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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

JUL 23 1992

MEMORANDUM FOR: Joseph J. Holonich, Director
Repository Licensing and Quality Assurance
Project Directorate, HLWM

FROM: Ronald L. Ballard, Chief
Geology and Engineering Branch, HLWM

SUBJECT: DOE REQUEST TO CLOSE SCA OBJECTION 1 AND RELATED COMMENTS

REFERENCES:

1. Letter dtd. March 3, 1992, from J. Roberts, Department of Energy (DOE) to J. Holonich, Nuclear Regulatory Commission (NRC); submitting ESFAS/CHRBA walk-through document for removing SCA Objection 1.

2. "Exploratory Studies Facility Alternatives Study," Sand 91-0025, September 1991 (ESFAS Report).

3. "Risk/Benefit Analysis of Alternative Strategies for Characterizing the Calico Hills Unit at Yucca Mountain, January 1991, (CHRBA Report).

4. Letter dtd. July 31, 1991 from R. Bernero, NRC, to J. Bartlett, DOE; transmitting NRC's evaluation of DOE's response to Site Characterization Analysis (SCA) Objections and Comments.

Objection 1, in the NRC Staff "Site Characterization Analysis of the Department of Energy's Site Characterization Plan, Yucca Mountain, Nevada" (SCA Report), dealt with the topic of Exploratory Shaft (now Studies) facility testing, operations, layout constraints, and zone of influence. This objection addressed two fundamental concerns; adequacy of the Title I design control process and adequacy of the Title I design. The design control process had not considered all applicable 10 CFR Part 60 requirements and had overlooked integrating available technical data on the location of a potential fault at the site in locating the shaft. The Title I design had not demonstrated that the underground test facility and currently identified test durations will permit all tests to be conducted without interference for the time periods required.

DOE has requested closure of Objection 1 and related comments on the basis of information provided in the 'walk-through,' ESFAS, and CHRBA documents (References 1, 2, and 3). Objection 1 was supported by six bases; each basis, in turn, consisted of items related to SCA Comments and/or Questions. Some of the Comments and Questions were previously resolved, based on DOE's response to the SCA (Reference 4). DOE's 'walk-through' document explicitly addressed in part or in its entirety each of the basis and most of the related Comments and Questions. DOE's response to each of these Comments and/or Questions has been evaluated from the perspective of removing SCA Objection 1.

102.8
NHXW

APR 14 1992

NOTE TO: Charlotte Abrams

FROM: Keith I. McConnell

SUBJECT: THE DOE'S EXPLORATION PLANS FOR THE CALICO HILLS UNIT

I note in the review of the ESFAS that DOE has ranked Option #30 as the #1 option for the design of the exploratory studies facilities (ESF). Option #30 provides for at least 12,000 feet of exploratory drifting in the Calico Hills unit in the repository block, below the level of the repository. Option #30 adopts with certain changes the drifting layout in the Calico Hills that was developed in strategies 2 and 5 of the Calico Hills Risk Benefit Analysis (CHRBA).

In performing only a "walk-through" review of the ESFAS and CHRBA for the purposes of closing out (potentially) some of the SCA objections and comments, it appears likely that the staff will not generate any new comments on the ESFAS and CHRBA. The absence of formal reviews of the ESFAS and CHRBA raises the possibility that if the DOE has ranked Option #30 as the #1 option for the ESF, and the staff does not comment on that being the #1 option, then DOE may interpret our silence as acceptance of the #30 option?

I raise this question, because at the time of the CHRBA Technical Exchange, there was some concern about the need to perform Calico Hills unit testing in the repository block. Specifically, DOE indicated in the CHRBA that a strategy where the Calico Hills was tested outside of the repository block (i.e., Strategy #1) was nearly as desirable as the strategy where the Calico Hills unit was tested inside the repository block (i.e., Strategies 2 and 5). Strategies 2 and 5 were ranked ahead of Strategy 1 because advantages in delay and cost more than offset their disadvantage in risk, confidence and phasing. To my knowledge, the staff has never formally or informally concurred on the methods and results of DOE's performance assessments related to the ranking of strategies for testing the Calico Hills unit.

An additional question that can be raised is: if DOE can obtain acceptable characterization data in the Calico Hills from outside of the repository block, why add uncertainty to performance assessment calculations by drifting below the repository level?

I suggest that the staff may want to address this issue to avoid what could be construed as defacto acceptance of Option #30. If nothing else, consideration should be given to making it clear to DOE that the staff is neither accepting nor rejecting the Calico Hills testing strategy at this time.

cc. R.Ballard
D.Brooks
R.Nataraja
S.Coplan

Based on our review of the walk-through document, and relevant portions of ESFAS and CHRBA reports, we recommend removing Objection 1 and keeping 'open' Comment Nos. 34, 74, 119, 121, 130, and Questions 28 and 58. Keeping 'open' some of the supporting Comments and Questions, will enable the staff to follow these items during the review of DOE's future documents, such as Title II design. Enclosure 1 presents Objection 1 and its basis and recommendations. Enclosure 2 presents the list of Comments and Questions that related to or formed the bases for this objection, and their disposition, based on our review of the information provided in References 1, 2, 3, and 4. Enclosure 3 presents detailed documentation of the resolution of Comments and Questions that formed the bases for removal of Objection 1. DOE's 'walk-through' document explicitly addressed one of the five staff recommendations for removing Objection 1, and our evaluation of DOE's discussion related to this recommendation is also presented in Enclosure 3.

Removing Objection 1 with some of the supporting Comments and Questions remaining 'open,' is not expected to have an adverse impact on the staff's review of DOE's Yucca Mountain Site Characterization program, because the remaining 'open' Comments and Questions can be reviewed in future DOE documents, and deferring their resolution should not have an adverse impact on our review of the site characterization program. Listed below are the items that will be tracked in future review of the Title II design and other design documents.

(1) Overall confirmation testing program - DOE has not provided adequate details of the program and this is being tracked under Comment 119 (comment by the Performance Assessment Section). Therefore, there is no need to track this item under Objection 1, and removal of Objection 1 will have no adverse impact on the staff's future review of the overall confirmation testing program.

(2) In-situ seal testing program - Although DOE has addressed the importance of the sealing issue in the 'walk-through' document, we still consider the matter important enough to be tracked under Comment No. 74 and Question 28 (comment and question by Geotechnical Engineering Section), which are to remain 'open.' Removing Objection 1 is not expected to have any adverse impact on the staff's future review of the in-situ seal testing program.

(3) Consideration of applicable Part 60 requirements in the design-DOE's Title I design and Design Acceptability Analysis (DAA) document did not list 11 applicable Part 60 requirements. The ESFAS lists the requirements, but the consideration of these in the design must be verified during review of the Title II design. This topic was addressed in Comment Nos. 128 and 130 (comments by Geotechnical Engineering Section). The staff intends to track this issue under Comment No. 130, and to 'close' related Comment No. 128.

(4) Concerns on the extent of the testing area - The Main Testing Level (MTL) area was only 400,000 square feet and was considered

inadequate to perform all the tests for the required duration without interference, because test locations appeared to be too close. The ESFAS indicates the revised MTL area to be 800,000 square feet, and also the new drifting configuration provides space for additional test areas, if needed. Therefore, the staff considers the MTL area to be adequate and removes this as a basis for Objection 1. However, the staff intends to focus on this further under the Title II design review.

(5) Seismic design basis - DOE has not responded to this issue in the ESFAS, CHRBA, or 'walk-through' documents. This issue will be tracked under Comment No. 121 (comment by Geotechnical Engineering Section) and during the review of the Title II design. Therefore, the seismic design issue has been removed as a basis for Objection 1 and will be tracked under Comment No. 121, during the Title II design review.

(6) Number and location of shafts - Staff recommendations under SCA Objection 1 indicated that the design process should consider all available data and ensure that the number of shafts and their locations in the final repository contribute to reducing uncertainty with respect to waste isolation. Although the CHRBA addresses this item, the staff intends to continue tracking this important issue during the Title II design review and throughout the design process. This item is removed as a basis for Objection 1 and will be tracked under Title II design review.

(7) Impact of ES-1 penetration of the Calico Hills unit on the current sealing program - This issue was not addressed in any of the documents reviewed in connection with DOE's request for removal of Objection 1. Therefore, the staff considers this item (Question NO. 28) 'open.'

In summary, based on review of the relevant sections of ESFAS and CHRBA, and the 'walk-through' documents, the staff recommends that SCA Objection 1 be removed while retaining Comment Nos. 34, 74, 119, 121, and 130, and Question 28 as 'open' items. Comment No. 82 and Question 58, which were referenced in Objection 1, were not addressed by DOE in the 'walk-through' document, and therefore should also remain 'open.' These will be tracked during the review of Title II design and other design documents.

This review was coordinated with the Geology and Hydrology sections and their inputs are attached to Enclosure 2. The CNWRA also took part in this review Should you have any questions on this review, please call me or Dr. Banad Jagannath of my staff.

Sincerely,

Ronald L. Ballard, Chief
Geology and Engineering Branch, HLWM

Enclosure: as stated

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4.0 OBJECTIONS, COMMENTS, AND QUESTIONS

4.1 Objections

Section 8.4.2.3.1 Exploratory Shaft facility testing, operations, layout constraints, and zones of influence, pp. 8.4.2-93/147

OBJECTION 1

The exploratory shaft facility (ESF) is intended to become an integral part of the repository if the site is found acceptable. However, the SCP and its references do not demonstrate the adequacy of ESF Title I design control process, and the adequacy of the ESF Title I design which is the basis for the SCP. For example, neither the design nor the subsequent Design Acceptability Analysis (DAA) considers some of the applicable 10 CFR 60 requirements. Also, the process used to integrate currently available technical data into decisions regarding shaft location appears to have overlooked evidence of a potential fault near the location of the exploratory shafts. In addition, it has not been demonstrated that the underground test facility and currently identified test durations will permit all tests to be conducted for the time periods required without interference. Furthermore, resolution of the problems identified with the Title I design may result in considerable corresponding modifications to the SCP.

BASIS

- In response to CDSCP objection number 3, the SCP described an acceptable approach for assessing the potential for test-to-test and construction-to-test interference. However, the SCP has not established that this approach has been appropriately implemented to resolve potential interference problems. In responding to NRC CDSCP objection number 3, the discussions and analyses presented in the SCP did not completely address the following NRC staff recommendations:

  a. In planning the underground test facility, the overall performance confirmation testing program and the need for starting certain performance confirmation tests (e.g., waste package testing) as early as practicable during site characterization should be considered.

  b. The design of the ESF should take into account the need for preliminary information from in situ seal testing to be available in the License Application submittal.

- The Design Acceptability Analysis (DAA) undertaken by DOE in response to NRC concerns for evaluating the acceptability of the ESF Title I design did not consider certain concerns critical to NRC acceptance of DAA conclusions. The following are some examples:

  a. Independence of the reviewers is in question. Five reviewers who were certified not to have significantly contributed to the ESF Title I design and SDRD (sub-system design requirements) are identified as authors, reviewers, and/or contributors to specific documents which were input documents to the ESF design. (Question 63)

  b. Neither the ESF Title I design nor the subsequent DAA considers (qualitatively or quantitatively) 11 of the applicable 10 CFR 60 requirements. (Comment 128)

  c. Of the 52 requirements considered by DOE to be applicable to the ESF design, only 22 were considered quantitatively. The remaining were said to have been considered qualitatively. Included in the remaining 30 are the requirements of Subpart F (Performance Confirmation Program) which according to 10 CFR 60.140(b), "shall have been started during site characterization." Several of these 30 requirements are potentially important in evaluating the acceptability of the ESF Title I design. (Comment 130)

  d. Of the 22 requirements that were considered quantitatively, some inadequacies have been identified. For example, in considering the regulatory requirement related to alternatives to major design features important to waste isolation (60.21(c)(1)(ii)(D)), the analysis presented was limited and incomplete. As a result, comparative evaluation of alternatives to the major design features was limited to comparative evaluation of five alternative ESF locations. Hence other comparative evaluations such as the number of man-made openings were not considered. (Comment 132)

  e. DAA did not thoroughly check the adequacy of data used in the ESF Title I design. For example, several key documents which were part of ESF Title I design were not reviewed. (Comment 131)

  f. DAA has not demonstrated that DOE has considered information that indicates the presence of an anomaly in the immediate vicinity of the proposed locations of exploratory shafts 1 and 2. (Comment 127) By not considering this

readily available information in reaching the decision on the locations of ES-1 and ES-2, uncertainties regarding the design control process are further heightened. The design itself is further questioned since the comparative evaluation of the major design features (i.e., ES-1 and ES-2) with respect to waste isolation did not assess the impact of the anomaly.

- The analysis presented did not demonstrate that the underground test area layout can accommodate currently identified tests in the ESF while avoiding interference between tests and between tests and construction operations. Also, information presented in the SCP did not clearly show that thermal tests can be conducted for sufficient lengths of time to gather necessary site characterization data without interference problems. The bases for these concerns are as follows:

  a. SCP does not clearly address the potential incompatibility of some of the tests with construction operations. It has not been demonstrated that operational requirements (e.g., storage of mobile equipment, drill steel, blasting materials, vent pipes, water pipes, support/reinforcement, disabled equipment, etc.) will not encroach on some of the identified test locations. For example, sequential drift mining test, heated block test and canister-scale heater experiment are currently shown to be located adjacent to the first loop access drifts to the shafts and therefore subject to potential operational interference.

  b. The zones of influence presented for thermal tests are based on short test durations. Thermal tests such as the canister-scale heater experiment, heated block test, and heated room experiment are planned to run for relatively short durations (30 months, 100 days, 36 months). The staff considers that longer durations will very likely be necessary. The need to obtain additional site characterization data beyond the planned time periods may result in larger zones of influence.

  c. It is stated in the SCP that in some cases the same space can be used for more than one test by sequencing the tests. However, it is not clear if it has been fully considered that delays during initial testing could affect the timing for the tests to be followed in the same space.

  d. It is not clear that uncertainties have been sufficiently considered in the calculations of zones of influence for various tests. For example, uncertainties associated with the numerical models and material properties have not been considered in calculating zones of influence.

  e. The location of the canister-scale heater test shown in Figure 8.4.2-39 (p. 8.4.2-209) has been erroneously indicated on the layout. As a result, its zone of influence apparently overlays the heated block test. In addition, the SCP gives the following two constraints for locating the canister scale heater test (p. 8.4.2-120):

     - located greater than 9 m from drifts or alcoves running parallel to the axis of the heater.
     - located in a "low traffic" area.

     Neither of these constraints has apparently been met.

  f. The locations of several major tests identified in the SCP have not been specifically identified. These include some tests that could have a considerable zone of influence (e.g., Heated room experiment) and some that require extensive test area (e.g., Horizontal drilling demonstration test). Examples of other tests for which specific locations have not been identified include thermal stress measurements, development and demonstration of required equipment, three of the four diffusion tests identified on p. 8.4.2-140, seal tests and other performance confirmation tests.

  g. Page 8.3.2.1-14 of the SCP states that "there are other tests that have not yet been completely defined that will investigate coupled interactions." Information has not been presented to indicate if any of these undefined tests will be in the main test area.

  h. The space designated for tests within the underground test area layout is very likely to be inadequate. DOE assumes that all the space within the dedicated test area may be or is usable. This is unlikely to be the case. For example, some areas may not be suitable for use because of faults, lithophysal content, breccia, etc. In addition, offsets from waste emplacement areas (30 m) and from proposed multipurpose boreholes (two drift diameters) may further reduce the available test area.

  i. The zone of influence from the drilling activities of existing borehole USW G-4 located within the dedicated test area should be considered in evaluating the size of suitable available test space. In calculating the zone of influence for USW G-4 it should be considered that a

total of 342,255 gallons of water were lost to various formations. Over 81,000 gallons of soap were used in the operation; however, how much soap was lost is unknown.

- Potential impacts of long-term performance confirmation testing on ESF design have not been addressed (see Comment 119).

  The SCP has not provided sufficient demonstration that in situ waste package testing will not be needed during site characterization to reduce uncertainties associated with long-term waste package performance prediction for license application and closure. If such testing is found necessary, an analysis of the impact on ESF design is not presented. (Question 58 and Comment 82)

- Some of the ESF design criteria are not sufficiently justified. These include:

  (a) Seismic design basis (Comment 121);

  (b) ES-1 drainage volume and long-term drainage reliability (Comment 124, Question 27); and

  (c) effect of liner removal at closure (Question 24)

- The subsurface drifting and exploration planned in the SCP have not been shown to be sufficient to yield the data needed for repository design and site suitability demonstration at license application. (Comment 35)

RECOMMENDATIONS

- An acceptable baselined QA process should be used during Title II design.

- The Title II design should ensure that the design process, which appears to have overlooked key regulatory requirements and information about the suitability of exploratory shaft locations during Title I design, is adequate and that the number of shafts and their locations in the final repository contribute to reduce uncertainty with respect to waste isolation.

- The DOE should evaluate existing technical data (e.g., geophysical, geological) with respect to ESF location decisions and criteria; and, if deemed necessary, the DOE should consider additional geological and geophysical surface based tests in the vicinity of the exploratory shafts to investigate potentially adverse features and conditions.

- The ESF Title II Design should present the basis for selected test durations, address the suitability of established test durations, and assess their impact on the testing program.

- The ESF Title II Design should provide a complete conceptual layout of the main test level and related test schedules. The layout and schedule should account for the following: (a) uncertainties in the zones of influence calculations; (b) construction and facilities operations; (c) contingencies for unsuitable test areas; (d) drilling effects of USW G-4; (e) contingencies for tests that will need to be running longer than planned; (f) effect of sequencing tests on the overall license application and performance confirmation test programs; and (g) coupled interaction tests mentioned on p. 8.3.2.1-14. Based on these considerations, the ESF Title II design should recognize the potential need for additional underground testing area and demonstrate sufficient flexibility to accommodate likely contingencies.

ENCLOSURE 2

STATUS OF SCA OPEN ITEMS PERTAINING TO OBJECTION 1

SCA OPEN ITEM		STATUS
COMMENTS AND QUESTIONS ADDRESSED IN DOE'S 'WALK-THROUGH'		
COMMENT	12 - Hydrology	Closed
	16 - Hydrology	Closed
	34 - Geology/Geophysics	Open
	35 - Geology/Geophysics	Closed
	57 - Engineering	Closed
	72 - Engineering	Closed
	127 - Geology/Geophysics	Closed
	128 - Engineering	Closed
	130 - Engineering	Open
	132 - Engineering	Closed
QUESTION	28 - Engineering	Open
COMMENTS AND QUESTIONS REFERENCED BUT NOT ADDRESSED IN DOE'S 'WALK-THROUGH'		
COMMENT	74 - Engineering	Open
	82 - Waste Package	Open
	119 -Performance Assessment	Open
	121 - Engineering	Open
QUESTION	58 - Engineering	Open
COMMENTS AND QUESTIONS REFERENCED IN DOE'S 'WALK-THROUGH' AND RESOLVED BASED ON DOE'S RESPONSE TO SCA (DOE 1991)		
COMMENT	124 - Hydrology	Closed
	131 - Engineering	Closed
QUESTION	24 - Engineering	Closed
	27 - Engineering	Closed
	63 - Engineering	Closed

ENCLOSURE 2

STATUS OF SCA OPEN ITEMS PERTAINING TO OBJECTION 1

SCA OPEN ITEM		STATUS
COMMENTS AND QUESTIONS ADDRESSED IN DOE'S 'WALK-THROUGH'		
COMMENT	12 - Hydrology	Closed
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	35 - Geology/Geophysics	Closed
	57 - Engineering	Closed
	72 - Engineering	Closed
	127 - Geology/Geophysics	Closed
	128 - Engineering	Closed
	130 - Engineering	Open
	132 - Engineering	Closed
QUESTION	28 - Engineering	Open
COMMENTS AND QUESTIONS REFERENCED BUT NOT ADDRESSED IN DOE'S 'WALK-THROUGH'		
COMMENT	74 - Engineering	Open
	82 - Waste Package	Open
	119 -Performance Assessment	Open
	121 - Engineering	Open
QUESTION	58 - Engineering	Open
COMMENTS AND QUESTIONS REFERENCED IN DOE'S 'WALK-THROUGH' AND RESOLVED BASED ON DOE'S RESPONSE TO SCA (DOE 1991)		
COMMENT	124 - Hydrology	Closed
	131 - Engineering	Closed
QUESTION	24 - Engineering	Closed
	27 - Engineering	Closed
	63 - Engineering	Closed

ENCLOSURE 3

REVIEW OF DOE'S RESPONSE TO SCA OPEN ITEMS
SCA OBJECTION 1

SCA OBJECTION 1

The exploratory shaft facility (ESF) is intended to become an integral part of the repository if the site is found acceptable. However, the SCP and its references do not demonstrate the adequacy of the ESF Title I design control process, and the adequacy of the of the ESF Title I design which is the basis for the SCP. For example, neither the design nor the subsequent Design Acceptability Analysis (DAA) considers some of the applicable 10 CFR 60 requirements. Also, the process used to integrate currently available technical data into decisions regarding the shaft location appears to have overlooked evidence of a potential fault near the location of the exploratory shafts. In addition, it has not been demonstrated that the underground test facility and currently identified test durations will permit all tests to be conducted for time periods required without interference. Furthermore, resolution of the problems identified in Title I design may result in considerable corresponding modifications to the SCP.

EVALUATION OF DOE RESPONSE

- Objection 1 addresses two fundamental concerns, i.e. adequacy of the Title I design control process and adequacy of the Title I design. Objection 1 is supported by six bases, some of which are in turn based directly on related SCA Comments and/or Questions. DOE's 'walk-through' explicitly addresses part or all of five of the bases and most of the related Comments and Questions.

- The first basis contains two supporting items: (1) a portion of item (a) which deals with early performance confirmation testing, and (2) which deals with consideration of seal testing in ESF design. Based on information provided in the ESFAS, CHRBA and 'walk-through' documents, these two supporting items can be considered closed. The remaining portion of item (a) is related to concern regarding the overall performance confirmation testing program. This concern is fully addressed by Comment 119 which remains open. Based on the foregoing the staff considers this basis closed.

- The second basis contains six supporting items dealing with a variety of ESF design considerations. These six items are all related to SCA Comments or Questions. Two items, (a)

and (e), were previously closed in NRC's evaluation of DOE's response to SCA (July 1991). Two items, (d) and (f), are considered closed based on information provided in the ESFAS, CHRBA and 'walk-through' document. The NRC staff recognizes that item (b) is a special case of item (c) and can be considered as fully addressed by item (c). Insufficient information was provided in the ESFAS, CHRBA and 'walk-through' document warrant closure of item (c). However, NRC concerns related to this item are fully covered by Comment 130, which remains open. Based on the foregoing the staff considers this basis closed.

- The third basis contains nine supporting items dealing with test space, test interference, and operational interference. Two items, (b) and (h), are explicitly addressed by the 'walk-through' document and based on information provided in the CHRBA, ESFAS and 'walk-through' document, items (b) and (h) are considered closed. The remaining items are not explicitly addressed by the 'walk-through' document. However, DOE's Title I design now describes 800,000 square feet of space dedicated to subsurface testing (with an additional 3,280,000 square feet available for test expansion) compared to 400,000 square feet in the SCP dedicated test area. Considering the substantially increased MTL test area, sufficient space should be available to allow DOE to take the test space and interference concerns into consideration. In view of this, the NRC staff does not consider that these items will prevent closure of Objection 1. Evidence that DOE has considered these items will be evaluated during review of the Title II design and other DOE documents related to in situ testing.

- The fourth basis deals with potential impacts of long-term performance confirmation testing (for the waste package) on ESF design. Information provided in the ESFAS and 'walk-through' document allows closure of this basis.

- The fifth basis deals with justification of some ESF design criteria and contains three supporting items. The 'walk-through' document does not address this basis. Two items, (b) and (c), were previously closed in NRC's evaluation of DOE's response to SCA (July 1991). Item (a), which deals with seismic design criteria, is fully covered by Comment 121 which remains open. Based on the foregoing, the NRC staff considers this basis closed.

- The sixth basis deals with subsurface drifting and exploration. Based on information provided in the ESFAS, CHRBA, and 'walk-through' document, this basis is considered closed.

- The staff recommends this objection be closed.

- Detailed evaluation of each basis and supporting items is given below.

- The 'walk-through' document explicitly addresses one of the five recommendations for Objection 1. Evaluation of this DOE's response to this recommendation is also given below.

DETAILED EVALUATION OF OBJECTION 1 BASES AND SUPPORTING ITEMS

SCA OBJECTION 1

Basis, first bullet, item (a)

In planning the underground test facility, the overall performance confirmation testing program and the need for starting certain performance confirmation tests (e.g. waste package testing) as early as practicable during site characterization should be considered.

EVALUATION OF DOE RESPONSE

- This basis point addresses two concerns:

  - the overall performance confirmation testing program, and

  - the need for starting certain performance confirmation tests (e.g. waste package testing) as early as practicable during site characterization

- The first concern is related to Comment 119. In reviewing DOE's response to Comment 119 in the SCA, the NRC staff (July 1991) noted the following [see page 140 of NRC's evaluation of DOE's response (July 1991)]:

  1. The DOE position remains that "a complete definition of the performance confirmation program during later repository phases is premature for the SCP and that 10 CFR Part 60 does not require a complete definition at this time." The NRC staff agrees with this position. However, the NRC concern deals specifically and explicitly with performance confirmation testing which should commence during site characterization.

  2. DOE maintains that "the performance confirmation program described in the SCP, and to be developed more fully as site characterization proceeds, is in

accordance with the requirements of Subpart F of Part 60." Staff considers that DOE has not provided enough supporting information to establish this position.

The NRC staff finds nothing in the ESFAS, CHRBA or 'walk-through' which addresses the two items listed above. Nevertheless, because this concern is being tracked under Comment 119, this concern does not preclude closure of Objection 1.

- With regard to the second concern, DOE's current position [as presented in the ESFAS and 'walk-through'(page 9)] emphasizes early tests for site suitability evaluation. The NRC staff agrees that site suitability tests may logically precede performance confirmation testing. However, the ESFAS does not indicate that DOE has considered "starting certain performance confirmation tests (e.g., waste package testing) as early as practicable during site characterization".

- The incorporation of ramps and additional Main Testing Level (MTL) testing space into the design can accommodate in situ waste package testing if DOE considers it necessary to begin such testing during site characterization. Considering the fact that DOE's approach now does not preclude in situ waste package testing should it become necessary, the second concern of this basis point could be closed. But, to be able to ensure that the ESF design decisions will consider in situ testing of waste package, this question will be kept 'open'.

SCA OBJECTION 1

-Basis, first bullet, item (b)

The design of the ESF should take into account the need for preliminary information from in situ seal testing to be available in the License Application submittal.

EVALUATION OF DOE RESPONSE

- The DOE has proposed a larger MTL. One reason for increasing the size of the MTL is to provide flexibility for additional seal tests (see page 5C-102 of the ESFAS).

- Ramp development using a Tunnel Boring Machine (TBM) allows the flexibility to conduct seals test at the ramp base or the main portal (see page 5C-102 of the ESFAS).

- Ramps were chosen as a preferred access option over shafts

because seals for ramps were believed to be more effective (see page 6-16 of the ESFAS).

- The DOE states that "the ESFAS specifically addressed this concern in scoring the 34 options " (p. 10 of 'walk-through').

- The NRC staff considers that DOE's current position as expressed in the 'walk-through' and the ESFAS takes into account the need for preliminary information from in situ seal testing to be available in the LA submittal.

- The NRC staff therefore considers that this basis item has been addressed.

- Because of the importance of the seal program the NRC staff considers it is necessary to continue tracking this concern under Comment 74 and Question 28.

SCA OBJECTION 1

-Basis, second bullet, item (a) (Question 63)

EVALUATION OF DOE RESPONSE

- Question 63 was closed in NRC's evaluation of DOE's response to SCA (July 1991).

SCA OBJECTION 1

-Basis, second bullet, item (b)

b. Neither the ESF Title I design nor the subsequent DAA considers (qualitatively or quantitatively) 11 of the applicable 10 CFR 60 requirements. (Comment 128)

EVALUATION OF DOE RESPONSE

- DOE lists in Table 2-1 (page 2-41 of ESFAS) some 10 CFR 60 regulatory requirements which were used as discriminators used for the ESFAS. DOE states that "all 10 CFR 60 requirements were considered during the performance of the ESFAS and will continue to be considered during Title II design" (see page 19 of 'walk-through').

- Evidence that design criteria based on 10 CFR 60

requirements have been developed for the Title II design will be evaluated during review of the Title II design.

- See evaluation for Comment 130.

- The NRC staff recognizes that Comment 128 is a special case which can be tracked together with the more general Comment 130. Accordingly, this item is considered to have been addressed.

SCA OBJECTION 1

-Basis, second bullet, item (c)

Of the 52 requirements considered by DOE to be applicable to ESF design, only 22 were considered quantitatively. The remaining were said to have been considered qualitatively. Included in the remaining 30 are requirements of Subpart F (Performance Confirmation Program) which according to 10 CFR 60.140(b), "shall have been started during site characterization." Several of these 30 requirements are potentially important in evaluating the acceptability of the Title I design.
(Comment 130)

EVALUATION OF DOE RESPONSE

- DOE states that "all 10 CFR 60 requirements ... will continue to be considered during Title II design." (see page 19 of 'walk-through'). No evidence is provided that design criteria based on 10 CFR 60 requirements are being developed for the Title II design.

  Evidence that design criteria based on 10 CFR 60 requirements have been developed for the Title II design will be evaluated during review of the Title II design.

- The NRC staff considers this item closed, but Comment 130 remains open.

SCA OBJECTION 1

-Basis, second bullet, item (d)

Of the 22 requirements that were considered quantitatively, some inadequacies have been identified. For example, in considering the regulatory requirement related to alternatives to major design features important to waste isolation

(60.21(c)(1)(ii)(D)), the analysis presented was limited and incomplete. As a result, comparative evaluation of alternatives to the major design features was limited to comparative evaluation of five alternative ESF locations. Hence other comparative evaluations such as the number of man-made openings were not considered. (Comment 132)

EVALUATION OF DOE RESPONSE

- See Evaluation for Comment 132
- This item is mainly addressed by Comment 132 which the NRC staff considers closed.

SCA OBJECTION 1

-Basis, second bullet, item (e) (Comment 131)

EVALUATION OF DOE RESPONSE

- Comment 131 was previously closed [see NRC's evaluation of DOE's response to SCA (July 1991)].

SCA OBJECTION 1

-Basis, second bullet, item (f)

DAA has not demonstrated that DOE has considered information that indicates the presence of an anomaly in the immediate vicinity of the proposed locations of exploratory shafts 1 and 2 (Comment 127). By not considering this readily available information in reaching the decision on the locations of ES-1 and ES-2, uncertainties regarding the design control process are further heightened. The design itself is further questioned since comparative evaluation of major design features (i.e. ES-1 and ES-2) with respect to waste isolation did not assess the impact of the anomaly.

EVALUATION OF DOE RESPONSE

- The CHRBA considered 24 locations from which shafts and/or ramps would access the Calico Hills resulting in eight strategies for characterizing the Calico Hills. All eight

strategies were assessed for their impact on waste isolation.

- DOE revised its process for controlling the ESF design and incorporated the revised process into DOE administrative procedures.

- The ESFAS resulted in a favored option that utilizes a two ramp configuration in which the criteria for set-back from faults is not considered applicable. DOE indicated that any major fault encountered during ramp construction will be evaluated for its impact on ESF design.

- The NRC staff considers that this item has been addressed.

SCA OBJECTION 1

-Basis, third bullet, item (a)

a. SCP does not clearly address the potential incompatibility of some of the tests with construction operations. It has not been demonstrated that operational requirements (e.g. storage of mobile equipment, drill steel, blasting materials, vent pipes, water pipes,support/reinforcement, disabled equipment,etc.) will not encroach on some of the identified test locations. For example, sequential drift mining test, heated block test and canister-scale heater experiment are currently shown to be located adjacent to the first loop access drifts to shafts and therefore subject to potential interference.

EVALUATION OF DOE RESPONSE

- The 'walk-through' does not specifically address this item.

- Because DOE has planned to substantially increase the MTL test area, it should be possible to avoid potential interference problems between tests with construction operations. In view of this, the NRC staff does not consider that this item will prevent closure of Objection 1. Evidence that potential construction operation interference with tests has been avoided will be evaluated during review of the Title II design and other DOE documents related to in situ testing.

SCA OBJECTION 1

-Basis, third bullet, item (b)

The zones of influence presented for thermal tests are based on short durations. Thermal tests such as the canister-scale heater experiment, heated block test, and heated room experiment are planned to run for relatively short durations (30 months, 100 days, 36 months). The staff considers that longer durations will very likely be necessary. The need to obtain additional site characterization data beyond the planned time periods may result in larger zones of influence.

EVALUATION OF DOE RESPONSE

- The DOE states (see page 12 of 'walk-through') that this concern (i.e. adequate test separation to avoid test interference) was specifically considered when evaluating and ranking the 34 ESF options in the ESFAS.

- DOE also states (see page 12 of 'walk-through') that the revised design provides more MTL space and greater separation of tests than the ESF design identified in the SCP.

  DOE's Title I design lists 800,000 square feet (18.4 acres) of space dedicated to subsurface testing and an additional 3,280,000 square feet (75.3 acres) available for test expansion (page 3-56 of Title I design). The SCP showed approximately 400,000 square feet in the dedicated test area including two shafts (see page 8.4.2-209 of SCP). [The MTL test area for ESFAS option B7 is shown on page 5C-6 to be 1456 x 629 feet.]

- The NRC staff considers that this item has been addressed, but will review the Title II and other DOE documents related to in situ testing design to see if potential test interference has been avoided.

SCA OBJECTION 1

-Basis, third bullet, item (c)

c. It is stated in the SCP that in some cases the same space can be used for more than one test by sequencing tests. However, it is not clear if it has been fully considered that delays during initial testing could affect the timing for tests to be followed in the same space.

EVALUATION OF DOE RESPONSE

- The 'walk-through' does not specifically address this item.
- Considering the substantially increased MTL test area, it should be possible for DOE to avoid conducting different tests at the same place.
- In view of the above, the NRC staff does not consider that this item will prevent closure of Objection 1. Evidence that DOE has considered delays during initial testing which could affect timing for tests which follow in the same space will be evaluated during review of the Title II design and other DOE documents related to in situ testing.

SCA OBJECTION 1

-Basis, third bullet, item (d)

d. It is not clear that uncertainties have been sufficiently considered in the calculations of zones of influence for various tests. For example, uncertainties associated with the numerical models and material properties have not been considered in calculating zones of influence.

EVALUATION OF DOE RESPONSE

- The 'walk-through' does not specifically address this item.
- Considering the substantial increase in the MTL test area, tests should be able to be sufficiently separated to allow for uncertainties associated with the zone of influence calculations. In view of this, the NRC staff does not consider that this item will prevent closure of Objection 1. Evidence that DOE has accounted for uncertainties associated with the zone of influence calculations for various tests will be evaluated during review of the Title II design and other DOE documents related to in situ testing.

SCA OBJECTION 1

-Basis, third bullet, item (e)

e. The location of the canister-scale heater test shown in Figure 8.4.2-39 (p.8.4.2-209) has been erroneously indicated in the layout. As a result, its zone of influence apparently overlays the heated block test. In addition, the SCP gives the

following two constraints for locating the canister scale heater test (p.8.4.2-120):

- located greater than 9m from drifts or alcoves running parallel to the axis of the heater.

-located in a "low traffic"area.
Neither of these constraints has apparently been met.

EVALUATION OF DOE RESPONSE

- The 'walk-through' does not specifically address this item.
- Considering the substantial increase in the MTL test area, tests should be able to be sufficiently separated to satisfy test location constraints. In view of this, the NRC staff does not consider that this item will prevent closure of Objection 1. All test locations will be evaluated with respect to test constraints during review of the Title II design and other DOE documents related to in situ testing.

SCA OBJECTION 1

-Basis, third bullet, item (f)

f. The locations of several major tests identified in the SCP have not been specifically identified. These include some tests that could have a considerable zone of influence (e.g. Horizontal drilling demonstration test). Examples of other tests for which specific locations have not been identified include thermal stress measurements, development and demonstration of required equipment, three of the four diffusion tests identified on p.8.4.2-140, seal tests and other performance confirmation tests.

EVALUATION OF DOE RESPONSE

- The 'walk-through' does not specifically address this item.
- Considering the substantial increase in the MTL test area, space should be available to accommodate those tests listed in the SCP for which locations were not specified. In view of this, the NRC staff does not consider that this item will prevent closure of Objection 1. The Title II design and other DOE documents related to in situ testing will be reviewed to ensure that all planned tests are shown on the MTL layout.

SCA OBJECTION 1

-Basis, third bullet, item (g)

g. Page 8.3.2.1-14 of the SCP states that "there are other tests that have not yet been completely defined that will investigate coupled interactions." Information has not been presented to indicate if any of these undefined tests will be in the main test area.

EVALUATION OF DOE RESPONSE

- The 'walk-through' does not specifically address this item.
- Considering the substantial increase in the MTL test area, space may be available to accommodate coupled interaction tests. In view of this, the NRC staff does not consider that this item will prevent closure of Objection 1. NRC staff will evaluate general locations and estimates of required test areas for coupled interaction tests in its review of the Title II design and other DOE documents related to in situ testing.

SCA OBJECTION 1

-Basis, third bullet, item (h)

The space designated for tests within the underground test area layout is very likely to be inadequate. DOE assumes that all the space within the dedicated test area may be or is usable. This is unlikely to be the case. For example, some areas may not be suitable for use because of faults, lithophysal content, breccia, etc. In addition, offsets from waste emplacement areas (30m) and from proposed multi-purpose boreholes (two drift diameters) may further reduce the available test area.

EVALUATION OF DOE RESPONSE

- DOE's Title I design lists 800,000 square feet (18.4 acres) of space dedicated to subsurface testing and an additional 3,280,000 square feet (75.3 acres) available for test expansion (page 3-56 of Title I design). The SCP showed approximately 400,000 square feet in the dedicated test area including two shafts (page 8.4.2-209 of SCP).
- The NRC staff considers that this item has been addressed, but will review the Title II design and other DOE documents related to in situ testing to see if adequate test space has

been provided.

SCA OBJECTION 1

-Basis, third bullet, item (i)

i. The zone of influence from the drilling activities of borehole USW G-4 located within the dedicated test area should be considered in evaluating the size of suitable available test space. In calculating the zone of influence for USW G-4 it should be considered that a total of 342,255 gallons of water were lost to various formations. Over 81,000 gallons of soap were used in the operation; however, how much soap was lost is unknown.

EVALUATION OF DOE RESPONSE

- The 'walk-through' does not specifically address this item.
- Considering the substantial increase in the MTL test area, tests should be able to be located outside the zones of influence of boreholes and excavations. In view of this, the NRC staff does not consider that this item will prevent closure of Objection 1. The NRC staff will consider zones of influence of boreholes and excavations in evaluating available Title II test area.

SCA OBJECTION 1

-Basis, fourth bullet

Potential impacts of long-term performance confirmation testing on ESF design have not been addressed (see Comment 119).

The SCP has not provided sufficient demonstration that in situ waste package testing will not be needed during site characterization to reduce uncertainties associated with long-term waste package performance prediction for license application and closure. If such testing is found necessary, an analysis of the impact on ESF [should be] presented. (Question 58 and Comment 82)

EVALUATION OF DOE RESPONSE

- The issue of potential impacts of long-term performance

confirmation testing (for the waste package) on design has been addressed in the ESFAS.

- The size of the MTL has been significantly increased with respect to the size given in the ESF design identified in the SCP (see current Title I design).

- Ramp accesses do not preclude transportation of waste packages. (Shafts as designed previously were felt to preclude transportation of waste packages.)

o DOE's response to the SCA (December 1990) commits to lab testing to determine whether in situ testing is necessary or not. If DOE determines that in situ waste package testing is desirable, DOE will consider the impact of such testing on the ESF.

o The NRC staff considers this basis has been adequately addressed.

SCA OBJECTION 1-

Basis, fifth bullet, item (a)

Some of the ESF design criteria are not sufficiently justified. These include:

(a) Seismic design basis (Comment 121)

EVALUATION OF DOE RESPONSE

o DOE did not provide any response to this item in the 'walk-through'.

o The issue of seismic design is an important one and will be tracked in Comment 121 throughout the design process, including review of Title II design.

SCA OBJECTION 1

-Basis, fifth bullet, item (b)

Some of the ESF design criteria are not sufficiently justified. These include:

(b) ES-1 drainage volume and long-term drainage reliability (Comment 124,Question 27)

EVALUATION OF DOE RESPONSE

- DOE did not provide any response to this item in the 'walk-through'.
- Comment 124 and Question 27 were closed in NRC's evaluation of DOE's response to SCA (July 1991).

SCA OBJECTION 1

-Basis, fifth bullet, item (c)

Some of the ESF design criteria are not sufficiently justified. These include:

(c) effect of liner removal at closure (Question 24)

EVALUATION OF DOE RESPONSE

- DOE did not provide any response to this item in the 'walk-through'.
- Question 24 was closed in NRC's evaluation of DOE's response to SCA (July 1991).

SCA OBJECTION 1

-Basis, sixth bullet

The surface drifting and exploration planned in the SCP have not been shown to be sufficient to yield the data needed for repository design and site suitability demonstration at license application. (Comment 35)

EVALUATION OF DOE RESPONSE

- DOE indicates that the underground excavations will now comprise 76,000 feet of drifts as opposed to 10,000 feet that was reported in the SCP (p.5 of 'walk-through'). The ESFAS indicates that 19,000 feet of drifting would occur in the Calico Hills unit. Access to features such as the Solitario Canyon fault, Drill Hole wash, the imbricate normal fault zone to the east of the repository, and the vitric-zeolitic facies transition will result from this

increased excavation.

- The ESFAS and the CHRBA provide the bases used to determine the extent and direction of drifting.

- The NRC staff considers that this basis point has been addressed.

SCA OBJECTION 1

-Recommendations, second bullet

The Title II design should ensure that the design process, which appears to have overlooked key regulatory requirements and information about the suitability of exploratory shaft locations during Title I design, is adequate and that the number of shafts and their locations in the final repository contribute to reduce uncertainty with respect to waste isolation.

EVALUATION OF DOE RESPONSE

- DOE discusses waste isolation with respect to access location and number based on the following general concepts:

  - Fewer accesses are better in terms of waste isolation than more accesses (see page 2.4-11 of CHRBA).

  - Accesses outside the repository which do not connect to the waste emplacement area would enhance waste isolation slightly compared to accesses which do connect to the waste isolation areas or openings within the Calico Hills natural barrier (see page 2.4-11 of CHRBA).

  It is unlikely that these two general concepts are sufficient to "ensure... that the number of shafts and their locations in the final repository contribute to reduce uncertainty with respect to waste isolation."

  Other factors which potentially should be included in considering impacts of waste isolation are:

  - Are shafts better than ramps? To reach the same point underground within the repository, shafts collars would be located at a different place than ramp portal. On page 2.4-16 of the CHRBA it states that there is no obvious difference between shafts and ramps with respect to waste isolation. On the other hand, the ESFAS noted

that ramps were favored in terms of seal effectiveness. Effective seals contribute to reducing uncertainty with respect to waste isolation.

- Is one large access better than two or more smaller accesses?

- No quantitative comparisons of alternative strategies with respect to waste isolation are presented.

- In conclusion, it appears that an intuitive process was used in scoring options. It is not clear that an intuitive process is sufficient to "ensure ... that the number of shafts and their locations in the final repository contribute to reduce uncertainty with respect to waste isolation."

- The issue of reducing uncertainty with respect to waste isolation in ESF design is an important one and will be tracked throughout the design process, including review of Title II design.

SCA COMMENT 57

Recommendation

Studies relating to design verification do not consider investigating the effects of underground excavation in the tuff using alternate excavation methods.

Recommendation

Alternate methods of excavation should be evaluated and results provided in SCP updates.

EVALUATION OF DOE RESPONSE

- NRC's review of DOE's response to SCA (July 1991) recommended that progress toward closure of this Comment would require DOE to submit Study Plan 8.3.1.15.1.8 . This study plan has not been submitted.
- The ESFAS notes (page 4-4) that construction methods considered for ESF included "drill and blast, machine excavation, and various combinations of the two."
- The ESFAS notes (page 6-6) that the excavation method for the MTL could be either drill and blast or mechanical mining.
- Appendix 3B of ESFAS provides a list of 13 access construction cases of which drill and blast, blind drill and TBM have been considered.
- The 'walk-through' contains (p. 16-17) statements regarding advantages and disadvantages of mechanical versus drill and blast excavation.
- Based on the information provided it is clear that DOE has considered alternate excavation methods.
- The NRC staff considers this Comment closed.

SCA COMMENT 72

Recommendations

In view of the limited data available at this time, it would be prudent for DOE to assume that seals will be needed until and unless it can be shown that seals will not be required to meet the repository performance objectives. It is not clear in the SCP that this is the assumption under which the sealing program is going to proceed.

Recommendations

DOE should plan its sealing program on the basis that seals will be needed until and unless it can be demonstrated otherwise.

The SCP updates should evaluate the need for temporary and permanent seals for accesses based on conditions inherent at each location of proposed shafts and ramps.

EVALUATION OF DOE RESPONSE

- The SCP did not include analyses to evaluate the need for seals in repository shafts and ramps. The NRC staff recommended that DOE plan its sealing program on the basis that seals will be needed until and unless it can be demonstrated otherwise. DOE's original response to NRC's SCA did not indicate a commitment to follow up on the NRC recommendation.

- Seal tests are listed as one of the planned 'late tests' for the MTL test program (see pages 5-8 and 5-9 of ESFAS) for all ESF options. Although no details of the seal tests are provided in the ESFAS, the 'walk-through' (page 10-11) indicates that DOE considers that seals may be required to meet repository performance objectives.

- The NRC staff considers this Comment closed.

SCA COMMENT 119

The information presented in the SCP, Section 8.3.5.16-Performance Confirmation Testing, is insufficient to allow NRC staff to determine if the confirmation program meets the requirements of 10 CFR 60, Subpart F.

EVALUATION OF DOE RESPONSE

- Some aspects of this Comment were addressed in DOE's response to SCA (December 1990) and closed in NRC's

evaluation of DOE's response (July 1991). The 'walk-through' does not provide any additional information on which to close this Comment.

- The NRC staff considers this Comment remains open.

SCA COMMENT 121

Seismic design criteria for the ESF are not sufficiently described in the SCP.

EVALUATION OF DOE RESPONSE

- The issue of seismic design is an important one and will be tracked throughout the design process, including review of Title II design.
- There is no change in the status of this Comment, i.e. this Comment remains open [see NRC's evaluation of DOE's response to SCA (July 1991)].

SCA COMMENT 124

The discussion of the potential causes for a reduction in the drainage capacity of the shaft bottom does not include certain plausible mechanisms.

EVALUATION OF DOE RESPONSE

- This Comment was closed in NRC's evaluation of DOE's response to SCA (July 1991).

SCA COMMENT 128

Several applicable 10 CFR 60 requirements have not been considered in evaluating the acceptability of ESF Title I design.

EVALUATION OF DOE RESPONSE

- DOE lists in Table 2-1 some 10 CFR 60 regulatory requirements which were used as discriminators used for the ESFAS. DOE claims that "all 10 CFR 60 requirements were considered during the performance of the ESFAS and will

continue to be considered during Title II design" (see page 19 of 'walk-through').

- Evidence that design criteria based on 10 CFR 60 requirements have been developed for the Title II design will be evaluated during Title II design.

- See evaluation for Comment 130.

- The NRC staff recognizes that this Comment is a special case which can be tracked together with the more general Comment 130. Accordingly, this Comment is considered closed.

SCA COMMENT 130

Out of the fifty-two (52) 10 CFR 60 requirements considered applicable to ESF design by the DOE in reviewing the acceptability of Title I design, the DAA focuses on only 22 requirements that belong to three areas specifically outlined by NRC. Other requirements (e.g. retrievability, preclosure radiological safety, performance confirmation, and QA program) are said to be qualitatively evaluated (see p.2-1, second paragraph). The approach taken in the DAA raises questions about completeness and rigor in the design acceptability analysis, as detailed design criteria were not developed for all applicable requirements.

EVALUATION OF DOE RESPONSE

- DOE states that "all 10 CFR 60 requirements ... will continue to be considered during Title II design." (see page 19 of 'walk-through'). No evidence is provided that design criteria based on 10 CFR 60 requirements are being developed for the Title II design.

- Evidence that design criteria based on 10 CFR 60 requirements have been developed for the Title II design will be evaluated during Title II design.

- The NRC staff considers this Comment open.

SCA COMMENT 131

One of the key steps in the DAA process was to review the adequacy of data used in Title I design. It appears that the DAA does not reasonably address this step.

EVALUATION OF DOE RESPONSE

- This Comment was previously closed [see NRC's evaluation of DOE's response to SCA (July 1991)].

SCA COMMENT 132

The requirements of 10 CFR 60.21(c)(1)(ii)(D)[i.e. consideration of major design features],in particular, have not been adequately addressed in evaluating the acceptability of ESF Title I design.

EVALUATION OF DOE RESPONSE

- According to Section 6.2.1 of the ESFAS the major design features which were considered are:
  - Means of access
  - Location of accesses
  - Location of (core) MTL
  - Excavation method of openings
  - Total number of repository accesses

- The original SCA Comment noted that the requirements of 10 CFR 60.21(c)(1)(ii)(D) were not adequately addressed in evaluating the acceptability of ESF Title I design and recommended that the Title II design be expanded to fully address the 10 CFR 60.21 requirements. However, the consideration, description and evaluation of major design features is contained in the ESFAS. Therefore the bases for the Title II design in addressing the requirements of 10 CFR 60.21 are contained in the ESFAS. (DOE has previously indicated that the preferred option will be used as the basis for Title II design.) The NRC staff considers that the ESFAS addresses the 10 CFR 60.21 requirements.

- The NRC staff considers this Comment closed. However, the adequacy of the Title II design with respect to all 10 CFR 60 requirements will be evaluated when the staff reviews the Title II design.

SCA QUESTIONS RESOLUTION

SCA Question 28

If it is decided that ES-1 will penetrate the Calico Hills unit, what will be the impacts on the current sealing program and issue resolution strategy for Issue 4.4?

EVALUATION OF DOE RESPONSE

- Areas where DOE says that the open item is addressed in ESFAS relate primarily to seal testing in the MTL.
- Review of DOE's 'walk-through' for Question 28 did not change the status of Question 28.
- The NRC staff considers Question 28 open.

SCA QUESTION 58

How does the ESF design described in the SCP provide the flexibility to accommodate in situ testing of waste packages should it be considered desirable or necessary by DOE?

EVALUATION OF DOE RESPONSE

- The issue of ESF flexibility has been addressed in the ESFAS.

  - The size of the MTL has been significantly increased with respect to the size given in the ESF design identified in the SCP (see current Title I design).

  - Ramp accesses do not preclude transportation of waste packages. (Shafts in the ESF design identified in the SCP were previously felt to preclude transportation of waste packages because of inadequate headframe capacity and shaft dimensions.)

- DOE's response to the SCA (December 1990) commits to lab testing to determine whether in situ testing is necessary or not. If DOE determines that in situ waste package testing is desirable, DOE will consider the impact of such testing on the ESF.

- The original NRC recommendation to resolve this question is

for DOE to analyze "the impact of such testing on ESF design". NRC does not want DOE to make ESF design decision without consideration of such tests. This question was not directly addressed in the 'walk-through' document, and therefore, will be 'open' to ensure that the ESF decision will address this question.

- Question 58 is 'open'.

SCA QUESTION 63

What is the justification for certifying (Appendix C.3 of DAA) that all TAR reviewers were not principal contributors to ESF Title I Design or to the Subsystem Design Requirements Document (SDRD) which was used for ESF Title I Design in view of the documentation in the DAA showing that some of the TAR reviewers worked on the ESF Title I Design and/or SDRD?

EVALUATION OF DOE RESPONSE

- Question 63 was closed in NRC's evaluation of DOE's response to SCA (July 1991).

REFERENCES:

1. Letter of March 3, 1992, from J. Roberts of DOE to J. Holonich of NRC; submitting ESFAS/CHRBA Walk-through document for removing SCA Objection 1.

2. Exploratory Studies Facility Alternative Study, Sand91-0025, September,1991 (ESFAS report.)

3. Risk/Benefit Analysis of Alternative Strategies for Characterizing the Calico Hills Unit at Yucca Mountain, January 1991, (CHRBA report.)

4. Letter of July 31, 1991 from R. Bernero of NRC to J. Bartlett of DOE; transmitting NRC's evaluation of DOE's response to SCA Objections and Comments.

05/07/92

NOTE TO: Charlotte Abrams, Sr. Project Manager
Repository Licensing & Quality Assurance
Project Directorate

FROM: David Brooks, Section Leader
Hydrologic Transport Section
Hydrology and Systems Performance Branch

SUBJECT: EVALUATION OF DOE REQUEST TO CLOSE SITE CHARACTERIZATION ANALYSIS COMMENTS 12 AND 16

In response to your note dated 03/24/92, please find enclosed our evaluation of DOE responses to Site Characterization Analysis Comments 12 & 16. Both comments have been closed. Please note that these comments differ from earlier drafts. Should you have any questions, contact me at 504-3457 or W. Ford at 504-2506.

David Brooks, Section Leader
Hydrologic Transport Section
Hydrology and Systems Performance Branch

Enclosure:
As stated

cc: M. Federline
W. Ford
M. Nataraja

Section 8.3.1.2 Overview of the geohydrology program: Description of the present and expected geohydrologic characteristics required by the performance and design issues

Section 8.3.1.2-2a Current representation and alternative hypotheses for unsaturated-zone hydrologic system conceptual models for the geohydrology program

SCA COMMENT 12

The hypothesis that liquid-water flow in the Calico Hills unit is restricted to the rock matrix and the hypothesis that matrix properties of the altered Calico Hills nonwelded zeolitized unit are probably largely isotropic (because chemical alteration can be expected to destroy preferred orientations of rock properties) are not stated in Table 8.3.1.2-2a and no definite activities to test them are found in the plan.

EVALUATION OF DOE RESPONSE

- Comment 12 points out that the Yucca Mountain Site Characterization Plan does not identify test activities for two ground water flow hypotheses. These hypotheses are:

  1. Liquid-water flow in the Calico Hills unit is restricted to the rock matrix.

  2. Matrix properties of the altered Calico Hills nonwelded zeolitized unit are probably largely isotropic.

- Page 6 of the DOE communication to Joseph J. Holonich (NRC), dated March 3, 1992, identifies areas of the "Risk/Benefit Analysis of Alternative Strategies For Characterizing the Calico Hills Unit at Yucca Mountain" that address this comment. In this communication, it is stated that the proposed tests for the Calico Hills unit "are expected to provide information on variations of hydrologic properties and processes with scale validation of models for flow and transport, and monitoring of in situ conditions." Further, the underground testing strategies proposed in the "Risk/Benefit Analysis of Alternative Strategies For Characterizing the Calico Hills Unit at Yucca Mountain" are for specific test strategies in the Calico Hills nonwelded unit, some of which may be combined with surface based test activities." It is also stated that Table 2.3-9 of the "Risk/Benefit Analysis of Alternative Strategies For Characterizing the Calico Hills Unit at Yucca Mountain" (pages 2.3-18 to 2.3-21) describes testing activities, that when executed within the Calico Hills nonwelded unit, will test hypotheses of liquid flow in the Calico Hills nonwelded unit.

- The information provided in the "Risk/Benefit Analysis of Alternative Strategies For Characterizing the Calico Hills Unit at Yucca Mountain" demonstrates that investigation of these hypotheses is part of the Yucca Mountain characterization plan.

- Therefore, the NRC staff considers this comment closed.

Section 8.3.1.2.2.4.6 Activity: Calico Hills Test in the Exploratory Shaft Facility

Section 8.4.2.1.6.1 Characterization of the Calico Hills Nonwelded Unit

SCP COMMENT 16

The SCP does not contain a plan to adequately characterize the hydrologic properties of the Calico Hills unit, which has been designated the primary barrier to ground water flow and radionuclide transport.

EVALUATION OF DOE RESPONSE

- Comment 16 was primarily focused on the need to understand the effects that fractures and faults have on flow paths and travel times, and the conditions under which fracture flow may occur in the Calico Hills unit. Studies were initiated by DOE to identify an optimal testing strategy to characterize the hydrologic properties of the Calico Hills unit (Risk/Benefit Analysis of Alternative Strategies for Characterizing The Calico Hills Unit At Yucca Mountain and the Exploratory Shaft Facility Alternatives Study). The document "Responses to NRC Point Papers on Site Characterization Plan/Consultation Draft" dated December, 1988, stated that for these studies considerable weight was given to a testing strategy that would confirm or reject the hypothesis that water movement in the Calico Hills nonwelded unit has a predominantly vertical component of flow through the matrix and continues downward directly to the water table wherever it intersects the Calico Hills nonwelded unit. The "Risk/Benefit Analysis of Alternative Strategies for Characterizing the Calico Hills Unit at Yucca Mountain" identifies data needs and contains many alternative strategies for testing the Calico Hills unit. Some of these strategies are identified in Table 2.3-9 (pages 2.3-18 through 2.3-21). It should also be noted, that all of the testing strategies include additional testing approaches not described in the Yucca Mountain Site Characterization Plan.

- The original intent of Comment 16 was to call attention to the need for adequate characterization of Calico Hills unit hydrologic properties. The "Risk/Benefit Analysis of Alternative Strategies for Characterizing the Calico Hills Unit at Yucca Mountain" demonstrates that adequate characterization of Calico Hills unit hydrologic properties is part of the plan to characterize Yucca Mountain .

- Therefore, the NRC staff considers this comment closed.

APR 21 1992

NOTE TO: Charlotte Abrams

FROM: Keith I. McConnell

SUBJECT: PRELIMINARY DRAFT COMMENTS ON REVIEW OF THE "WALK-THROUGH" OF THE EXPLORATORY STUDIES FACILITY ALTERNATIVES STUDY (ESFAS)

The Geology/Geophysics Section has completed preliminary drafts of comments (see attached) related to those Site Characterization Analysis (SCA) comments that are our responsibility and which were identified in the "walk-through" document as having been closed (i.e., SCA Comments #34, 35, and 127). We have concluded that the information provided in the ESFAS, the Calico Hills Risk Benefit Analysis (CHRBA) and the "walk-through" document is sufficient to close open items related to Comments #35 and #127. However, we find that the information in the same documents is insufficient for closing Comment #34. Although DOE indicates that they consider this item closed, they only addressed one recommendation out of 5 that are made in the SCA comment. The staff considers this to be inadequate to close the open item related to Comment #34.

With respect to Objection #1, those comments (i.e., #35 and #127) that form the basis of Geology/Geophysics input into the objection are being closed based on the information provided in the ESFAS, CHRBA, and "walk-through" document. Therefore, we consider our part of the open item related to Objection #1 to be closed.

cc. RBallard
RNataraja
RWeller
HLefevre

Section 8.3.1.3.1.1 Activity: Development of an integrated drilling program

Section 8.3.1.4.2.1 Study: Characterization of the vertical and lateral distribution of stratigraphic units within the site area

SCA COMMENT 34

Discussions of the integrated drilling program are unclear as to how data from various holes will be used in support of different studies; how uncertainty in core retrieval and data analysis will be handled; and how the large volume of existing information will be used to plan the drilling program.

EVALUATION OF DOE RESPONSE

- Closure of this item is dependent upon the DOE's having addressed each of the comment's five "recommendations".

- Only one of the five comment "recommendations" (the third bullet) has been addressed by the DOE. This third "recommendation" is: "Angled drillholes should be considered as a means to identify and characterize vertical/near vertical features."

- The CHRBA (DOE, 1991, p. 2.3-1) identifies angle boreholes as a potential technique to be employed for characterization of the Calico Hills (CHn) nonwelded tuff. The DOE's technique evaluation subgroup consistently rated angle drillholes in deference to vertical drillholes in the acquisition of rock information, including fracture and fault zone properties (CHRBA, Tables 2.3-2, 2.3-3 and 2.3-4, pp. 2.3-3 through 2.3-5).

- In its deliberations, the DOE subgroup recommended (DOE, 1991, p. 2.3-10) that "because of the uncertainty as to the feasibility of dry-drilled angle holes" the multiple-angle-hole clusters category be eliminated, but did recommend that the single (isolated) angle hole category be retained.

- The sections of the CHRBA (DOE, 1991) referenced in DOE (1992, p. 8) provide <u>relative</u> ratings of various investigative techniques, not <u>recommended</u> techniques.

- Except for consideration for CHRBA-related investigations (DOE, 1991) the above referenced CHRBA sections do not imply or suggest that angled drill holes will be considered when composing other site characterization strategies.

- However, the DOE does indicates in another document (DOE, 1992, p. 8) that angled drill holes will be considered in composing site characterization strategies.

- Sufficient bases ~~has~~ have been provided by the DOE (1992, pp. 7-8) for the NRC staff's closure of the comment's third recommendation which addresses the use of angled drillholes. The staff considers this portion of the comment closed.

- As indicated in the staff's evaluation of the DOE's response to this comment (NRC, 1991), closure of the remainder of the SCA "Recommendations" (bullets 1,2, 4 and 5) must await DOE confirmation of the integrated program and the NRC staff evaluations of Study Plan 8.3.1.9.2.1, Activity 8.3.1.2.2.4.10, the C-Hole Complex study and unspecified attendant study plans.

- The NRC staff considers this comment (exclusive of the third SCA Recommendation) open.

REFERENCES

NRC, 1991, Letter of July 31, 1991, from R. M. Bernero to J. M. Bartlett, DOE, transmitting NRC staff evaluations of DOE's responses to SCA open items, 4 pp. plus 2 enclosures.

DOE, 1991, U.S. Department of Energy, "Record Memorandum, Risk/Benefit Analysis of Alternative Strategies for Characterizing the Calico Hills Unit at Yucca Mountain (CHRBA)", YMP/191-6, Revision 0, January, 1991, 2 volumes.

DOE, 1992, Letter of March 3, 1992, from J. P. Roberts to J. J. Holonich, NRC, transmitting information supporting DOE's closure of SCA Objection, 2 pp. plus 2 enclosures, including CHRBA/ESFAS Documentation and SCA Open Items.

Section 8.3.1.4.2 Investigation: Geologic Framework of the Yucca Mountain Site

Section 8.3.1.4.3 Investigation: Development of three-dimensional models of rock characteristics at the repository site.

Section 8.4.2.1 Rationale for planned testing

SCA COMMENT 35
The program of drifting in the north, combined with systematic drilling and feature sampling drilling, appears unlikely to provide the lithologic and structural information necessary to adequately investigate potentially adverse conditions at the site or insure that observations made and data collected will be representative of conditions and processes throughout the repository block. Also, it has not been demonstrated that the proposed site characterization plan provides for a sufficient amount of underground drifting to collect data necessary for designing the repository and analyzing repository performance.

EVALUATION OF DOE RESPONSE

- The response to this comment indicates that the underground excavations will now comprise 76,000 feet of drifts as opposed to 10,000 feet that was reported in the SCP. The Exploratory Studies Facilities Alternatives Study indicated that 19,000 feet of drifting would occur in the Calico Hills unit. Access to features such as the Solitario Canyon fault, Ghost Dance fault, Drill Hole wash, the imbricate normal fault zone to the east of the repository, and the vitric-zeolitic facies transition will result from this increased excavation.

- The Exploratory Studies Facilities Alternatives Study and the Calico Hills Risk Benefit Analysis provided the bases used to determine the extent and direction of the drifting.

- The staff considers this comment ~~resolved.~~ closed.

Section: Design Acceptability Analysis, Chapter 3: Assessment of Alternative Shaft Locations

SCA COMMENT 127

The process used to integrate all available technical data into decisions regarding shaft location appears to have been inadequate because an apparent lack of data integration raised concerns about the suitability of shaft locations and about a process that has resulted in a possible violation of the criteria specified in the Design Acceptability Analysis (DAA) for set-back distances from faults.

EVALUATION OF DOE RESPONSE

- The response to this comment indicates that the Calico Hills Risk Benefit Analysis considered 24 locations from which shafts and/or ramps would access the Calico Hills resulting in eight strategies for characterizing the Calico Hills. All eight strategies were assessed for their impact on waste isolation.

- DOE revised its process for controlling the ESF design and incorporated the revised process into DOE administrative procedures.

- The Exploratory Studies Facilities Alternatives Study resulted in a favored option that utilizes a two ramp configuration in which the criteria for set-back from faults is not considered applicable. DOE indicated that any major fault encountered during ramp construction will be evaluated for its impact on ESF design.

- The staff considers this comment ~~resolved~~. Closed.