications and acceptance criteria for shaft construction including construction controls, test blasting and overbreak control will be provided to the NRC when available. The plan for finalizing the specifications, criteria and controls is to develop the technical information necessary to implement revised blasting specifications. This will allow the development of technically defensible controlled blasting specifications, in the event they are determined to be necessary, to meet operational or postclosure radiological safety and isolation requirements based on

6the results of the revised performance analysis study (see I.(a) above). This will involve gathering available technical literature and review to form a firm technical foundation of knowledge. A first step will be to review information concerning the blast damage zone. A second step is to attempt to gather performance data from blasting at G-tunnel at the Nevada Test Site (this blasting is required for other needs and obtaining blast damage data would be a secondary objective). Opportunities will be available in FY 86 and FY 87 to obtain this data. Coincident with these efforts, informal communication with mining professionals will continue.

Different blasting specifications can be incorporated easily into ESF construction plans at any time until actual construction bids are requested.

The date for complete closure on this item depends on the resolution of need for controlled blasting which will be based on the results of the revised performance analysis study.

This item will be a subject of discussion at the second meeting on ESF Design and construction.

- d) The shaft seal design concepts and materials are described in the Repository Sealing Concepts Report, SAND 83-1778. Further development in this area depends on the results of the revised performance analysis study as well as numerous other planned studies that will be reported in the SCP Conceptual Design Report, Advance Conceptual Design studies report, the License Application design report, etc. Further discussion with NRC on the subject of sealing will occur at the meeting on the NNWSI Project repository design. This meeting has not yet been scheduled.
- e) This information will be contained in the "NNWSI Exploratory Shaft Test Plan" and will be discussed with NRC at a meeting on that Plan which is yet to be scheduled. A summary of test plans was presented in the June 7, 1985, transmittal to the NRC and the pertinent parts of that summary are repeated here.

"Eight tests are planned to start ES construction. One of the eight, shaft-wall mapping, photographing, and hand specimen sampling, will be conducted routinely following each blast round as the ES-1 is being sunk. ...large-block sampling for porewater analysis, ³⁶Cl age dating, and geomechanical testing, will follow selected blasting rounds at 15 to 30 locations in the shaft. ...unsaturated-zone water sampling [will also be conducted]... The remaining tests initiated during ES construction will be at predetermined depths... These tests include (1) vertical and lateral coring to confirm adequacy of geologic and hydrologic conditions before breakout at the 158-m (520-ft) level, the 366-m (1200-ft) level, and the shaft bottom at 451-m (1480-ft); (2) the tests performed in the upper and lower demonstration breakout rooms (DBRS) to assess constructibility and stability of repository-sized drifts; (3) shaft convergence tests, between the 158-m (520-ft) and 366-m (1200-ft) breakouts, and (4)

permeability tests also at the 158-m and 366-m levels."

"Most of the tests will be conducted at the 366-m (1200-ft) level in drifts located off the lower DBR. However, a few tests will also be performed in the upper DBR, in a drill room at the bottom of the ES-1, and through the ES-1 shaft liner at selected depths.

"It is currently planned to perform hydrologic tests at the interface of the Calico Hills and the Topopah Spring units and within the upper few meters of the Calico Hills unit. The purpose of these tests are (1) to investigate whether significant, sustained water flow in fractures is possible between the Topopah Spring and the Calico Hills units and within the zeolitized tuff of Calico Hills and (2) to obtain bulk hydrologic and geochemical properties for water flow within the Calico Hills unit...

"The data collected in these tests will be used in the final design and construction of the shaft seals, which will be emplaced during [closure.] Of particular significance to seal design and construction will be the extent and nature of the overbreak surrounding the shaft, and the extent of faulting, fracturing, and water producing zones..."

- f) The information requested is contained in the report, "Stratigraphic and Structural Characteristics of Volcanic Rocks in Borehole USW-G4," USGS-OFR-84-789 and the report "Uniaxial and Triaxial Compression Test Series on Topopah Spring Tuff from USW G-4, Yucca Mountain, Nevada", SAND84-1011. The latter report was transmitted to you on March 4, 1986, completing the response to this request.

II. Construction Plans and Procedures

- a) Identify the acceptance criteria for construction of the exploratory shaft
- b) Identify procedures used to minimize damage to the rock mass penetrated
- c) Identify liner construction and placement technique. Include such information as: liner type, liner material testing and placement of liner. This information needs to be fully considered in application of any permanent sealing program.

Response:

- a) Specific acceptance criteria for the ES are still being developed and will be incorporated into drawings and specifications. It is the NNWSI Project position that these criteria and their implementing construction controls need be no more strict than those required for short term stability. Therefore, these criteria will be representative of good quality, conventional shaft construction practices. Normal Title III inspections will verify compliance and quality assurance surveillance will provide additional

documentation. This item is closed.

- b) Short-term stability and safety requirements suggest that the use of excavation procedures transmitted to NRC as Enclosure A to Reference 2 will be adequate. These procedures limit the damage to the penetrated rock mass to reasonable levels. Note that some damage to the penetrated rock mass will occur due to stress relief even if no blasting were used. In view of the insignificant impact of the potential damage on the long-term repository performance, no special requirements have been identified. This item is closed.
- c) The NNWSI Project approach to construction and placement of the liner was transmitted to NRC as Enclosure B of Reference 2. The construction methods will not preclude the removal of the liner, if in the future it is determined to be necessary to emplace sealing components. This item is closed.

III. Sealing or Grouting Plans and Procedures

- a) Describe how the seals are expected to perform in sealing the exploratory shaft. Describe tests done, both laboratory and field, to determine their long-term durability and their compatibility, both chemical and physical, to the host rock environment.
- b) Describe the placement methods.
- c) Describe remedial methods to be used if sealing methods are not adequate.

Response:

- a, b and c) This question is believed to be related to seals planned for installation during construction of the ES. As identified in the August 27-28, 1985, meeting, such seals are not planned for an ES at Yucca Mountain since all construction is above the water table. Plans for monitoring potential vadose water inflow will be discussed in the ESTP. These items should, therefore, be considered closed.

Future discussions of postclosure performance of seals emplaced prior to closure (not during ES construction) will be held with NRC on a basis much broader than for the ES alone.

Remedial methods for seals intended to function during postclosure are not planned. Design philosophy will emphasize conservative assumptions and redundancy to preclude necessity for remedial measures.

IV. Construction Testing and Inspection Plans and Procedures

- a) Describe test and inspection procedures to be used during excavation (e.g., plumbness of hole, rock mass disturbance etc.) to determine acceptability of the shaft as constructed.
- b) Describe test and inspection procedures to be used during shaft liner construction. Include information such as grout injection

rates, grout bond logs, thermal measurements of grout during curing, and liner instrumentation to be used.

- c) Describe test and inspection procedures to be used after sealing of the shaft to assess the results of the sealing effort in controlling adverse effects. Include information such as grout strength tests, visual identification of seal conditions, records of water inflow, assessment of seal bond to host rock, and logging of drill holes.
- d) Describe plans to document the above construction activities.

Response:

- a) Test and inspection procedures utilized during ES construction, other than site characterization, will be developed based on the acceptance criteria developed during the Title II design (See Response IIa, above). It is anticipated that the Title II design will be complete by September, 1986. The Project will discuss the acceptance criteria which form the bases for the procedures in the second ESF design and construction meeting.
- b) This information request appears to be based on the blind bored shaft concept presented in LA-9179-MS. As the exploratory shaft is planned to be conventionally sunk, a grouted steel liner is no longer proposed. Pressure cells are planned to be installed in the concrete liner as part of the shaft convergence testing. This item is closed.
- c) This question is believed to be related to seals planned for installation during construction of ES. Such seals are not planned for ES at Yucca Mountain since all construction is above the water table. Test and inspection procedures are therefore not required. This item is closed.

Test and inspection procedures for use during construction of the shaft seals intended for postclosure are not required at this time.

- d) The documentation of construction activities will be in the Title III summary reports. The format of these reports is to be determined but the reports will contain as a minimum: 1) summaries of construction inspection reports; 2) materials testing reports; 3) change order records; and 4) as-built drawings. These reports should be available about six months after completion of construction. This item is closed.

V. Plans and Procedures for Gathering Specific Information Related to Site Characterization

- a) Describe test plans and procedures used to obtain adequate data on site characteristics that can be measured either directly or indirectly during construction of the exploratory shaft. For example:
 - o Geologic mapping and rock mass characterization of the shaft

walls

- o Measurements of rates and quantities of groundwater inflow and collection of groundwater samples for testing
- o Measurements of overbreakage during blasting
- o Rock mechanics testing of samples obtained during drill and blast operations

Response:

- a) The plans for gathering data during construction of the exploratory shaft are contained in the NNWSI Project "Exploratory Shaft Test Plan" (ESTP). Detailed test and measurement procedures have not yet been completed. The ESTP will be discussed at a meeting with NRC on that subject. The meeting has not yet been scheduled.

VI. Quality Assurance (QA)

Administrative Procedures

- a) Identify the line of responsibility for implementing QA procedures down to and including the Construction Contractor "... (10 CFR 50 Appendix B. Criteria I requires that 'organizations performing quality assurance functions shall report to a management level such that this required authority and organizational freedom, including sufficient independence from cost and schedule when opposed to safety consideration, are provided.)..."
- b) Identify the procedures to be used by the Quality Assurance organization for implementing and monitoring the QA program for exploratory shaft design, construction and testing.

Response:

- a) The line of responsibility was described in the June 7, 1985, transmittal to the NRC and discussed at the August meeting. The description from the June 7 transmittal is reproduced here for completeness. This response is completed.

"The line of responsibility starts with DOE/HQ, which has mandated to DOE/NV that quality practices will conform to ANSI/ASME NQA-1-1983. DOE/NV has in turn written and issued NVO-196-17, entitled Nevada Nuclear Waste Storage Investigations Quality Assurance Plan, which conforms to ANSI-ASME NQA-1-1983. NVO-196-17 requires that each organization participating in the NNWSI Project write a Quality Assurance Program Plan plus write (or cite) detailed procedures for all items or activities judged to be Quality Level I or II. Reynolds Electrical and Engineering Co. (REECO) will be the construction contractor for the ESF; however, the shaft sinking and underground drifting will be performed by a subcontractor. Therefore, the line of responsibility flows from DOE/HQ to DOE/NV to participating

organizations and, in the case of REECo, on to the shaft sinking subcontractor. Quality assurance procedures for the Level I and II shaft sinking and drift mining activities will be either written or adopted from such professional societies as ASME, IEEE, AIME, ASCE, etc. These procedures will be part of the subcontract.

- b) The QA procedures for exploratory shaft construction and testing will be completed prior to the start of shaft construction. The anticipated start of construction is May, 1987. Identification of these procedures will be transmitted to the NRC by March, 1987. (NRC VI B-1, this response is complete). The Quality Level assigned to exploratory shaft construction and to data collection during construction will be based in part on the revised performance analysis study and will be a topic of discussion at a meeting with the NRC yet to be scheduled (NRC VI B-2 and NRC VI B-3).

ENCLOSURE II

STATUS OF OPEN ITEMS RESULTING FROM
THE DOE/NRC MEETING
AUGUST 27-28, 1985

1. DOE would like copies of Ted Johnson's analysis that indicated the 1/2" run-off from the E.S. Drainage Area could result in a 4 order of magnitude increase of water into the ES over the SNL 500-year floor scenario.

RESPONSE

- o Open item 1: The NRC Analyses "Review of Flooding Analyses, Exploratory Shaft Performance Analysis Study, NNWSI," was transmitted to D. L. Vieth by letter from J. J. Linehan, April 21, 1986. Closed.
2. DOE would like a copy of the report on in situ stress measurement at NTS referenced by David Conover.
 19. The NRC will provide the DOE with the U.S. Bureau of Mines reference related to horizontal stress of southern Nevada rocks.

RESPONSE

- o Open Items 2 and 19: The USBM reference is: "In Situ Testing Determination of Stress in Rocks," Mining Engineering, pp. 51-58, August 1962, per NRC. Closed.
3. DOE would like specific details on the areas of landslides at Yucca Mountain referenced by John Trapp.

RESPONSE

- o Open Item 3: In a letter of December 3, 1985, (Linehan to Vieth) the following information was referenced in response to this Open Item:
 - Scott, R. B. and Bonk, J. "1984 Open File Report 84-494, page 8, Preliminary Geologic Map of Yucca Mountain, Nye County, Nevada with Geologic Sections"
 - Scott, R. B. referred to these slide areas during the 9/84 Geology Data Review in Nevada.
4. NRC [is to provide its] position on the 1 part per 100,000 release limit as an instantaneous differential or an integral over a year.

15. The NRC is to furnish the DOE with the information as to whether NRC's 10^{-5} /yr release rate applies on a discrete year-by-year basis or a continuous rate basis.
 - o Open Items 4 and 15 are NRC's responsibility.
5. Need to establish an authoritative set of references on the subject of rock damage around openings in the earth.

RESPONSE

- o Open Item 5: A report on the zone of modified permeability ("damage zone") around openings is being prepared and will contain a bibliography developed by IT Corporation supplemented by additional references developed by Van Eeckhout. This report will be transmitted to NRC by 10/3/86. This item will be closed by that transmittal.
6. Need to establish a common approach to evaluating the magnitude of the damage around openings.
18. The DOE will provide the NRC with the data (e.g., RQD's stresses, hydraulic conductivities) used to get the results presented during the DOE presentation on damage zone model for tuff.

RESPONSE

- o Open Item 6 and 18: Due to the importance of having a well defined damage zone model, we have initiated additional efforts that will refine that model. All information used to develop the damage zone model will be included in this report. This item should be left open until the report is transmitted to you. Our anticipated date of transmittal is July 1, 1986. The common approach to evaluating the magnitude of the damaged zone should be an agenda item for the second meeting on exploratory shaft design and construction.
7. Need to establish the properties of characteristics that can be used in the evaluation of "representativeness." A method for analyzing the data also needs to be established.

12. During the DOE presentation on the rationale for selection of the site for the exploratory shaft, the DOE stated that the site chosen is representative of the repository block but indicated that discussion of the question of representativeness would be deferred. The NRC staff agrees that this should be an agenda item for a future meeting.

RESPONSE

- o Open Items 7 and 12: A determination needs to be made as to which properties or characteristics, capable of being measured from the surface, need to be evaluated as a basis for determining representativeness. This subject should be an agenda item for the Exploratory Shaft Design and Construction second meeting.

8. Need to structure the Open Items in a manner that will allow the April 1983 NRC Letter (Coplan to Vieth) to be closed out.

RESPONSE

- o Open Item 8: This transmittal includes the structure which relates the Open Items to the April 1983 letter (see Table I). Closed.

9. NRC final comments on the Draft Performance Assessment on the Exploratory Shaft.

RESPONSE

- o Open Item 9: The November 25, 1985, letter from Linehan to Vieth provided these comments. Closed.

10. Need to review section 60.21(c) to determine NRC's expectations regarding the information of fracture characteristics to be obtained from the exploratory shaft.

RESPONSE

- o Open Item 10: NNWSI Project will initiate a discussion with NRC on this item by August 1, 1986.

11. NRC staff [member] concerned about the fact that the second exploratory shaft was located outside of the preferred area, needs to more thoroughly explain his logic as to why this is a significant point. Is it an issue related to validity of testing data or radiological health and safety?

RESPONSE

- o Open Item 11: NNWSI Project will initiate a discussion with NRC on this item by August 1, 1986.
12. See 7, above.
 13. The DOE will provide to the NRC the Keystone Document 6310/85/1, Recommended Matrix and Rock Mass Bulk, Mechanical, and Thermal Properties for Thermomechanical Stratigraphy of Yucca Mountain, Version 1, October 1984, related to selection of the repository horizon.

RESPONSE

- o Open Item 13: A copy of the Keystone Document, "Recommended Matrix and Rock Mass Bulk, Mechanical, and Thermal Properties for Thermomechanical Stratigraphy of Yucca Mountain," was transmitted to you on March 4, 1986. Closed.
14. The DOE delineated the underground layout of the exploratory shaft and drifts and stated that underground testing considerations heavily influenced the layout. The NRC cannot assess the adequacy of the planned tests and hence the testing layout until the test plans are provided prior to the NNWSI/NRC ESTP meeting.

RESPONSE

- o Open Item 14: This item cannot be closed until the Project meets with the NRC on exploratory shaft testing. This meeting has not yet been scheduled.
15. See 4, above.
 16. The DOE will furnish the NRC with the document which contains recent information on thickness of the Calico Hills.

RESPONSE

- o Open Item 16: A copy of SAND85-1076, "A Three Dimensional Model of Reference Thermal/Mechanical and Hydrological Stratigraphy of Yucca Mountain, Southern Nevada," was transmitted to you on March 4, 1986. This report contains the basic information on the stratigraphy that was used to construct the three-dimensional model that currently is being used by SNL in design studies. Contained in this report are the data on the Calico Hills unit that was requested by the NRC.

In this report the NRC will find discussions on the presence of zeolites within Yucca Mountain, as well as the methodology used to create the three-dimensional model. It must be emphasized that we occasionally revise the model as our understanding of Yucca Mountain increases. The reference information base will include the three-dimensional model and it is that model which forms the basis for our calculations. Closed.

17. The DOE will send the NRC copies of the viewgraphs used in the DOE's presentation of the damaged zone model for tuff.

RESPONSE

- o Open Item 17: A copy of the viewgraphs presented on the damage zone model during the subject meeting was transmitted to NRC on March 11, 1986. This item is closed.
18. See 6, above.
 19. See 2, above.
 20. DOE will provide NRC with information relating to testing performed in/on samples obtained from USW G-4 in addition to that presented in USGS-OFR-84-789.

RESPONSE

- o Open Item 20: The report SAND84-1101, "Uniaxial and Triaxial Compression Test Series on Topopah Springs Tuff from US G-4, Yucca Mountain, Nevada," was transmitted to you on March 4, 1986. Closed.
21. NRC requests that DOE identify the schedule for providing the items identified in DOE's response of June 7, 1985 as being under development.

RESPONSE

<u>Information Item</u>	<u>Subject</u>	<u>Schedule</u>
III a)	Design requirements for ES seals	See Table I
III b)	Seal placement methods ES construction test and inspection activities	See Table I See Table I

IV b)	Liner test and inspection procedures	See Table I
IV c)	Seal test and inspection methods	See Table I

Since these items are covered under open information requests or are related to sealing issues much broader than ES concerns, this item is closed.

22. A decision (and the implications of such a decision) on whether the DOE will remove the liner at permanent closure or use it as part of the long term sealing system has not been determined.

RESPONSE

- o Open Item 22: The decision has not yet been made by the NNWSI Project.

23. A discussion of sealing materials and placement method and timing for exploratory boreholes from the ES will be provided in a future meeting on repository design.

RESPONSE

- o Open Item 23: This item cannot be closed until the Project meets with NRC on this subject (sealing). This meeting has not yet been scheduled.

24. The testing program to characterize perched water zones will be discussed at the ESTP meeting.

RESPONSE

- o Open Item 24: This item cannot be closed until the Project meets with the NRC on exploratory shaft testing. This meeting has not yet been scheduled.

25. The design specifications and acceptance criteria for the shaft construction including construction controls, test blasting, and overbreak control will be provided to the NRC when available.

RESPONSE

- o Open Item 25: The design specifications and acceptance criteria for the shaft construction including construction controls, test blasting, and overbreak control will be provided to the NRC when available.

The plan for responding to this Open Item is to develop the technical information necessary to implement revised blasting specifications. This will allow the development of technically defensible controlled blasting specifications in the event they are determined to be necessary to meet operational or postclosure radiological safety and isolation requirements based on the results of the revised performance analysis study (see Enclosure I, Item 1a). This will involve gathering available technical literature and performing sufficient review to form a firm technical foundation of knowledge. A first step on this will be to review information concerning the blast damage zone. A second step is to attempt to gather performance data from blasting at G-tunnel at the Nevada Test Site (this blasting is required for other needs and obtaining blast damage data would be a secondary objective). Opportunities will be available in FY 86 and FY 87 to obtain this data. Coincident with these effects, informal communication with mining professionals will continue.

The date for complete closure on this item depends on the resolution of need which will be based on the results of the revised performance analysis study.

Substitutions of different blasting specifications can be incorporated easily into ESF construction plans at any time until actual construction bids are requested.

This item will be discussed at the second meeting on ESF Design and Construction.

26. The NRC will provide guidance on the key parameters that should be considered in determining the representativeness of the ESF.

RESPONSE

- o Open Item 26: Guidance is being developed by NRC on this subject. Note that NUREG/CR 4161 has been published on this subject for basalt.
27. DOE's plans on the characterization of lithophysal zones and on plans for demonstrating horizontal emplacement and exploration holes will be discussed in a future meeting on repository design.

RESPONSE

- o Open Item 27: This item cannot be closed until the Project meets with the NRC on exploratory shaft testing. This meeting has not yet been scheduled.

28. Has DOE/OGR made a decision that the use of radioactive materials in the site characterization program will not be considered in the future?

RESPONSE

- o Open Item 28: This item cannot be closed until the Project meets with NRC on exploratory shaft testing. This meeting has not yet been scheduled.

ENCLOSURE III

AGREEMENTS FROM AUGUST 1985 MEETING

1. The DOE has proposed construction methods for the two exploratory shafts (ES-1, drill and blast, ES-2, raise bored) in the DOE letters dated June 7, 1985 from D. Vieth to J. Linehan entitled, "Comments on the NNWSI Exploratory Shaft Conceptual Design Report (SA-9179-MS)." The NRC has no objection to the use of the proposed construction methods, provided that they [the shafts] are properly constructed and controlled with an adequate quality assurance program. This position is taken considering both information gathering and final site sealing objectives. This is further based on specific information related to these objectives made available to staff over the past several years and the discussion in this meeting.
 - 2.* The calculations in the performance analysis document based upon a 12-foot shaft diameter and a 6-foot damaged rock zone will be redone utilizing the full excavated diameter of the exploratory shaft.
 - 3.* In the performance analysis it is assumed that the fuel cladding breaches linearly from year 300 to year 10,000. The DOE will recalculate using a more conservative scenario in which all cladding has been breached 1,000 years after the container has failed. This is in accord with the work presented by Lawrence Livermore National Laboratory at the NNWSI Project/NRC Waste Package meeting in July, 1985.
 - 4.* The uncertainties in dissolution rates of spent fuel should be clearly recognized in the performance analysis document. In its present form the performance analysis gives the impression that such uncertainties do not exist.
 - 5.** The NRC agrees to provide written comments on the DOE response to the NRC letter and the Performance Analysis report within 30 days.
- * Refer to Enclosure I, Responses ... Item I.a will consider these statements.
- ** Refer to Enclosure II, Status of Open Items.... This commitment is similar to Open Item 9.

TABLE I
CORRELATION OF INFORMATION REQUESTS AND OPEN ITEMS
OF AUGUST 1985 MEETING

INFORMATION REQUEST (4/14/83)	OPEN ITEMS FROM 8/27-28/85 MEETING	INFORMATION/ OPEN ITEM STATUS	REMARKS
I. a	*	open	revised analysis to NRC by 10/3/86
b	6	open	report on model to NRC by 7/1/86
	17	closed	viewgraphs transmitted to NRC on 3/11/86
	18	open	ESF Design and Construction second meeting
c	25	open	depends on results of I.a
d	23	open	repository design meeting on sealing shafts & boreholes
e	14,24,28	open	ESTP meeting
f	20	closed	SAND 84-1011 transmitted to NRC on 3/4/86
II. a	*	closed	Enclosure I, letter to J. J. Linehan from D. L. Vieth 6/2/86.
b	*	closed	" " "
c	22	closed	Enclosure B, letter to J. J. Linehan from D. L. Vieth June 7, 1985
III. a	21	closed	seals will not be installed during ES construction
b	21	closed	" " "
c	*	closed	" " "
IV. a	21	open	ESF Design and Construction second meeting
b	21	closed	Enclosure I, letter to J. J. Linehan from D. L. Vieth 6/2/86.
c	21	closed	" " "
d	*	closed	" " "
V. a	*	open	ESTP meeting

* No Open Item correlates with Information Request.

TABLE I (Cont'd)

CORRELATION OF INFORMATION REQUESTS AND OPEN ITEMS
OF AUGUST 1985 MEETING

<u>INFORMATION REQUEST (4/14/83)</u>	<u>OPEN ITEMS FROM 8/27-28/85 MEETING</u>	<u>INFORMATION/ OPEN ITEM STATUS</u>	<u>REMARKS</u>
VI. a	*	closed	at 8/27-28/85 Meeting
b	*	closed	VI-B-1 of NRC's 11/25/85 letter; Enclosure I, letter to J. J. Linehan from D. L. Vieth 6/2/86.
		open	VI-B-2 and 3; ES Design and Construction second meeting
		open	VI-B-4; ESF Design and Construction second meeting (these two Open Items depend on results of I.a, above)
None**	1	open	NRC analysis transmitted to DOE by letter of 4/2/86
None	2, 19	closed	USBM reference is "In Situ Testing Determination of Stress in Rocks" <u>Mining Engineering</u> , pp. 51-58, August 1962 per NRC
None	3	closed	Letter from NRC of 12/3/85
None	4, 15	open	NRC response needed
None	5	open	Report with bibliography to be transmitted to NRC by 10/3/86
None	7,12	open	NNWSI Project position on representativeness to be discussed at ESF Design and Construction second meeting
None	8	closed	letter to J. J. Linehan from D. L. Vieth 6/2/86.
None	9	closed	by transmittal of NRC's 11/25/85 letter
None	10	open	NNWSI Project to initiate discussion by 8/1/86
None	11	open	NNWSI Project to initiate discussion by 8/1/86

TABLE I (Cont'd)

CORRELATION OF INFORMATION REQUESTS AND OPEN ITEMS
OF AUGUST 1985 MEETING

<u>INFORMATION REQUEST (4/14/83)</u>	<u>OPEN ITEMS FROM 8/27-28/85 MEETING</u>	<u>INFORMATION/ OPEN ITEM STATUS</u>	<u>REMARKS</u>
None	13	closed	Keystone document transmitted to NRC on 3/4/86
None	16	closed	SAND 85-1076 transmitted to NRC on 3/4/86
None	21	closed	considered under other items
None	27	open	Repository Design Meeting

** No Information Requests correlates with Open Item