



Department of Energy
Washington, DC 20585

OCT 3 1988

Mr. John Linehan, Chief
Project Management and Quality
Assurance Branch
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Linehan:

The purpose of this letter is to transmit to the U.S. Nuclear Regulatory Commission (NRC) the pre-meeting materials for a meeting between NRC and the U.S. Department of Energy scheduled for October 18-20, 1988. The purpose of the meeting is to discuss and agree to an approach and schedule for addressing the Exploratory Shaft Facility (ESF) related open items. Please note that the enclosed materials identify 21 items that have been closed through documented correspondence and for which further discussion is not required.

The following pre-meeting materials are enclosed:

1. Meeting agenda, as agreed to with King Stablein on September 28, 1988.
2. Spreadsheet summarizing ESF open items.
3. Tables of the open items sorted by Agenda topic and in the order DOE suggests they be discussed in the meeting.
4. Summary table which identifies a breakdown of open items by agenda topic.

The meeting will be held in Room 1E-245 of the Forrestal Building, 1000 Independence Avenue, Washington, D.C. Attendees should plan to arrive a few minutes early to check in through the DOE security system.

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We look forward to meeting with you on these important topics.
If you have any questions, please contact Mr. Edward Regnier on
(202) 586-4590.

Sincerely,



Ralph Stein
Associate Director for Systems
Integration and Regulations
Office of Civilian Radioactive
Waste Management

Enclosure: As stated

cc: Robert Loux, State of NV
S. Kale, RW-20
K. Klein, RW-30
E. Regnier, RW-331
C. Gertz, YMPO, NV



Department of Energy
Washington, DC 20585

OCT 3 1988

Robert R. Loux
Executive Director
Nuclear Waste Project Office
State of Nevada
Evergreen Center
Suite 252
1802 North Carson Street
Carson City, NV 89710

Dear Mr. Loux:

The purpose of this letter is to notify the State of Nevada and to transmit to the State the pre-meeting materials for a meeting between the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy scheduled for October 18-20, 1988. The purpose of the meeting is to discuss and agree to an approach and schedule for addressing the Exploratory Shaft Facility (ESF) related open items. Please note that the enclosed materials identify 21 items that have been closed through documented correspondence and for which further discussion is not required.

The following pre-meeting materials are enclosed:

1. Meeting agenda, as agreed to with King Stablein on September 28, 1988.
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4. Summary table which identifies a breakdown of open items by agenda topic.

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Ralph Stein
Associate Director for Systems
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Office of Civilian Radioactive
Waste Management

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cc: J. Linehan, NRC ✓
S. Kale, RW-20
K. Klein, RW-30
E. Regnier, RW-331
C. Gertz, YMPO, NV

AGENDA

NRC-DOE MEETING ON
EXPLORATORY SHAFT FACILITY (ESF)
OPEN ITEMS
DOE Forrestal Building, Washington, D.C.
October 18-20, 1988

OBJECTIVE: The objectives of the meeting are: (1) for NRC to restate all outstanding ESF open items previously documented in meeting notes or letters to DOE, noting the information needed to resolve the open item and whether the information is needed prior to the SCP, in the SCP, or prior to the start of ESF construction; (2) to get agreement from DOE that they clearly understand the NRC concerns; (3) for DOE to present an approach and schedule for addressing the ESF-related open items identified and documented by NRC from 1983 to the present that will lead to resolution of those open items; and (4) for NRC and DOE to agree on the approach and schedule for the resolving each open item.

In the event that some agenda items for any session require less time than projected, items scheduled for later discussion may be discussed earlier than the time shown on this agenda.

October 18, 1988

8:30 a.m. OPENING STATEMENTS

NRC
DOE
STATE OF NEVADA
OTHER AFFECTED
PARTIES

SCOPE OF MEETING

- o History of ESF Open Items Identified and Documented by NRC NRC
- o DOE Approach to Address ESF Open Items DOE

9:30 a.m. ESF DESIGN CONTROL PROCESS

- o Review of Open Items NRC
- o Requirements Flowdown DOE
- o NUREG 1318 Philosophy DOE

10:30 a.m. SUMMARY OF PERFORMANCE ANALYSIS

- o Review of CDSCP Objections 2,3, and 4 NRC
- o Penetration of Calico Hills Unit (CDSCP Objection 2) DOE
- o Potential Interferences with Testing (CDSCP Objection 3) DOE
- o Shaft Location (CDSCP Objection 4) DOE

12:00 LUNCH

1:00 p.m. SUMMARY OF PERFORMANCE ANALYSIS (CONTINUED)

2:30 p.m. OPEN ITEMS ON SHAFT LOCATION

- o Review of Open Items NRC
- o Approach to and schedule for Resolution DOE

3:30 p.m. OPEN ITEMS ON PERFORMANCE ASSESSMENT

- o Review of Open Items NRC
- o Approach to and schedule for Resolution DOE

5:00 p.m. ADJOURN

October 19, 1988

8:30 a.m. OPEN ITEMS ON SEALS

- o Review of Open Items NRC
- o Approach to and schedule for Resolution DOE

12:00 LUNCH

1:00 p.m. OPEN ITEMS ON TESTING

- o Review of Open Items NRC
- o Approach to and schedule for Resolution DOE

5:00 p.m. ADJOURN

October 20, 1988

8:30 a.m. OPEN ITEMS ON DESIGN AND CONSTRUCTION

- o Review of Open Items NRC
- o Approach to and schedule for Resolution DOE

12:00 LUNCH

1:00 p.m. MISCELLANEOUS OPEN ITEMS

- o Review of Open Items NRC
- o Approach to and schedule for Resolution DOE

2:00 p.m. CAUCUS ALL

3:30 p.m. CLOSING STATEMENTS NRC
DOE
STATE OF NEVADA
OTHER AFFECTED
PARTIES

4:30 p.m. PREPARATION OF MEETING SUMMARY (To be ^e
continued Friday, October 21, as necessary) ALL

AGENDA CATEGORY	QTY	QTY IN SCP	WESTON/SAIC ITEM NUMBERS	REMARKS	LEAD
1 APP. TO ESF OPEN ITEMS (CLOSED/DOCUMENTED)	21	N/A	6, 18, 19, 20, 21, 22, 23, 24, 25, 27, 30, 31, 33, 35, 38, 39, 40, 41, 42, 53, 55		BROCOUW
2 DESIGN CONTROL PROCESS	2	1	67, 68	ITEM 68 NOT IN SCP	LAMOTI
3 SUMM. OF PERF. ANALYSIS (POINT PAPER OBJECTIONS)	3	3	69, 70, 71		BLANCHARD
4 SHAFT LOCATION	6	6	29, 34, 51, 102, 123, 124		DOBSON
5 PERFORMANCE ASSESSMENT	13	13	52, 56, 57, 59, 73, 84, 85, 88, 90, 91, 96, 98, 100		BLANCHARD
6 SEALS	27	25	1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 15, 28, 44, 45, 54, 58, 86, 89, 92, 93, 94, 95, 97, 101, 103, 119, 121	ITEMS 15, 45 NOT IN SCP	DOBSON
7 TESTING	34	32	17, 32, 36, 46, 49, 50, 74, 76, 77, 78, 79, 80, 81, 82, 83, 87, 99, 104, 105, 108, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 120, 125	ITEMS 46, 49 NOT IN SCP	BLANCHARD
8 DESIGN AND CONSTRUCTION	8	2	7, 13, 14, 16, 47, 61, 72, 75	ITEMS 7, 13, 14, 16, 47, 61 NOT IN SCP	SKROUSEN
9 MISCELLANEOUS					BROCOUW
- NRC OBLIGATIONS	4	N/A	26, 37, 48, 65		
- PENDING	5	N/A	60, 62, 63, 64, 66		
- OTHER	2	1	43, 122	ITEM 43 NOT IN SCP	
TOTAL	125	83		83 ITEMS RESOLVED IN SCP 12 DOE OPEN ITEMS NOT RESOLVED IN SCP 21 ITEMS CONSIDERED CLOSED 5 ITEMS PENDING NRC CLOSURE 4 NRC OBLIGATIONS	
				125 TOTAL	

Item No	Group	Open Items	Reference	Expected Documents for Closure	NRC Status	Expected Date
1	SEAL	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	4831R 1a	SCP 8 4 2 3 6 3 (Repository/ESF integration) SCP 8 4 3 2 5 3 (ESF Construction Impacts) SCP 8 4 3 2 4 (Design features contributing to performance) SCP 8 4 3 3 (Impacts on postclosure performance)	Open	12/30/88
2	SEAL	Describe how the selected excavation technique and shaft design accounts for limitations and uncertainties in long term sealing considerations	4831R 1b	SCP 8 4 2 3 4 4 (ESF Construction) SCP 8 4 2 3 3 3 (General ES arrangement) SCP 8 4 3 3 (Impacts on postclosure performance) SCP 8 4 3 2 4 (Design features contributing to performance)	Open	12/30/88
3	SEAL	Provide design specifications for the shaft construction and show how they deal with the factors affecting sealing	4831R 1c	SCP 8 4 2 3 3 3 (General ES arrangement) SCP 8 4 2 3 4 3 (ES Collar construction) SCP 8 4 2 3 4 4 (ESF Underground construction) SCP 8 4 3 3 (Impacts on postclosure performance) SCP 8 4 3 2 4 (Design features contributing to performance)	Open	12/30/88
4	SEAL	Describe the seal design and materials	4831R 1d	SCP 8 4 2 3 1 (ESF in situ testing of seal components) SCP 8 4 3 3 1 (Impact on total system releases) SCP 8 2 8 (Seal designs) SCP 8 3 3 2 3 (Seal emplacement methods) SCP 8 3 3 2 2 (Seal materials) SCP 8 3 3 1 2 (Seal materials)	Open	12/30/88
5	SEAL	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	4831R 1e	SCP 8 4 2 3 1 (ESF testing activities) SCP 8 3 3 2 2 3 (In situ testing of seals)	Open	12/30/88
6	CD	Provide drilling history and results of geotechnical testing from the principal borehole, G 4	4831R 1f	USGS DFR 84 552, SAND83 1711, SAND85 0762, SAND84-1471 Closure documented by 7/8/88 Linehan to Gertz letter.	Closed	N/A
7	DC	Identify the acceptance criteria for construction of the exploratory shaft.	4831R 11a	Upon completion of title II	Open	
8	SEAL	Identify procedures used to minimize	4831R 11b	SCP 8 4 2 3 4 4 (ESF underground construction)	Open	12/30/88

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Item No	Group	Open Items	Reference	Inserted Documents for Closure	MRC Status	Expected Date
		damage to the rock mass penetrated.		SCP 0 4 2 3 3 2 (Surface facilities arrangement) SCP 0 4 3 2 3 (Thermal/mechanical analyses and data)		
9	SEAL	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.	4831R IIIc	SCP 0 4 2 3 4 4 (ESF underground construction) SCP 0 4 3 2 4 (Design features contributing to performance) SCP 0 4 3 2 2 (Geochemical analyses and data) SCP 0 4 3 2 3 (Thermal/mechanical analyses and data) SCP 0 4 3 2 5 3 (Impacts from construction of shafts)	Open	12/30/88
10	SEAL	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.	4831R IIIa	SCP 0 4 2 3 1 (ESF in situ testing of seal components) SCP 0 4 3 3 1 (Impact on total system releases) SCP 0 3 3 2 2 3 (In situ testing of seals)	Open	12/30/88
11	SEAL	Describe the placement methods	4831R IIIb	SCP 0 4 3 3 1 (Impact on total system releases) SCP 0 3 3 2 3 (Emplacement method) SCP 0 2 0 2 (Shaft/ramp seal emplacement) SCP 0 2 0 4 (Borehole seal emplacement)	Open	12/30/88
12	SEAL	Describe remedial methods to be used if sealing methods are not adequate	4831R IIIc	SCP 0 3 3 1 (Overview of the seal program)	Open	12/30/88
13	DC	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	4831R IVa	Upon completion of title II	Open	
14	DC	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	4831R IVb	Upon completion of title II	Open	
15	SEAL	Describe test and inspection procedures to be used after sealing of the shaft	4831R IVc	Letter on this subject	Open	

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Item No.	Group	Open Items	Reference	Expected Documents for Closure	NRC Status	Expected Date
		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.				
16	DC	Describe plans to document the above construction activities	4831R IVd	Upon completion of Title II	Open	
17	TEST	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 <ul style="list-style-type: none"> n Geologic mapping and rock mass characterization of the shaft walls n Measurements of rates and quantities of groundwater inflow and collection of groundwater samples for testing n Measurements of overbreakage during blasting n Rock mechanics testing of samples obtained during drill and blast operations 	4831R Va	SCP 0 4 2 3 1 (ESF testing operations) SCP 0 4 2 3 4 4 (ESF underground construction & operation) SCP 0 4 2 3 8 (Evaluation of ESF layout) SCP 0 3 1 2 2 3 (surface based study of percolation) SCP 0 3 1 2 2 3 1 (Matrix hydrologic properties testing) SCP 0 3 1 2 2 4 4 (Radial borehole tests in the ESF) SCP 0 3 1 2 2 4 7 (Perched water test in ESF) SCP 0 3 1 15 1 0 1 (Mining methods; design verification) SCP 0 3 1 15 1 1 (Thermal properties testing) SCP 0 3 1 15 1 2 (Thermal expansion testing) SCP 0 3 1 15 1 3 (Mechanical properties of intact rock) SCP 0 3 1 15 1 4 (Mechanical properties of fractures)	Open	12/30/88
18	CD	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	4831R VIa	Provided at August 85 DOE/NRC meeting. Closure documented by 10/31/86 Linehan to Vieth letter	Closed	N/A

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Item No.	Group	Open Items	Reference	Expected Documents for Closure	NRC Status	Expected Date
		consideration, are provided. 2)				
		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				
19	CD	Provide a schedule for completion of ES Construction and Testing QA procedures.	4831R V1b1	Closure documented by 7/88 QA meeting summary	Closed	N/A
20	CD	Provide basis for assignment of quality level to the ES construction.	4831R V1b2	Closure documented by 7/88 QA meeting summary	Closed	N/A
21	CD	Provide basis for assignment of quality level to data collection during construction.	4831R V1b3	Closure documented by 7/88 QA meeting summary	Closed	N/A
22	CD	Provide basis for assignment of quality level to the dewatering system	4831R V1b4	Closure documented by 7/88 QA meeting summary.	Closed	N/A
23	CD	DOE would like copies of Ted Johnson's analysis that indicated the 1/2" runoff from the E S Drainage Area could result in a 4 order of magnitude increase of water into the ES over the SMI 500 year flood scenario	88SA1 1	4/21/88 Letter from NRC providing requested analysis. Closure documented by 10/31/86 Linehan to Vieth letter	Closed	N/A
24	CD	DOE would like a copy of the report on in situ stress measurement at NTC referenced by David Canover.	88SA1 2	Reference identified. Closure documented by 10/31/86 Linehan to Vieth letter	Closed	N/A
25	CD	DOE would like specific details on the areas of landslides at Yucca Mountain referenced by John Trapp	88SA1 3	letter sent 12/3/85. Closure documented by 10/31/86 Linehan to Vieth letter	Closed	N/A
26	NRC	NRC position on the 1 part per 100,000 release limit as an instantaneous differential or an integral over a year	88SA1 4	N/A	Open	
27	CD	Need to establish an authoritative set of references on the subject of rock damage around openings in the earth.	88SA1 5	SAW008-7001. Closure documented by 8/19/87 Linehan to Kunich letter	Closed	N/A
28	SEAL	Need to establish a common approach to	88SA1 6	SCP B 4 2 3.1 (ESF testing operations)	Open	12/30/88

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Item No.	Group	Open Items	Reference	Expected Documents for Closure	NRC Status	Expected Date
		evaluating the magnitude of the damage around openings		SCP 8 4 3 2 3 (Thermal/mechanical analyses) SCP 8 4 3 2 5 (Summary of potential impacts to site from SC activities)		
29	SL	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	88SAI 7	SCP 8 4 2 1 5 (Representativeness of planned testing) SCP 8 4 2 1 8 2 (Drifting to southern block)	Open	12/30/88
30	CD	Need to structure the open items in a manner that will allow the April 1983 NRC letter (Coplan to Vieth) to be closed out.	88SAI 8	Letter sent to NRC 6/2/86. Closure documented by 10/31/86 Linehan to Vieth letter	Closed	N/A
31	CD	NRC final comments on the Draft Performance Assessment on the Exploratory Shaft.	88SAI 9	Letter sent 11/25/85. Closure documented by 10/31/86 Linehan to Vieth letter	Closed	N/A
32	TEST	Need to review section 80.21(c) to determine NRC's expectations regarding the information of fracture characteristics to be obtained from the exploratory shaft.	88SAI 10	SCP 8 3 1 4 2 2 2 (Surface fracture network studies) SCP 8 3 1 4 2 2 4 (Geologic mapping of ESF) SCP 8 4 2 3 1 (ESF testing operations)	Open	12/30/88
33	CD	NRC staff concerned about the fact that the second exploratory shaft was located outside of the preferred area, needs to more thoroughly explain logic as to why this is a significant point. Is it an issue related to validity of testing data or radiological health and safety?	88SAI 11	Letter sent 12/26/86. Closure documented by 8/19/87 Linehan to Kunrich letter	Closed	N/A
34	SL	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.	88SAI 12	SCP 8 4 2 1 5 (Representativeness of planned testing) SCP 8 4 2 1 5 5 (Need for drifting to southern part of the repository block) SCP 8 4 2 3 3 (Description of the ESF)	Open	12/30/88
35	CD	The DOE will provide to the NRC the Keystone Document R310/85/1.	88SAI 13	Keystone document. Closure documented by 10/31/86 Linehan to Vieth letter	Closed	N/A

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Item No	Group	Open Items	Reference	Inspected Documents for Closure	NRC Status	Expected Date
		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				
36	TESI	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 NWDG/NRC TSP meeting.	88SAI 14	SCP 8 4 2 3 1 (ESF testing operations and layout constraints) SCP 8 4 2 2 3 3 (ES general arrangement) SCP 8 4 2 3 3 4 (Main test level general arrangement) SCP 8.4 2.3.8 (Evaluation of FSF layout and operations) SCP 8I 4 2 1 (Rationale for Planned testing)	Open	12/30/88
37	NRC	The NRC is to furnish the DOE with the information as to whether NRC's 10exp 5/yr release rate applies on a discrete year by year basis or a continuous rate basis	88SAI 15	N/A	Open	
38	CD	The DOE will furnish the NRC with the document which contains recent information on thickness of the Calico Hills	88SAI 16	Closure (via 7/20/87 DOE submital) documented by 9/10/87 Linehan to Gertz letter	Closed	N/A
39	CD	The DOE will send the NRC copies of the vieographs used in the DOE's presentation of the damaged zone model for Tuff.	88SAI 17	Vieographs transmitted 3/11/88 Closure documented by 10/31/88 Linehan to Vieth letter	Closed	N/A
40	CD	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 damaged zone model for Tuff.	88SAI 18	SAND86-7001 Closure documented by 4/7/88 Youngblood to Gertz letter	Closed	N/A
41	CD	The NRC will provide the DOE with the U.S. Bureau of Mines reference related to horizontal stress of southern Nevada rocks.	88SAI 19	Reference identified. Closure documented by 10/31/88 Linehan to Vieth letter	Closed	N/A
42	CD	DOE will provide NRC with information relating to testing performed in or on	88SAI 20	DOE submitted info. on 9/18/87. Closure documented by 2/8/88	Closed	N/A

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Item No.	Group	Open Items	Reference	Expected Documents for Closure	MRC Status	Expected Date
		samples obtained from USW G-4 in addition to that presented in USGS OIR-84-789		Linehan to Gertz letter		
43	M	NRC requests that DOE identify the schedule for providing the items identified in DOE's response of June 7, 1985 as being under development.	885A1 21	letter on this subject	Open	
44	SEAL	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	885A1 22	SCP 0 4 3 2 3 (Thermal/mechanical analyses) SCP 6 2 8 2 (Shaft seal emplacement)	Open	12/30/88
45	SEAL	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	885A1 23	SCP 0 2 0 (Seal designs) SCP 0 3 3 1 2 (Seal materials) SCP 0 3 3 2 2 (Seal materials) SCP 6 2 0 4 (Borehole seal emplacement) SCP 0 3 3 2 3 (Seal emplacement method) SCP 6 2 0 2 (Shaft/ramp seal emplacement) SCP 0 3 3 1 (Overview of the seal program) SCP 0 4 3 3 1 (Impact on total system releases) SCP 0 4 2 3 1 (FSF in situ testing of seal components)	Open	
46	TEST	The testing program to characterize perched water zones will be discussed at the ESIP meeting	885A1 24	SCP 0 4 2 3 1 (FSF testing operations) SCP 0 3 1 2 2 4 7 (Perched water tel in ESF)	Open	
47	DC	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	885A1 25	Upon completion of title II	Open	
48	NRC	The NRC will provide guidance on the key parameters that should be considered in determining the representativeness of the ESF.	885A1 26	N/A	Open	
49	TEST	DOE's plans on the characterization of lithophysal zones and on plans for demonstrating horizontal emplacement and exploration holes will be discussed	885A1 27	SCP 0 3 1 15 1.1 (Study of thermal properties) SCP 0 3 1 15 1.2 (Thermal expansion testing) SCP 0 3 1 15 1.3 (Mechanical properties of intact rock) SCP 0 3 1 15 1.4 (Mechanical properties of fractures)	Open	

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Item No.	Group	Open Items	Reference	Expected Documents for Closure	NRC Status	Expected Date
		in a future meeting on repository design		SCP 0 3 1 15 1 5 2 (Excavation investigation, DBR) SCP 0 3 1 15.1 6.1 (Heater experiment in unit 15u1) SCP 0 3 1 15.1.7.1 (Plate loading tests) SCP 0 3 2 5 8 (Development and demonstration of equipment) SCP R 4 2.3 (ESF testing operations, layout constraints and zones of influence)		
50	TEST	Has DOE/OCR made a decision that the use of radioactive materials in the site characterization program will not be considered in the future?	885A1 28	SCP 0 7 1 (Decontamination) SCP 0 4 1 2 (Incorporation of 10 CFR 60) SCP R 4 2 2 2 (Locations, operations and construction controls for surface-based activities) SCP R 4 2 3 1 (ESF testing operations, layout constraints and zones of influence)	Open	12/30/88
51	SL	Demonstrate that flooding and erosion do not adversely affect long term repository performance (incorporate shaft location changes into performance analysis)	487IR Ia	SCP 0 4 2 3 3.1 (Rationale for shaft location) SCP 0 4 3 2 1 (Hydrologic analyses and data) SCP 0 4 3 3 2 (Impact on waste package constraintment) SCP 0 4 3 3 (Potential impacts of site char. activities on postclosure performance) SCP 0 4 3 2 4 (Design features that may contribute to performance)	Open	12/30/88
52	PERF	Provide reasonable assurance that shafts are adequately separated so that testing in one does not adversely affect ability to obtain required data in the other shaft and adjacent test areas.	487IR Ib	SCP 0 4 2 3 1 (Test constraints and zones of influence) SCP 0 4 2 3 6.1 (Test to test interference) SCP 0 4 2 3 6 2 (Construction to test interference) SCP 0 4 2 3 4 4 (ESF Underground Construction and operations)	Open	12/30/88
53	CD	Adopt adequate drift construction controls to meet 10 CFR 60 pre/post-closure performance requirements.	487IR IIIa	Closure documented by 7/25/88 Linehan to Stein letter	Closed	N/A
54	SEAL	Discuss recognition of possible need for remedial measures to maintain postclosure isolation capabilities due to penetration of targeted geological/hydrological structures.	487IR IIIb	SCP 0 4 3 3.1 (Impacts on total release [faulting and seismicity]) SCP 6 2 R 5, 6.2 8.6 (Options for sealing a discrete fault or fracture zone)	Open	12/30/88
55	CD	Provide assurance that planned drift length and directions are adequate for characterizing each of the targeted fault zones.	487IR IIIc	Letter summary sent 10/29/87. Closure documented by 7/25/88 Linehan to Stein letter	Closed	N/A
56	PERF	Describe the measures to be taken to avoid interference with testing by	487IR IV	SCP 0 4 2 3 1 (Test constraints and zones of influence) SCP 0 4 2.3 6.2 (Construction to test interference)	Open	12/30/88

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Item No.	Group	Open Items	Reference	Expected Documents for Closure	NRC Status	Expected Date
		drifting operations.		SCP R 4 2 3 4 4 (ESF underground construction & Operations)		
57	PERF	Modify performance analysis to reflect increase in size of ES-2 to 12 feet.	487IR Va	SCP R 4 3 2 5 3 (Impacts from shaft construction) SCP R 4 2 3 3 1 (History of shaft location and configuration) SCP R 4 2 3 6 2 (Construction to test interference)	Open	12/30/88
58	SEAL	Describe how construction methods minimize shaft wall damage.	487IR Vb	SCP R 4 2 3 4 4 (FSF underground construction and operations)	Open	12/30/88
59	PERF	Demonstrate that there will be minimal interference with testing from underground construction activities. In particular, address the potential for <ul style="list-style-type: none"> o movement of construction fluids through fractures from ES-2 to ES-1 test areas o damage to test instruments from blasting vibrations 	487IR Vc	SCP R 4 2 3 1 (test constraints and zones of influence) SCP R 4 2 3 6 1 (test to test interference) SCP R 4 2 3 6 2 (Construction to test interference) SCP R 4 2 3 4 4 (Underground operations)	Open	12/30/88
60	P	The DOE will assemble the draft ESF Repository Interface Control Drawings in a manner that they can be released to NRC and the State by June 1, 1987	487AI 1	Drawings sent to NRC on 6/4/87 Closure not yet documented	Pending	
61	DC	The DOE will provide the technical analysis supporting the proposed size of the exploratory drifts by June 1, 1987	487AI 2	Upon completion of Title II	Open	
62	P	The DOE committed to constructing exploratory drifts using controlled blasting techniques, but emphasized that this did not mean that DOE had agreed that Level I QA requirements will apply to controlled blasting in the drifts. The Department will evaluate the relevance of drift stability and damage control to retrievability and waste isolation considerations	487AI 3	Letter/position paper sent to NRC on 10/16/87 and 10/19/87	Pending	10/88

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Item No	Group	Open Items	Reference	Expected Documents for Closure	MRC Status	Expected Date
63	P	The DOE committed to using the same construction control requirements in the second 12 ft diameter shaft as in the first 12 ft diameter shaft	487A1 4	Upon completion of Title II	Pending	10/88
64	P	The DOE committed to provide from files, if available, historic drawings depicting the initial repository elevation at the 1200 ft horizon by June 1, 1987	487A1 5	Drawing sent to MRC on 6/4/87 Closure not yet documented	Pending	10/88
65	MRC	The MRC will review attachment 7 and will notify the DOE by June 1, 1987 if the proposed response plan to close out open items is satisfactory.	487A1 6	N/A	Open	
66	P	The DOE provided the information requested in Attachment 6 to MRC and the State of Nevada on April 15, 1986. Copies are included with distribution of this summary	487A1 7	Provided at meeting April 14 and 15 Closure not yet documented	Pending	10/88
67	DES	DOE should demonstrate that it has in place and is implementing an overall systematic design and approval process for the ESF that (i) considers 10 CFR 60 requirements including those for QA, (ii) recognizes uncertainties associated with site characterization activities, (iii) recognizes the need for feedback and interaction among participants responsible for design, scientific tests, performance assessment, construction and operation, and (iv) considers operational impacts on tests and space requirements to avoid test interferences	588A1 1	SCP 8 4 1 2 (Incorporation of 10 CFR 60 requirements) SCP 8 4 2 1 (Rationale for planned testing) SCP 8 4 2 3 1 (ESF testing operations, layout constraints, and zones of influence) SCP 8 4 2 3 2 (ESF Integrated Data System) SCP 8 4 2 3 3 1 (Design and interface control) SCP 8 4 2 3 6 2 (Potential for construction and operations interference with testing) SCP 8 4 2 3 6 1 (Test to test interference)	Open	12/30/88
68	DES	DOE should provide justification for assigning quality levels II and III to practically all activities for which specifications were handed out to F&S during the 50 % Title I design review of the ESF	588A1 2	Print Ln site preparations for the ESF	Open	

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Item No.	Group	Open Items	Reference	Expected Documents for Closure	NRC Status	Expected Date
69	OBJ	The NRC staff considers that the need for extending the Exploratory shaft 1 (ES-1) approximately 400 ft below the repository horizon into the zeolitic zone of the Calico Hills unit has not been established in the CDSCP nor has the need been established for tests requiring drifting (horizontal excavation) through the Calico Hills unit. It has not been demonstrated that the proposed shaft (ES-1) penetration into the Calico Hills unit (an important barrier between the repository horizon and the underlying groundwater table) or the proposed drifting through it will not have potential adverse impacts on the waste isolation capability of the site.	588PP 02	SCP 8 4 2 1 0.1 (Characterization of Calico Hills) SCP 8 4 1 3 (Concepts of unsaturated zone flow) SCP 8 4 2 1 1 (Data needed for postclosure performance evaluations) SCP 8 4 2 1 4 (Relation between planned testing and data needs)	Open	12/30/88
70	OBJ	The CDSCP does not include sufficient and consistent conceptual design information on the proposed ESF. This does not allow the evaluation of the potential interference of proposed investigations with each other and the interference of construction operations in the two shafts and long drifts with these investigations.	588PP 03	SCP 8 4 2 3 1 (Test constraints and zones of influence) SCP 8 4 2 3 2 (General arrangement of surface facilities) SCP 8 4 2 3 6 1 (Test to test interference) SCP 8 4 2 3 6 2 (Construction to test interference) SCP 8 4 2 3 4 4 (Underground operations) SCP 8 4 2 3 5 (General description of underground support systems) SCP 8 4 2 3 3 3 (General Arrangement of ES-1 & ES-2) SCP 8 4 2 3 3 4 (General arrangement of main test level & drifts)	Open	12/30/88
71	OBJ	The CDSCP does not sufficiently consider the potentially adverse impacts resulting from the proposed locations of ES-1, ES-2, other shafts and ramp portals in areas which may be susceptible to surface water infiltration, sheet flow, and lateral and vertical erosion (Refs. 1 and 2). For the proposed locations, there is a possibility of (a) potentially significant and unmitigable long-term adverse impacts on the waste isolation capability of the site and/or (b) affecting the ability to adequately	588PP 04	SCP 8 4 2 3 3 1 (Rationale for shaft location) SCP 8 4 3 1 1 (General approach to performance assessment) SCP 8 4 3 1 2 (Approach to assess the potential impacts of site char. activities) SCP 8 4 3 2 (Supporting technical analyses and data) SCP 8 4 3 3 1 (Impacts on total-system releases) SCP 8 4 3 3 2 (Impacts on waste package containment) SCP 8 4 3 3 3 (Impacts on EBS release) SCP 8 4 3 3 4 (Impacts on GWTI)	Open	12/30/88

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Item No	Group	Open Items	Reference	Expected Documents for Closure	NRC Status	Expected Date
		characterize the site				
72	DC	The rationale for the specification of information needs does not appear to ensure completeness of those information needs. Furthermore, the integration of testing with design and performance assessment appears to be lacking	588PP C1	SCP 8.3 (throughout all sections) SCP 8.3.7.5 (Preclosure design)	Open	12/30/88
73	PERI	The CDSCP (Section 8.4.1.1) states that current plans call for drilling approximately 300 to 350 shallow holes (50 to 150 ft deep), and 45 to 90 exploratory holes (presumably deep). Several trenches are also planned to be excavated for site characterization. In addition, Section 8.4.2.5.1 includes a summary of proposed numerous activities that would involve drilling from or very close to ES-1. The individual, the cumulative and the synergistic effects of these holes have not been considered in the evaluation of the potential impacts of exploratory shaft construction and testing on the waste isolation integrity of the site (Section 8.4.2.6, and supporting references, in particular Fernandez et al., 1987, Case and Kelsall, 1987).	588PP C27	SCP 8.4.3.2.5.2 (Potential impacts from drilling) SCP 8.4.3.2.5.1 (Potential impacts from surface activities) SCP 8.4.3.3.1.2 (Impacts on total system releases)	Open	12/30/88
74	TEST	CDSCP's approach to characterizing the complex three-dimensional nature of fracture systems in the repository block appears to rely on fractal analysis of outcrop exposures and geologic mapping of ES-1, drifts and boreholes (excluding floors and working faces). Also the CDSCP limits the objectives of fracture network studies to providing fracture analyses to supporting hydrologic modeling. The approach and objective to characterization described in the CDSCP may not lead to sufficient descriptions of the fracture networks	588PP C29	SCP 8.3.1.4.2.2.2 (Surface fracture network studies) SCP 8.3.1.4.2.2.4 (Geologic mapping of ESF)	Open	12/30/88

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Item No.	Group	Open Items	Reference	Expected Documents for Closure	MRC Status	Expected Date
75	DC	The required integration of site-specific subsurface information with repository design is not considered in this section (e.g., not even among the qualifying factors listed in the next to last paragraph on pg 8.3.1.4.90)	588PP C30	SCP 8.3.1.4.3.1 (Site-specific subsurface information study) SCP 8.4.2.3.6.3 (Integration of ESF with repository design)	Open	12/30/88
76	TEST	This Table, which summarizes the requests for thermal and mechanical rock properties, appears to be far from complete	588PP C42	SCP 8.3.1.15 (Listing on page 8.3.1.15-1 summarizing performance and design requirements) SCP 8.3.1.15 (Table 8.3.1.15-1) SCP 8.4.2.1 (Rationale for planned testing) SCP 8.4.2.1.4 (Relationship of planned testing to data needs)	Open	12/30/88
77	TEST	Section 8.3.1.15 does not present a clear testing rationale. Thermal and mechanical properties to be determined are not related to specific individual tests.	588PP C43	SCP 8.3.1.15 (Overview of thermal and mechanical rock properties)	Open	12/30/88
78	TEST	The testing program laid out in Section 8.3.1.15 is deficient in several respects. In some cases, important information that could be gained in testing is not identified. Also, some proposed tests are ill-defined, and others may not be able to provide required information.	588PP C44	SCP 8.3.1.15 (Overview of thermal and mechanical rock properties) SCP 8.4.2.3.1 (ESF testing operations, layout constraints and zones of influence)	Open	12/30/88
79	TEST	The discussion and use of statistics in this chapter is not clear. A statistical approach has been suggested to determine numbers of tests required to determine various rock properties, but the approach suggested is confusing and apparently overlooks several considerations that should be factors into such an approach. Also, needed confidences of "low," "medium," or "high" have been assigned without explaining the basis for such assignments. Bases for assigning the	588PP C45	SCP 8.3.1.15 (Overview of thermal and mechanical rock properties) SCP 8.3.1.15.1 (Investigation: Study on spatial distribution of thermal and mechanical properties)	Open	12/30/88

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Item No	Group	Open Items	Reference	Expected Documents for Closure	NRC Status	Expected Date
		needed confidence of low, medium or high are not discussed.				
80	TEST	In order to examine the margin of safety engineered into the stability of emplacement holes from the standpoint of retrievability, the canister scale heater experiment needs to be run beyond the average design heat load. The CDSCP does not include provisions for such testing. Also, no mention is made of testing of lined versus unlined holes, backfilled holes, etc.	588PP C46	SCP 8 3 1 15 1 6 2 (Canister scale heater experiment)	Open	12/30/88
81	TEST	This experiment is one of the more important rock mechanics experiments proposed; yet, virtually no detail is given regarding it. There seems to be a lack of integration between this experiment and the modeling activities and design.	588PP C47	SCP 8 3 1 15.1.6.5 (Heated room experiment) SCP 8 4 2.3 1 (ESF testing operations, layout constraints and zones of influence)	Open	12/30/88
82	TEST	Plate load tests do not necessarily provide a means of determining in situ (i.e., undisturbed) rock mass deformational properties. Data obtained from such tests may be useful in assessing spatial variability, effects of different excavation procedures, etc. as part of the overall program to characterize deformational relations of the rock mass adjacent to underground openings but may not be useful in thermomechanical calculations.	588PP C48	SCP 8 3 1 15 1.7.1 (Plate loading tests) SCP 8 4 2 3 1 (ESF testing operations, layout constraints and zones of influence)	Open	12/30/88
83	TEST	CDSCP has limited its consideration of how jointed tuff can be treated to equivalent continuum models. Although several possible models are described in Chapter 2 (pp. 2-19 and -20), representation of jointed tuff by equivalent continuum models only and disregarding of other models such as quasi-discrete or distinct element models has not been justified.	588PP C54	SCP 8 3 2 1 4.1.1 (Geomechanical analyses)	Open	12/30/88

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Item No	Group	Open Items	Reference	Expected Documents for Closure	MRC Status	Expected Date
84	PERF	Geomechanical analyses do not consider the effects of replaced support components or the effect of elevated temperature on the support system components	588PP C55	SCP 8 3 2 1 4 1 1 (Geomechanical analyses) SCP 8 4 3 2 3 (Thermal/mechanical analyses) SCP 8 4 2 3 1 (ESF testing operations, layout constraints, and zones of influence) SCP 8 3 1 15 1 6 5 (Heated room experiment)	Open	12/30/88
85	PERF	The first section of the next to last paragraph on pg. 8 3 2 2-55 expresses the anticipation that contingency measures might strongly emphasize constructibility based on semi-empirical rock mass classifications. These classifications bear no direct relation to the primary long term repository performance requirements of containment and isolation. It is not clear, therefore, whether the selected criteria are appropriate for guiding emplacement decisions, and, specifically to perform system performance studies for off-normal conditions, as proposed in the first sentence of the last paragraph on pg. 8 3 2 2 55.	588PP C56	SCP 8 3 2 2 3 (Information need 1 11 3)	Open	12/30/88
86	SFAI	The CDSCP states that the potential for the development of new paths to the accessible environment or for an extension of the disturbed zone will be mitigated by backfilling the emplacement drifts. Given the proposed loose backfill and only partial filling of the drifts, this effect may be quite limited.	588PP C57	SCP 8 3 2 2 6 (Drift scale analyses) SCP 8 4 3 1 1 (General approach to performance assessment)	Open	12/30/88
87	TEST	The proposed wedge analysis and key block analysis are not capable of including the effects of thermal loading or stress gradient on the host rock.	588PP C58	SCP 8 3 2 2 6 (Container scale analyses)	Open	12/30/88
88	PERF	The description of far field analysis in the CDSCP does not address potential for thermally induced movement along	588PP C59	SCP 8 3 2 2 6 (Far-field analyses)	Open	12/30/88

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Item No.	Group	Open Items	Reference	Expected Documents for Closure	NRC Status	Expected Date
		faults or fractures				
89	SEAL	The comment that "drifts will not be relied on to be open. They may have caved or settled on the backfill" raises concerns because it is formulated as a very broad option.	588PP C60	SCP B 3 2 2 7 (Information need 1.11 7) SCP B 4 3 1 1 (General approach to performance assessment)	Open	12/30/88
90	PERF	Systematic studies or calculations may be needed to determine the heat moisture transfer from the rock to the ventilation air.	588PP C61	SCP B 3 2 4 1 2 (Air quality and ventilation) SCP B 4 3 2 1 4 (Water-vapor movement)	Open	12/30/88
91	PERF	The last tentative goal on pg. B 3.2 5-21 indicates that high confidence is needed that ES-1 shafts will terminate no less than 150 m above ground water table. It does not appear that this goal is reached under the present FS 1 design.	588PP C63	SCP B 3 2 5 (Performance assessment table) SCP B 4 2 2 3 3 (ESF shafts arrangement)	Open	12/30/88
92	SEAL	The CDSCP does not include details of the in situ testing of the proposed seal design concepts. This information is necessary to evaluate the effects of seal testing activities on the ability of the site to meet the performance objectives (10 CFR 60.112 and 10 CFR 60.113). In addition, the CDSCP states that in situ testing to evaluate seal components and placement methods would not start until after the submission of License Application. In view of the uniqueness of the proposed seal design concepts and the associated uncertainties with the long-term performance of the seals, the NRC staff considers that the proposed start date of in situ testing for evaluation of seal components and placement methods will result in a lack of sufficient data for evaluating the license application.	588PP C64	SCP B 4 2 3 1 (FSF testing operations) SCP B 3 3 2 2 3 (In situ testing of seal components)	Open	12/30/88
93	SFAL	The CDSCP states that "The lack of aquifer above the waste emplacement	588PP C65	SCP B 3 3 1 (Overview of seal program)	Open	12/30/88

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Item No.	Group	Open Items	Reference	Expected Documents for Closure	NRC Status	Expected Date
94	SEAL	<p>horizon at the Yucca Mountain site, makes it unnecessary to install either permanent or temporary shaft or ramp seal components at the time of access construction. No evidence or substantiation is presented for the statement that neither operational nor permanent seals will be required.</p> <p>The CDSCP states that "the shaft liner can be removed to replace seal components later." This statement, without reference to an evaluation, analysis or justification, appears to imply that it is a straightforward matter to remove a shaft liner and that such a procedure has no implications for the isolation capability of the site.</p>	SB8PP C66	<p>SCP 8 3 3 1 (Overview of seal program) SCP 8 4 3 2 3 (Thermal/mechanical analyses) SCP 8 4 3 2 4 (Design features that may contribute to performance)</p>	Open	12/30/88
95	SEAL	<p>The statement near the end of the next to the last paragraph on pg. 8 3.3.1-4 that "boreholes that are upgradient or long distances from the repository may not require sealing" appears to be driven largely by the considerations of vertical downward flow in the pre-repository rock environment, and does not represent a conservative sealing approach.</p>	SB8PP C67	<p>SCP 8 3 3 1 (Overview of seal program) SCP 8 4 3 1 1 (General approach to performance assessment) SCP 8 4 1 3 (Concepts of unsaturated flow)</p>	Open	12/30/88
96	PERF	<p>It is stated in the second paragraph on pg. 8 3.3.2-24 that "more conservatism has been added by the selection of the design-basis performance goals to be substantially less than the maximum allowable values." Although this is true immediately after closure, the two curves (Fig. 8 3 3 2-3) do converge relatively rapidly. Although no time scale is included, it can be inferred from Fernandez et al, 1987, Fig. 3-2, that the breakpoint in the Design Basis Performance Goals is at about 1000 years. Beyond that point the two curves are so close together as to leave</p>	SB8PP C68	SCP 8 3 3 2 (Sealing issue)	Open	12/30/88

Item No	Group	Open Items	Reference	Reported Documents for Closure	NRC Status	Expected Date
		very little safety margin				
97	SEAL	It is unclear whether a reasonably conservative design approach has been used to determine required backfill hydraulic conductivity	S88PP C70	SCP 8.3.3.2.1 (Sealing issue)	Open	12/30/88
98	PERF	In evaluating potential effects of credible accidents on projected radiological exposures, the CDSCP has not sufficiently considered retrieval operations	S88PP C72	SCP 8.3.5.5 (Preclosure accident analysis)	Open	12/30/88
99	TEST	Plans should be made to correlate persistence of geologic features from ES-1 to ES-2 which might provide preferential pathways and to develop a photographic record of ES-2 for possible future use	S88PP C97	SCP 8.4.2.3.1 (ESF testing operations) SCP 8.4.2.3 (Subsurface based activities)	Open	12/30/88
100	PERF	A reasonable assurance that the shafts are far enough apart so that construction in FS 2 does not adversely affect the ability to obtain required data in ES 1 and adjacent test areas has not been provided.	S88PP C98	SCP 8.4.2.3.1 (Test constraints and zones of influence) SCP 8.4.2.3.2 (Construction to test interference) SCP 8.4.2.3.3.1 (Potential for interferences between tests) SCP 8.4.2.3.4.4 (ESF underground construction & Operations)	Open	12/30/88
101	SEAL	The CDSCP does not present appropriate information on blasting to reflect the most recent strategy for minimizing shaft wall damage as outlined in DOE's "Response to NRC Information Requests from the April 14-15 1987 Meeting Between DOE and NRC" (Ref 1)	S88PP C99	SCP 8.4.2.3.4.4 (ESF underground construction)	Open	12/30/88
102	SL	The extent of site exploration described in the CDSCP indicates that the DOE plans to explore only a small portion of the underground repository block through underground testing and drifting. Substantially more drifting may be necessary to reduce uncertainties about the presence of faults and other geologic and hydrologic conditions. In the CDSCP no exploratory drift is planned to cross	S88PP C100	SCP 8.4.2.1.5 (Representativeness of planned testing) SCP 8.4.2.1.5.1 (Relation between surface-based testing & ESF testing) SCP 8.4.2.1.5.2 (Representativeness of the ESF locations) SCP 8.4.2.1.5.5 (Need for drifting to the southern part of the repository block)	Open	12/30/88

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		<p>the main waste storage area to the southern portions of the block, which based upon existing information appears to contain more faults and fractures than other parts of the block. Borehole penetrations into the main waste storage area (boreholes from the surface, horizontal core drilling or other means) may not provide the representative information needed to construct a reliable three-dimensional geologic model of the repository block and evaluate ranges of parameters that could affect repository performance.</p>				
103	SEAL	Plans for remedial measures that may be required to minimize potentially adverse impacts of penetrating the target features are not given.	588PP C101	<p>SCP 6.2.8.6 (Options for sealing a discrete fault or fracture zone) SCP 8.4.3.3 (Potential impacts of site characterization activities on Postclosure Performance)</p>	Open	12/30/88
104	TEST	<p>In several activity descriptions, it is proposed that air coring will be used to drill holes to be used for permeability testing (e.g., Infiltration test, pg. 8.4-52; bulk permeability test, pg. 8.4-53; radial borehole tests, pg. 8.4-53; Calico Hills tests, pg. 8.4-54; diffusion tests, pg. 8.4-54. Aside from the potential technical difficulties associated with the feasibility of drilling such holes, this raises questions about the reliability of the permeability values thus obtained.</p>	588PP C102	<p>SCP 8.4.2.1.6 (other conditionally planned activities) SCP 8.4.2.3.1 (ESF testing operations, layout constraints and zones of influence)</p>	Open	12/30/88
105	TEST	The performance confirmation program has not been sufficiently well defined, and appropriate details are not included in the CDSCP. The discussion concerning confirmation, Issue 1.7, has not presented the strategy or a plan to meet the requirements set forth in Subpart F of 10 CFR 60 part 60.	588PP C103	<p>SCP 8.3.5.16 (Performance Confirmation Program) SCP 8.4.2.3.6.4 (Design flexibility)</p>	Open	12/30/88
106	TEST	What are the definitions of the terms	588PP Q12	SCP 8.3.1.4 (Rock characteristics)	Open	12/30/88

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		fracture 'aperture' and 'length'?				
107	TEST	Does this program include all drilling or only surface based drilling?	SR8PP Q14	SCP 8.3.1.4.1 (Integrated Drilling Program and integrated geophysical activities)	Open	12/30/88
108	TEST	How is the roughness coefficient parameter measured in a borehole? What is the difference between roughness coefficient listed here and 'roughness' discussed elsewhere in Section 8.3.1.4.2.3?	SR8PP Q16	SCP 8.3.1.4.2.3 (Borehole evaluation of faults and fractures)	Open	12/30/88
109	TEST	What role, if any, will the data presented in Chapter 2 play in the proposed model development and in scoping the amount of planned site specific in situ testing?	SR8PP Q17	SCP 8.3.1.4.3 (Development of 3-D models of rock characteristics at the repository site)	Open	12/30/88
110	TEST	What methods will be used to determine whether there is any impact of ground motion from underground nuclear explosions on repository design?	SR8PP Q25	SCP 8.3.1.17.3 (Studies to provide required information on vibratory ground motion that could affect repository design)	Open	12/30/88
111	TEST	How will the heated block experiment be used for model validation if there are no imposed stress gradients or temperature gradients inside the block?	SR8PP Q26	SCP 8.3.1.15.1.6.3 (Yucca Mountain heated block experiment) plan	Open	12/30/88
112	TEST	What are the parameters and the strength model for which the strength experiment(s) are designed, and how will a substantial volume of rock be driven to failure?	SR8PP Q27	SCP 8.3.1.15.1.7.2 (Rock-mass strength)	Open	12/30/88
113	TEST	Why is there no link (other than that indicated in Figure 8.3.2.1-1) established between this plan and Issue 1.12 - Repository Sealing?	SR8PP Q34	SCP 8.3.2.2.3 (Drainage and moisture control plan)	Open	12/30/88
114	TEST	According to the last sentence of this section, the approach to develop this plan is given in Section 8.3.2.3, and the data requirements for this plan are	SR8PP Q35	SCP 8.3.2.2.3.4 (Drainage and moisture control plan) SCP 8.4.2.3.3 (Description of ESF)	Open	12/30/88

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		given in Section 8.3.2.2.1. Both of these referenced sections cover extremely broad topics. What are the relevant items for this section?				
115	TEST	Where in Section 8.3.2.2.1 are the data requirements for this activity discussed?	588PP Q36	SCP 8.3.2.2.5.1 (Excavation methods criteria) SCP 8.3.2.2.5.2 (Long-term subsidence control strategy) SCP 8.3.2.2.1 (Site char. information needed for design)	Open	12/30/88
116	TEST	Some concerns exist as to whether the list of parameters for performance goal C2 (rock radiation shielding) given on pg. 8.3.2.2.30 is comprehensive. For example, does the expected pre-placement saturation value of 65% represent the expected post-placement saturation value?	588PP Q37	SCP 8.3.2.3 (Radiological safety)	Open	12/30/88
117	TEST	Use of mechanical excavation is considered not feasible in some parts of the document and plausible in other parts. The next to last paragraph on pg. 8.3.2.4.28 mentions the possibility that mechanical excavation may be used. Does this contradict other implications in the CDSCP (e.g., pg. 8.3.2.2.70) that mechanical excavation is not feasible?	588PP Q38	SCP 8.3.2.2 (Excavation methods criteria) SCP 8.4.2.3.4.4 (ESF underground construction & operations)	Open	12/30/88
118	TEST	Why are the requirements for some items on pg. 8.3.2.5-23 different from the requirements for System Element 1.2.1.2 identified in Table 8.3.2.4-2, non-radiological health and safety?	588PP Q39	SCP 8.3.2.4.2 (Drift construction)	Open	12/30/88
119	DC	What is the justification for the statement on pg. 8.3.2.5-24 that "no site characterization data is required to develop the high level of confidence needed for installation of borehole liners"?	588PP Q40	SCP 8.3.2.5 (Borehole construction)	Open	12/30/88
120	SEAL	There are many inconsistencies in this section when compared with the details given in other sections of the CDSCP and reference documents. What are the	588PP Q41	SCP 8.3.3.2 (Issue 1.12)	Open	12/30/88

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		potential impacts of such inconsistencies?				
121	SEAL	Description of items included in Table B.3.3.2-1 needs further clarification in several areas. Why have not all the seal components been included in this list?	588PP Q42	SCP B.3.3.2 (Table of sealing components)	Open	12/30/88
122	M	There are many apparent inconsistencies in the write-up of the proposed activities presented in this section when compared with the details given in other sections of the CDSCP and reference documents. What are the impacts of such inconsistencies?	588PP Q48	SCP B.4 (Planned SC activities and impacts)	Open	12/30/88
123	SL	Site characterization investigations should be planned based on the total area that may be needed for repository development. Is this the case for the drilling program laid out in the CDSCP?	588PP Q49	SCP B.4.2.2 (Surface-based activities) SCP B.4.2.2.1 (General description of extent of testing) SCP B.4.2.2.2 (Description of test locations) SCP B.4.2.1.5 (Representativeness of planned testing) SCP B.4.2.1.1 (Data needed for postclosure performance evaluation) SCP B.3.1.4.3.1 (Systematic acquisition of subsurface information) SCP B.4.2.2 (Configuration of underground facility)	Open	12/30/88
124	SL	It is difficult to tell from various depictions in the CDSCP what are the actual boundaries of the area that may be involved in repository development and that therefore may need to be characterized intensively. What are these actual boundaries?	588PP Q50	SCP B.3.1.4.3.1.1 (Systematic Drilling Program) SCP B.4.2.2.1 (Location and extent of testing and construction)	Open	12/30/88
125	TEST	Which activity in Table B.3.1-15-1 is planned to investigate the effects of radiation on thermal and mechanical rock properties?	588PP Q51	SCP B.3.1.15 (Performance Assessment Tables) SCP B.3.4.2.1.5 (Effects of radiation on water chemistry)	Open	12/30/88

GROUP KEY

TEST Testing
SEAL Seals

REFERENCE NUMBER EXAMPLES

483IR Ia : Information Request Ia from the April 1983 Coplan to Vieth letter
BNSAI 4 : Action Item 4 from the August 1985 DOE/NRC ESF meeting

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KEY TO ABBREVIATIONS ON LAST PAGE

PRELIMINARY COPY/SUBJECT TO CHANGE

Item No	Group	Open Items	Reference	Expected Documents for Closure	NRC Status	Expected Date
.		PERI - Performance Assessment DCS - Design Control Process SL - Shaft location DC - Design and Construction NRC - NRC obligations OBJ - NRC CDSCP Point Paper Objection CD - Closed item (closure documented by NRC letter) P - Pending item (material has been sent to NRC; awaiting response)		588PP C29 - Comment 29 from the NRC Point Papers on the CDSCP (issued MAY 1988)		

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KEY TO ABBREVIATIONS ON LAST PAGE

PRELIMINARY COPY/SUBJECT TO CHANGE

ESF OPEN ACTION ITEM LIST
REPORT 1

Item No.	Category	Description	Reference	Expected Document for Closure
67	DES	DOE should demonstrate that it has in place and is implementing an overall systematic design and approval process for the ESF that (i) considers 10 CFR 60 requirements including those for QA. (ii) recognizes uncertainties associated with site characterization activities, (iii) recognizes the need for feedback and interaction among participants responsible for design, scientific tests, performance assessment, construction and operation, and (iv) considers operational impacts on tests and space requirements to avoid test interferences.	588 AI 1	SCP 8.4.2.3.2 (ESF IDS) SCP 8.4.1.2 (10 CFR 60 REQUIRMENTS) SCP 8.4.2.1 (RATIONALE FOR PLANNED TESTING) SCP 8.4.2.3.6.1 (Test to test interference) SCP 8.4.2.3.3.1 (DESIGNED INTERFACE CONTROL) SCP 8.4.2.3.1 (ESF TESTING OPERATIONS, LAYOUT CONSTRAINTS, AND ZONES OF INFLUENCE) SCP 8.4.2.3.6.2 (POTENTIAL FOR CONSTRUCTION AND OPERATIONS INTERFERENCE WITH TESTING)
68	DES	DOE should provide justification for assigning quality levels II and III to practically all activities for which specifications were handed out to F&S during the 50% Title I design review of the ESF.	588 AI 2	Prior to Site Preparations for the ESF

 ESF OPEN ACTION ITEM LIST
 REPORT 1

Item No.	Category	Description	Reference	Expected Document for Closure
69	OBJ	The NRC staff considers that the need for extending the Exploratory shaft 1 (ES-1) approximately 400 ft below the repository horizon into the zeolitic zone of the Calico Hills unit has not been established in the CDSCP nor has the need been established for tests requiring drifting (horizontal excavation) through the Calico Hills unit. It has not been demonstrated that the proposed shaft (ES-1) penetration into the Calico Hills unit (an important barrier between the repository horizon and the underlying groundwater table) or the proposed drifting through it will not have potential adverse impacts on the waste isolation capability of the site.	588PP02	SCP 8.4.1.3 (Concepts of unsaturated zone flow) SCP 8.4.2.1.6.1 (Characterization of Calico Hills) SCP 8.4.2.1.4 (Relation between planned testing and data needs) SCP 8.4.2.1.1 (Data needed for postclosure performance evaluations)
70	OBJ	The CDSCP does not include sufficient and consistent conceptual design information on the proposed ESF. This does not allow the evaluation of the potential interference of proposed investigations with each other and the interference of construction operations in the two shafts and long drifts with these investigations.	588PP03	SCP 8.4.2.3.4.4 (Underground Operations) SCP 8.4.2.3.6.1 (Test to test interference) SCP 8.4.2.3.6.2 (Construction to test interference) SCP 8.4.2.3.3.3 (General arrangement of ES-1 & ES-2) CP 8.4.2.3.1 (Test constraints and zones of influence) SCP 8.4.2.3.3.2 (General Arrangement of surface facilities) SCP 8.4.2.3.3.4 (General arrangement of main test level & drifts) SCP 8.4.2.3.5 (General description of underground support systems)
71	OBJ	The CDSCP does not sufficiently consider the potentially adverse impacts resulting from the proposed locations of ES-1, ES-2 other shafts and ramp portals in areas which may be susceptible to surface water infiltration, sheet flow, and lateral and vertical erosion (Refs. 1 and 2). For the proposed locations, there is a possibility of (a) potentially significant and unmitigable long-term adverse impacts on the waste isolation capability of the site and/or (b) affecting the ability to adequately characterize the site.	588PP04	SCP 8.4.3.3.4 (Impacts on GWTT) SCP 8.4.3.3.3 (Impacts on EBS release) SCP 8.4.2.3.3.1 (Rationale for shaft location) SCP 8.4.3.3.1 (Impacts on total-system releases) SCP 8.4.3.2 (Supporting technical analyses and data) SCP 8.4.3.3.2 (Impacts on Waste package containment) SCP 8.4.3.1.1 (General approach to performance assessment) SCP 8.4.3.1.2 (Approach to assess the potential impacts of site chara. activities)

 ESF OPEN ACTION ITEM LIST
 REPORT 1

Item No.	Category	Description	Reference	Expected Document for Closure
51	SL	Demonstrate that flooding and erosion do not adversely affect long term repository performance (incorporate shaft location changes into performance analysis).	487IR Ia	SCP 8.4.3.2.1 (Hydrologic analyses and data) SCP 8.4.2.3.3.1 (Rationale for shaft location) SCP 8.4.3.3.2 (Impact on waste package containment) SCP 8.4.3.2.4 (Design features that may contribute to performance) SCP 8.4.3.3 (Potential impact of site chara. activities on postclosure performance)
29	SL	Need to establish the properties of characteristics that can be used in the evaluation of "representatitiveness." A method for analyzing the data also needs to be established.	885AI 7	SCP 8.4.2.1.6.2 (Drifting to southern block) SCP 8.4.2.1.5 (Representativeness of planned testing)
34	SL	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.	885AI 12	SCP 8.4.2.3.3 (Description of the ESF) SCP 8.4.2.1.5 (Representativeness of planned testing) SCP 8.4.2.1.5.5 (Need for drifting to southern part of the repository block)
102	SL	The extent of site exploration described in the CDSCP indicates that the DOE plans to explore only a small portion of the underground repository block through underground testing and drifting. Substantially more drifting may be necessary to reduce uncertainties about the presence of faults and other geologic and hydrologic conditions. In the CDSCP no exploratory drift is planned to cross the main waste storage area to the southern portions of the block, which based upon existing information appears to contain more faults and fractures than other parts of the block. Borehole penetrations into the main waste storage area (boreholes from the surface, horizontal core drilling or other means) may not provide the representative information needed to construct a reliable three-dimensional geologic model of the repository block and evaluate ranges of parameters that	588PPC 100	SCP 8.4.2.1.5 (Representativeness of planned testing) SCP 8.4.2.1.5.2 (Representativeness of the ESF location) SCP 8.4.2.1.5.1 (Relation between surface-based testing & ESF testing) SCP 8.4.2.1.5.5 (Need for drifting to the southern part of the repository block)

 ESF OPEN ACTION ITEM LIST
 REPORT 1

Item No.	Category	Description	Reference	Expected Document for Closure
		could		
123	SL	Site characterization investigations should be planned based on the total area that may be needed for repository development. Is this the case for the drilling program laid out in the CDSCP?	588PPQ 49	SCP 8.4.2.2 (Surface-based activities) SCP 8.4.2.2.2 (Description of test locations) SCP 6.4.2.2 (Configuration of underground facility) SCP 8.4.2.1.5 (Representativeness of planned testing) SCP 8.4.2.2.1 (General description of extent of testing) SCP 8.3.1.4.3.1 (Systematic acquisition of subsurface information) SCP 8.4.2.1.1 (Data needed for postclosure performance evaluations)
124	SL	It is difficult to tell from various depictions in the CDSCP what are the actual boundaries of the area that may be involved in repository development and that therefore may need to be characterized intensively. What are these actual boundaries?	588PPQ 50	SCP 8.3.1.4.3.1.1 (Systematic Drilling Program) SCP 8.4.2.2.1 (Location and extent of testing and construction)

 ESF OPEN ACTION ITEM LIST
 REPORT 1

Item No.	Category	Description	Reference	Expected Document for Closure
52	PA	Provide reasonable assurance that shafts are adequately separated so that testing in one does not adversely affect ability to obtain required data in the other shaft and adjacent test areas.	487IR Ib	SCP 8.4.2.3.6.1 (Test to test interference) SCP 8.4.2.3.6.2 (Construction to test interference) SCP 8.4.2.3.1 (Test constraints and zones of influence) SCP 8.4.2.3.4.4 (ESF Underground construction and operations)
100	PA	A reasonable assurance that the shafts are far enough apart so that construction in ES-2 does not adversely affect the ability to obtain required data in ES-1 and adjacent test areas has not been provided.	588PPC98	SCP 8.4.2.3.6.2 (Construction to test interference) SCP 8.4.2.3.1 (Test constraints and zones of influence) SCP 8.4.2.3.4.4 (ESF underground construction & operations) SCP 8.4.2.3.6.1 (Potential for interferences between tests)
56	PA	Describe the measures to be taken to avoid interference with testing by drifting operations.	487IR IV	SCP 8.4.2.3.6.2 (Construction to test interference) SCP 8.4.2.3.1 (Test constraints and zones of influence) SCP 8.4.2.3.4.4 (ESF underground construction & operations)
59	PA	Demonstrate that there will be minimal interference with testing from underground construction activities. In particular, address the potential for: (1) movement for construction fluids through fractures from ES-2 to ES-1 test areas; (2) damage to test instruments from blasting vibrations.	487IR Vc	SCP 8.4.2.3.4.4 (Underground operations) SCP 8.4.2.3.6.1 (Test to test interference) SCP 8.4.2.3.6.2 (Construction to test interference) SCP 8.4.2.3.1 (Test constraints and zones of influence)
73	PA	The CDSCP (Section 8.4.1.1 states that current plans call for drilling approximately 300 to 350 shallow holes (50 to 150 ft. deep), and 5 to 80 exploratory holes (presumably deep). Several trenches are also planned to be excavated for site characterization. In addition, Section 8.4.2.5.1 includes a summary of proposed numerous activities that would involve drilling from or very close to ES-1. The individual, the cumulative and the synergistic effects of these holes have not been considered in the evaluation of the potential	588PPC27	SCP 8.4.3.2.5.2 (POTENTIAL IMPACTS FROM DRILLING) SCP 8.4.3.3.1.2 (IMPACTS ON TOTAL-SYSTEM RELEASES) SCP 8.4.3.2.5.1 (POTENTIAL IMPACTS FROM SURFACE ACTIVITIES)

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Item No.	Category	Description	Reference	Expected Document for Closure
		impacts of exploratory shaft construction and testing on the waste isolation integrity of the site (Section 8.4.2.6, and supporting references, in particular Fernandez et al., 1987; Case and Kelsall, 1987).		
57	PA	Modify performance analysis to reflect increase in size of ES-2 to 12 feet.	487IR Va	SCP 8.4.2.3.6.2 (Construction/test interference) SCP 8.4.3.2.5.3 (Impacts from shaft construction) SCP 8.4.2.3.3.1 (History of shaft location and configuration)
84	PA	Geomechanical analyses do not consider the effects of emplaced support components or the effect of elevated temperature on the support system components.	588PPC55	SCP 8.3.1.15.1.6.5 (Heated room equipment) SCP 8.3.2.1.4.1.1 (Geomechanical analyses) SCP 8.4.3.2.3 (Thermal/mechanical analyses) SCP 8.4.2.3.1 (ESF testing operations, layout constraints, zones of influence)
88	PA	The description of far field analysis in the CDSCP does not address potential for thermally induced movement along faults or fractures.	588PPC59	SCP 8.3.2.2.6 (FAR-FIELD ANALYSES)
90	PA	Systematic studies or calculations may be needed to determine the heat moisture transfer from the rock to the ventilation air.	588PPC61	SCP 8.4.3.2.1.4 (WATER-VAPOR MOVEMENT) SCP 8.3.2.4.1.2 (AIR QUALITY AND VENTILATION)
98	PA	In evaluating potential effects of credible accidents on projected radiological exposures, the CDSCP has not sufficiently considered retrieval operations.	588PPC72	SCP 8.3.5.5 (PRECLOSURE ACCIDENT ANALYSIS)
96	PA	It is stated in the second paragraph on pg. 8.3.3.2-24 that "more conservatism has been added by the selection of the design-basis performance goals to be substantially less than the maximum allowable values." Although this is true immediately after closure, the two curves (Fig. 8.3.3.2-3) do converge relatively rapidly. Although no time scale is included, it can be inferred from Fernandez et al, 1987, Fig. 3-2,	588PPC68	SCP 8.3.3.2 (SEALING ISSUE)

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Item No.	Category	Description	Reference	Expected Document for Closure
		that the breakpoint in the Design Basis Performance Goals is at about 1000 years. Beyond that point the two curves are so close together as to leave very little safety margin.		
85	PA	The first section of the next to last paragraph on pg. 8.3.2.2-55 expresses the anticipation that contingency measures might strongly emphasize constructibility based on semi-empirical rock mass classifications. These classifications bear no direct relation to the primary long-term repository performance requirements of containment and isolation. It is not clear, therefore, whether the selected criteria are appropriate for guiding emplacement decisions, and, specifically to perform system performance studies for off-normal conditions, as proposed in the first sentence of the last paragraph on pg. 8.3.2.2-55.	588PPC56	SCP 8.3.2.2.3 (Information need 1.11.3)
91	PA	The last tentative goal on pg. 8.3.2.5-21 indicates that high confidence is needed that ES-1 shafts will terminate no less than 150 m above ground-water table. It does not appear that this goal is reached under the present ES-1 design.	588PPC63	SCP 8.3.2.5 (PA TABLE) SCP 8.4.2.2.3.3 (ES SHAFTS ARRANGEMENT)

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Item No.	Category	Description	Reference	Expected Document for Closure
8	SEALS	Identify procedures used to minimize damage to the rock mass penetrated.	483IR IIb	SCP 8.4.2.3.4.4 (ESF Underground Construction) SCP 8.4.2.3.3.2 (Surface facilities management) SCP 8.4.3.2.3 (Thermal/mechanical analyses and data)
58	SEALS	Describe how construction methods minimize shaft wall damage.	487IR Vb	SCP 8.4.2.3.4.4 (ESF underground construction and operations)
101	SEALS	The CDSCP does not present appropriate information on blasting to reflect the most recent strategy for minimizing shaft wall damage as outlined in DOE's "Response to NRC Information Requests from the April 14-15, 1987 Meeting Between DOE and NRC" (Ref. 1).	588PPC99	SCP 8.4.2.3.4.4 (ESF Underground Construction)
28	SEALS	Need to establish a common approach to evaluating the magnitude of the damage around openings.	885AI 6	SCP 8.4.2.3.1 (ESF Testing Operations) SCP 8.4.3.2.3 (Thermal/Mechanical Analyses) SCP 8.4.3.2.5 (Summary of Potential impacts to site from SC activities)
54	SEALS	Discuss recognition of possible need for remedial measures to maintain postclosure isolation capabilities due to penetration of targeted geological/hydrological structures.	487IR IIIb	SCP 8.4.3.3.1 (Impacts on Total Release; Faulting and Seismicity) SCP 6.2.8.5 (Options for Sealing a discrete fault or fracture zone) SCP 6.2.8.6 (Options for Sealing a discrete fault or fracture zone)
103	SEALS	Plans for remedial measures that may be required to minimize potentially adverse impacts of penetrating the target features are not given.	588PPC 101	SCP 6.2.8.6 (Options for sealing a discrete fault or fracture zone) SCP 8.4.3.3 (Potential impacts of site characterization activities on Postclosure Performance)
1	SEALS	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.	483IR Ia	SCP 8.4.3.2.5.3 (ESF Construction impacts) SCP 8.4.2.3.6.3 (Repository/ESF integration) SCP 8.4.3.3 (Impact on postclosure performance) SCP 8.4.3.2.4 (Design features contributing to performance)

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Item No.	Category	Description	Reference	Expected Document for Closure
2	SEALS	Describe how the selected excavation technique and shaft design accounts for limitations and uncertainties in long term sealing considerations.	483IR Ib	SCP 8.4.2.3.4.4 (ESF Construction) SCP 8.4.2.3.3.3 (General ES arrangement) SCP 8.4.3.3 (Impacts on postclosure performance) SCP 8.4.3.2.4 (Design features that may contribute to performance)
3	SEALS	Provide design specifications for the shaft construction and show how they deal with the factors affecting sealing.	483IR Ic	SCP 8.4.2.3.3.3 (General ES arrangement) SCP 8.4.2.3.4.3 (ES Collar construction) SCP 8.4.2.3.4.4 (ESF Underground construction) SCP 8.4.3.3 (Impacts on postclosure performance) SCP 8.4.3.2.4 (Design features that may contribute to performance)
4	SEALS	Describe the seal design and materials.	483IR Id	SCP 6.2.8 (Seal Designs) SCP 8.3.3.1.2 (Seal Materials) SCP 8.3.3.2.2 (Seal Materials) SCP 8.3.3.2.3 (Seal Emplacement Methods) SCP 8.4.3.3.1 (Impact on Total system releases) SCP 8.4.2.3.1 (ESF In situ Testing of Seal Components)
121	SEALS	Description of items included in Table 8.3.3.2-1 needs further clarification in several areas. Why have not all the seal components been included in this list?	588PPQ 42	SCP 8.3.3.2 (Table of sealing components)
5	SEALS	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.	483IR Ie	SCP 8.4.2.3.1 (ESF Testing Activities) SCP 8.3.3.2.2.3 (In situ testing of seals)
92	SEALS	The CDSCP does not include details of the in situ testing of the proposed seal design concepts. This information is necessary to evaluate the effects of seal testing activities on the ability of the site to meet the performance objectives (10 CFR 60.112 and 10 CFR 60.113). In addition, the CDSCP states that in situ testing to evaluate seal components and placement methods would not start until after the submission of	588PPC64	SCP 8.4.2.3.1 (ESF Testing Operations) SCP 8.3.3.2.2.3 (In situ testing of seal components)

 ESF OPEN ACTION ITEM LIST
 REPORT 1

Item No.	Category	Description	Reference	Expected Document for Closure
		License Application. In view of the uniqueness of the proposed seal design concepts and the associated uncertainties with the long-term performance of the seals, the NRC staff considers that the proposed start date of in situ testing for evaluation of seal components and placement methods will result in a lack of sufficient data for evaluating the license application.		
10	SEALS	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.	483IR IIIa	SCP 8.3.3.2.2.3 (In situ testing of seals) SCP 8.4.3.3.1 (Impact on total system releases) SCP 8.4.2.3.1 (ESF In situ testing of seal components)
11	SEALS	Describe the placement methods.	483IR IIIb	SCP 8.3.3.2.3 (Emplacement method) SCP 6.2.8.4 (Borehole seal emplacement) SCP 6.2.8.2 (Shaft/Ramp seal emplacement) SCP 8.4.3.3.1 (Impact on total system releases)
12	SEALS	Describe remedial methods to be used if sealing methods are not adequate.	483IR IIIc	SCP 8.3.3.1 (Overview of the seal program)
15	SEALS	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 hot rock, and logging of drill holes.	483IR IVc	Letter on this subject

 ESF OPEN ACTION ITEM LIST
 REPORT 1

Item No.	Category	Description	Reference	Expected Document for Closure
45	SEALS	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.	885AI 23	SCP 6.2.8 (Seal designs) SCP 8.3.3.1.2 (Seal materials) SCP 8.3.3.2.2 (Seal materials) SCP 6.2.8.4 (Borehole seal emplacement) SCP 8.3.3.2.3 (Seal emplacement method) SCP 6.2.8.2 (Shaft/ramp seal emplacement) SCP 8.3.3.1 (Overview of the seal program) SCP 8.4.3.3.1 (Impact on total system releases) SCP 8.4.2.3.1 (ESF in situ testing of seal components)
44	SEALS	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.	885AI 22	SCP 6.2.8.2 (Shaft Seal Emplacement) SCP 8.4.3.2.3 (Thermal/Mechanical Analyses)
94	SEALS	The CDSCP states that "The shaft liner can be removed to emplace seal components later." This statement, without reference to an evaluation, analysis or justification, appears to imply that it is a straightforward matter to remove a shaft liner and that such a procedure has no implications for the isolation capability of the site.	588PPC66	SCP 8.3.3.1 (Overview of sealing program) SCP 8.4.3.2.3 (Thermal/mechanical analyses) SCP 8.4.3.2.4 (Design features that may contribute to performance)
9	SEALS	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.	483IR IIIa	SCP 8.4.3.2.2 (Geochemical Analyses & Data) SCP 8.4.2.3.4.4 (ESF Underground Construction) SCP 8.4.3.2.3 (Thermal/Mechanical Analyses & Data) SCP 8.4.3.2.4 (Design features that may contribute to performance) SCP 8.4.3.2.5.3 (Potential impacts from construction of the shafts for current conditions)
93	SEALS	The CDSCP states that "The lack of aquifer above the waste emplacement horizon at the Yucca Mountain site, makes it unnecessary to install either permanent or temporary shaft or ramp seal components at the time of access construction." No evidence or substantiation is presented for the statement that neither operational nor permanent seals will be required.	588PPC65	SCP 8.3.3.1 (OVERVIEW OF SEAL PROGRAM)

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Item No.	Category	Description	Reference	Expected Document for Closure
95	SEALS	The statement near the end of the next to the last paragraph on pg. 8.3.3.1-4 that "boreholes that are upgradient or long distances from the repository may not require sealing" appears to be driven largely by the considerations of vertical downward flow in the pre-repository rock environment, and does not represent a conservative sealing approach.	588PPC67	SCP 8.4.3.1.1 (GENERAL APPROACH TO PA) SCP 8.3.3.1 (OVERVIEW OF SEALING PROGRAM) SCP 8.4.1.3 (CONCEPTS OF UNSATURATED FLOW)
89	SEALS	The comment that "...drifts will not be relied on to be open. They may have caved or settled on the backfill" raises concerns because it is formulatd as a very broad option.	588PPC60	SCP 8.4.3.1.1 (GENERAL APPROACH TO PA) SCP 8.3.2.2.7 (INFORMATION NEED 1.11.7)
86	SEALS	The CDSCP states that the potential for the development of new paths to the accessible environment or for an extension of the disturbed zone will be mitigated by backfilling the emplacement drifts. Given the proposed loose backfill and only partial filling of the drifts, this effect may be quite limited.	588PPC57	SCP 8.3.2.2.6 (DRIFT SCALE ANALYSES) SCP 8.4.3.1.1 (GENERAL APPROACH TO PERFORMANCE ASSESSMENT)
97	SEALS	It is unclear whether a reasonably conservative design approach has been used to determine required backfill hydraulic conductivity.	588PPC70	SCP 8.3.3.2.1 (SEALING ISSUE)
120	SEALS	There are many inconsistencies in this section when compared with the details given in other sections of the CDSCP and reference documents. What are the potential impacts of such incocnsistencies?	588PPQ 41	SCP 8.3.3.2 (Issue 1.12)

 ESF OPEN ACTION ITEM LIST
 REPORT 1

Item No.	Category	Description	Reference	Expected Document for Closure
36	TESTS	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.	885AI 14	SCP 8.4.2.1 (Rationale for Planned Testing) SCP 8.4.2.3.3.4 (Main Test level general arrangement) SCP 8.4.2.2.3.3 (Exploratory Shafts general arrangement) SCP 8.4.2.3.6 (Evaluation of ESF layout and operations) SCP 8.4.2.3.1 (ESF Testing Operations and Layout Constraints)
17	TESTS	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: (1) Geologic mapping and rock mass characterization of the shaft walls. (2) Measurements of rates and quantities of groundwater inflow and collection of groundwater samples for testing. (3) Measurements of overbreakage during blasting. (4) Rock mechanics testing of samples obtained during drill and blast operations.	483IR Va	SCP 8.4.2.3.1 (ESF Testing Operations) SCP 8.4.2.3.6 (Evaluation of ESF layout) SCP 8.3.1.15.1.2 (Thermal expansion testing) SCP 8.3.1.15.1.1 (Thermal properties testing) SCP 8.3.1.2.2.4.7 (Perched water test in ESF) SCP 8.3.1.2.2.3 (Surface-based study of percolation) SCP 8.3.1.2.2.4.4 (Radial borehole tests in the ESF) SCP 8.3.1.15.1.4 (Mechanical properties of fractures) SCP 8.3.1.15.1.3 (Mechanical properties of intact rock) SCP 8.3.1.15.1.8.1 (Mining methods; design verification) SCP 8.3.1.2.2.3.1 (Matrix hydrologic properties testing) SCP 8.4.2.3.4.4 (ESF underground construction & operations)
104	TESTS	In several activity descriptions, it is proposed that air coring will be used to drill holes to be used for permeability testing (e.g., Infiltration test, pg. 8.4-52; bulk permeability test, pg. 8.4-53; radial borehole tests, pg. 8.4-53; Calico Hills tests, pg. 8.4-54; diffusion tests, pg. 8.4-54. Aside from the potential technical difficulties associated with the feasibility of drilling such holes, this raises questions about the reliability of the permeability values thus obtained.	588PPC 102	SCP 8.4.2.1.6 (Other conditionally Planned activities) SCP 8.4.2.3.1 (ESF Testing Operations, layout constraints and zones of influence)

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Item No.	Category	Description	Reference	Expected Document for Closure
107	TESTS	Does this program include all drilling or only surface based drilling?	588PPQ 14	SCP 8.3.1.4.1 (Integrated drilling program and integrated geophysical activities)
74	TESTS	CDSCP's approach to characterizing the complex three-dimensional nature of fracture systems in the repository block appears to rely on fractal analysis of outcrop exposures and geologic mapping of ES-1, drifts and boreholes (excluding floors and working faces). Also the CDSCP limits the objectives of fracture network studies to providing fracture analyses to supporting hydrologic modeling. The approach and objective to characterization described in the CDSCP may not lead to sufficient descriptions of the fracture networks.	588PPC29	SCP 8.3.1.4.2.2.4 (GEOLOGIC MAPPING OF ESF) SCP 8.3.1.4.2.2.2 (SURFACE FRACTURE NETWORK STUDIES)
106	TESTS	What are the definitions of the terms fracture "aperture" and "length"?	588PPQ 12	SCP 8.3.1.4 (Rock characteristics)
32	TESTS	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.	885AI 10	SCP 8.4.2.3.1 (ESF Testing Operations) SCP 8.3.1.4.2.2.4 (Geologic Mapping of ESF) SCP 8.3.1.4.2.2.2 (Surface Fracture Network Studies)
108	TESTS	How is the roughness coefficient parameter measured in a borehole? What is the difference between roughness coefficient listed here and "roughness" discussed elsewhere in Section 8.3.1.4.2.2.3?	588PPQ 16	SCP 8.3.1.4.2.2.3 (Borehole evaluation of faults & fractures)
109	TESTS	What role, if any, will the data presented in Chapter 2 play in the proposed model development and in scoping the amount of planned site specific in situ testing?	588PPQ 17	SCP 8.3.1.4.3 (Development of 3-D models of rock characteristics at the repository site)

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Item No.	Category	Description	Reference	Expected Document for Closure
99	TESTS	Plans should be made to correlate persistence of geologic features from ES-1 to ES-2 which might provide preferential pathways and to develop a photographic record of ES-2 for possible future use.	588PPC97	SCP 8.4.2.3.1 (ESF Testing operations) SCP 8.4.2.3 (Subsurface based activities)
46	TESTS	The testing program to characterize perched water zones will be discussed at the ESTP meeting.	885AI 24	SCP 8.4.2.3.1 (ESF testing operations) SCP 8.3.1.2.2.4.7 (Perched water test in ESF)
105	TESTS	The performance confirmation program has not been sufficiently well defined, and appropriate details are not included in the CDSCP. The discussion concerning confirmation, Issue 1.7 has not presented the strategy or a plan to meet the requirements set forth in Subpart F of 10 CFR 60.	588PPC 103	SCP 8.4.2.3.6.4 (Design flexibility) SCP 8.3.5.16 (Performance Confirmation Program)
49	TESTS	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.	885AI 27	SCP 8.3.1.15.1.7.1 (Plate loading tests) SCP 8.3.1.15.1.2 (Thermal expansion testing) SCP 8.3.1.15.1.1 (Study of thermal properties) SCP 8.3.1.15.1.5.2 (Excavation investigation; DBR) SCP 8.3.1.15.1.6.1 (Heater experiment in unit TSw1) SCP 8.3.1.15.1.4 (Mechanical properties of fractures) SCP 8.3.1.15.1.3 (Mechanical properties of intact rock) SCP 8.3.2.5.6 (Development and demonstration of equipment) SCP 8.4.2.3.1 (ESF testing operations, layout constraints and zones of influence)
50	TESTS	Has DOE/OGR made a decision that the use of radioactive materials in the site characterization program will not be considered in the future?	885AI 28	SCP 8.7.1 (Decontamination) SCP 8.4.1.2 (Incorporation of 10 CFR 60) SCP 8.4.2.3.1 (ESF testing operations, layout constraints and zones of influence) SCP 8.4.2.2.2 (Locations, operations and construction controls for surface-based activities)

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Item No.	Category	Description	Reference	Expected Document for Closure
113	TESTS	Why is there no link (other than that indicated in Figure 8.3.2.1-1) established between this plan and Issue 1.12 - Repository Sealing?	558PPQ 34	SCP 8.3.2.2.3 (Drainage and moisture control plan)
114	TESTS	According to the last sentence of this section, the approach to develop this plan is given in Section 8.3.2.3, and the data requirements for this plan are given in Section 8.3.2.2.1. Both of these referenced sections cover extremely broad topics. What are the relevant items for this section?	588PPQ 35	SCP 8.4.2.3.3 (Description of ESF) SCP 8.3.2.2.3.4 (Drainage and moisture control plan)
115	TESTS	Where in Section 8.3.2.2.1 are the data requirements for this activity discussed?	588PPQ 36	SCP 8.3.2.2.5.1 (Excavation methods criteria) SCP 8.3.2.2.5.2 (Long-term subsidence control strategy) SCP 8.3.2.2.1 (Site characterization information needed for design)
117	TESTS	Use of mechanical excavation is considered not feasible in some parts of the document and plausible in other parts. The next to last paragraph on pg. 8.3.2.4-28 mentions the possibility that mechanical excavation may be used. Does this contradict other implications in the CDSCP (e.g., pg. 8.3.2.2-70) that mechanical excavation is not feasible?	588PPQ 38	SCP 8.3.2.2 (Excavation Methods Criteria) SCP 8.4.2.3.4.4 (ESF underground construction and operations)
110	TESTS	What methods will be used to determine whether there is any impact of ground motion from underground nuclear explosions on repository design?	588PPQ 25	SCP 8.3.1.17.3 (Studies to provide required information on vibratory ground motion that could affect repository design)
125	TESTS	Which activity in Table 8.3.1.15-1 is planned to investigate the effects of radiation on thermal and mechanical rock properties?	588PPQ 51	SCP 8.3.1.15 (PA Tables) SCP 8.3.4.2.4.1.5 (Effects of radiation on water chemistry)

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Item No.	Category	Description	Reference	Expected Document for Closure
76	TESTS	This table, which summarizes the requests for thermal and mechanical rock properties, appears to be far from complete.	588PPC42	SCP 8.3.1.15 (Table 8.3.1.15-1) SCP 8.4.2.1 (Rationale for planned testing) SCP 8.4.2.1.4 (Relationship of planned testing to data needs) SCP 8.3.1.15 (Listing on Page 8.3.1.15-1 summarizing performance and design requirements)
77	TESTS	Section 8.3.1.15 does not present a clear testing rationale. Thermal and mechanical properties to be determined are not related to specific individual tests.	588PPC43	SCP 8.3.1.15 (OVERVIEW OF THERMAL AND MECHANICAL ROCK PROPERTIES)
78	TESTS	The testing program laid out in Section 8.3.1.15 is deficient in several respects. In some cases, important information that could be gained in testing is not identified. Also, some proposed tests are ill-defined, and others may not be able to provide required information.	588PPC44	SCP 8.3.1.15 (Overview of thermal and mechanical rock properties) SCP 8.4.2.3.1 (ESF testing operations, layout constraints, and zones of influence)
79	TESTS	The discussion and use of statistics in this chapter is not clear. A statistical approach has been suggested to determine numbers of tests required to determine various rock properties, but the approach suggested is confusing and apparently overlooks several considerations that should be factors into such an approach. Also, needed confidences of "low," "medium," or "high" have been assigned without explaining the basis for such assignments. Bases for assigning the needed confidence of low, medium or high are not discussed.	588PPC45	SCP 8.3.1.15 (OVERVIEW OF THERMAL AND MECHANICAL ROCK PROPERTIES) SCP 8.3.1.15.1 (INVESTIGATION: STUDY ON SPATIAL DISTRIBUTION OF THERMAL AND MECHANICAL PROPERTIES)

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Item No.	Category	Description	Reference	Expected Document for Closure
80	TESTS	In order to examine the margin of safety engineered into the stability of emplacement holes from the standpoint of retrievability, the canister-scale heater experiment needs to be run beyond the average design heat load. The CDSCP does not include provisions for such testing. Also, no mention is made of testing of lined versus unlined holes, backfilled holes, etc.	588PPC46	SCP 8.3.1.15.1.6.2 (CANISTER-SCALE HEATER EXPERIMENT)
81	TESTS	This experiment is one of the more important rock mechanics experiments proposed; yet, virtually no detail is given regarding it. There seems to be a lack of integration between this experiment and the modeling activities and design.	588PPC47	SCP 8.3.1.15.1.6.5 (Heated room experiment) SCP 8.4.2.3.1 (ESF testing operations, layout constraints and zones of influence)
82	TESTS	Plate-load tests do not necessarily provide a means of determining in-situ (i.e., undisturbed) rock mass deformational properties. Data obtained from such tests may be useful in assessing spatial variability, effects of different excavation procedure, etc. as part of the overall program to characterize deformational relations of the rock mass adjacent to underground openings but may not be useful in thermomechanical calculations.	588PPC48	SCP 8.3.1.15.1.7.1 (Plate loading tests) SCP 8.4.2.3.1 (ESF testing operations, layout constraints and zones of influence)
83	TESTS	CDSCP has limited its consideration of how jointed tuff can be treated to equivalent continuum models. Although several possible models are described in Chapter 2 (pp. 2-19 and -20), representation of jointed tuff by equivalent continuum models only and disregarding of other models such as quasi-discrete or distinct element models has not been justified.	588PPC54	SCP 8.3.2.1.4.1.1 (GEOMECHANICAL ANALYSES)

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Item No.	Category	Description	Reference	Expected Document for Closure
87	TESTS	The proposed wedge analysis and key block analysis are not capable of including the effects of thermal loading or stress gradient on the host rock.	588PPC58	SCP 8.3.2.2.6 (CONTAINER SCALE ANALYSES)
111	TESTS	How will the heated block experiment be used for model validation if there are no imposed stress gradients or temperature gradients inside the block?	588PPQ 26	SCP 8.3.1.15.1.6.3 (Yucca Mountain Heated Block Experiment Plan)
112	TESTS	What are the parameters and the strength model for which the strength experiment(s) are designed, and how will a substantial volume of rock be driven to failure?	588PPQ 27	SCP 8.3.1.15.7.2 (Rock-mass strength)
116	TESTS	Some concerns exist as to whether the list of parameters for performance goal C2 (rock radiation shielding) given on pg. 8.3.2.3-30 is comprehensive. For example, does the expected pre-emplacment saturation value of 65% represent the expected post-emplacment saturation value?	588PPQ 37	SCP 8.3.2.3 (Radiological safety)
118	TESTS	Why are the requirements for some items on pg. 8.3.2.5-23 different from the requirements for System Element 1.2.1.2 identified in Table 8.3.2.4-2, non-radiological health and safety?	588PPQ 39	SCP 8.3.2.4.2 (Drift Construction)

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Item No.	Category	Description	Reference	Expected Document for Closure
7	CONST	Identify the acceptance criteria for construction of the exploratory shaft.	483IR IIa	Upon completion of Title II
47	CNSTR	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.	885AI 25	Upon completion of Title II
13	CONST	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.	483IR IVa	Upon Completion of Title II
14	CONST	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.	483IR IVb	Upon Completion of Title II
16	CONST	Describe plans to document the above construction activities.	483IR IVd	Upon Completion of Title II
61	CNSTR	The DOE will provide the technical analysis supporting the proposed size of the exploratory drifts by June 1, 1987	487 AI 1	Upon completion of Title II
63	CNSTR	The DOE committed to using the same construction control requirements in the second 12 ft. shaft as in the first 12 ft. shaft.	487 AI 4	Upon completion of Title II

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Item No.	Category	Description	Reference	Expected Document for Closure
72	CONST	The rationale for the specification of information needs does not appear to ensure completeness of those information needs. Furthermore, the integration of testing with design and performance assessment appears to be lacking.	588PPC1	SCP 8.3.2.5 (PRECLOSURE DESIGN) SCP 8.3 (THROUGHOUT ALL SECTIONS)
75	CONST	The required integration of site-specific subsurface information with repository design is not considered in this section (e.g., not even among the qualifying factors listed in the next to last paragraph on pg. 8.3.1.4-90.	588PPC30	SCP 8.4.2.3.6.3 (INTEGRATION OF ESF WITH REPOSITORY DESIGN) SCP 8.3.1.4.3.1 (SITE-SPECIFIC SUBSURFACE INFORMATION STUDY)
119	CONST	What is the justification for the statement on pg. 8.3.2.5-24 that "no site characterization data is required to develop the high level of confidence needed for installation of borehole liners.?"	588PPQ 40	SCP 8.3.2.5 (Borehole construction)

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Item No.	Category	Description	Reference	Expected Document for Closure
43	MISC	NRC requests that DOE identify the schedule for providing the items identified in DOE's response of June 7, 1985 as being under development.	885AI 21	Letter on this subject
122	MISC	There are many apparent inconsistencies in the write-up of the proposed activities presented in this section when compared with the details given in other sections of the SDSCP and reference documents. What are the impacts of such inconsistencies?	588PPQ 48	SCP 8.4 (Planned SC activities and Impacts)
60	PEND	The DOE will assemble the draft ESF-Repository Interface Control Drawings in a manner that they can be released to NRC and the State by June 1, 1987.	487AI 1	Closures not yet documented Drawings sent to NRC on 6/4/87
62	PEND	The DOE committed to constructing exploratory drifts using controlled blasting techniques, but emphasized that this did not mean that DOE had agreed that Level I QA requirements will apply to controlled blasting in the drifts. The Department will evaluate the relevance of drift stability and damage control to retrievability and waste isolation considerations.	487AI 3	Letter/position paper sent to NRC on 10/16/87 and 10/19/87
64	PEND	The DOE committed to provide from files, if available, historic drawings depicting the initial repository elevation at the 1200 ft. horizon by June 1, 1987.	487AI 5	Closure not yet documented Drawing sent to NRC on 6/4/87
66	PEND	The DOE provided the information requested in Attachment 6 to NRC and the State of Nevada on April 15, 1986. Copies are included with distribution of this summary.	487AI 7	Closure not yet documented Provided at meeting April 14 and 15

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Item No.	Category	Description	Reference	Expected Document for Closure
26	NRC	NRC position on the 1 part per 100,000 release limit as an instantaneous differential or an integral over a year.	885AI 4	NRC
37	NRC	The NRC is to furnish the DOE with the information as to whether NRC's $10\text{exp}-5/\text{yr}$ release rate applies on a discrete year by year basis or a continuous rate basis.	885AI 15	NRC
48	NRC	The NRC will provide guidance on the key parameters that should be considered in determining the representativeness of the ESF.	885AI 26	NRC
65	NRC	The NRC will review attachment 7 and will notify the DOE by June 1, 1987 if the proposed response plan to close out open items is satisfactory.	487AI 6	NRC