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NOV 23 1983

Donald L. Vieth, Director
Waste Management Project Office
U. S. Department of Energy
Nevada Operations Office
P.O. Box 14100
Las Vegas, NV 89114

Dear Dr. Vieth:

I have enclosed two signed copies each of the typed workshop summaries for the September 20-21 Hydrogeology Workshop, the October 4-6 Geology Workshop, and the October 18-19 Waste Package Workshop. Please countersign the geology and waste package summaries, have Max Blanchard countersign the hydrogeology summary and return one copy of each to me.

In reviewing the summary for the waste package workshop, it became apparent that a fundamental concern of the NRC workshop participants was not clearly brought out in the observations. The concern is that the Preliminary waste package designs discussed at the workshop use average environmental conditions as the design basis and that, therefore, there could be failure of a significant number of packages where spatial and temporal variations in actual environmental conditions may cause the design basis to be exceeded. While it may be possible to show by appropriate analyses that whatever variations that might actually be present would not lead to significant numbers of failures, it is the view of the NRC staff that a more prudent course would be one of using a more conservative design basis.

Finally, I would note that the summaries for all three of the workshops record our request for copies of the viewgraphs and slides used during the workshop presentations. The brief period during which they are flashed on the screen does not provide the NRC staff with an adequate opportunity to assimilate the material. I understand that the interpretations of data that are presented on some of the viewgraphs are

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preliminary; however, as we have discussed previously, they can be marked in any way that you feel is appropriate to indicate their status.

I would be happy to discuss any of these matters with you.

Sincerely,

Original Signed By

Seth M. Coplan, Project Manager
Repository Projects Branch
Division of Waste Management

OFC	:WMP:ejc	:WMEG <i>edw</i>	:WMEG <i>[Signature]</i>	:WMGT <i>keim</i>	:WMGT <i>[Signature]</i>	:WMPA <i>[Signature]</i>	:DWM
NAME	:SMCoplan <i>[Signature]</i>	:EWick	:JTGreeves	:MRKnapp <i>[Signature]</i>	:PSJustus	:HJMiller	:MBell <i>m/b</i>
DATE	:11/21/83	:11/21/83	:11/21/83	:11/22/83	:11/22/83	:11/21/83	:11/23/83

ATTENDEES
 NNWSI WASTE PACKAGE WORKSHOP WITH NRC
 Tuesday, October 18, 1983

<u>Name</u>	<u>Organization</u>	<u>Phone</u>
H. Clyde Claiborne	ORNL	FTS 626-2578
LEN BULLOU	LLNL	532-4911
J. C. Hard	LLNL	422-7088
R J Starmer	NRC	427-4541
H. A. TEWER	LLNL	532-6464
M. J. BELL	NRC	427-4200
F. J. Ryerson	LLNL	532-6608
M. M. Satchell	LLNL	532-3986
J E HANAN	LLNL	422-6367
LES JARDINE	Bechtel	415 768 1234
RWBuddman	LLNL	422-8153
A. D. [unclear]	LLNL	423 4482
Wunan Lin	LLNL	422-7162
Ray Beall	Weston NWS	301-963-6800
E. R. Wiot	Weston NWS	301-963-6700
F. BAZAN	LLNL	422-1552
J KEITH JOHNSTONE	SNL	FTS 944-7633
Ellen Raber	LLNL	422-3985
Jane Oberdorfer	LLNL	422-5636
JEFF BRAITHWAITE	SNL	846-1186
DUGMIR DUMSBY	LLNL	432-2228
Larry Schwartz	LLNL	423-4486
MICHAEL [unclear]	LLNL	422-1982

ATTENDEES
 NMWSI WASTE PACKAGE WORKSHOP WITH NRC
 Tuesday, October 18, 1983

<u>Name</u>	<u>Organization</u>	<u>Phone</u>
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D. Bish	LANL	FTS 843-4337
DON VIETH	DOE-NU	598-3662
Ron May	SAI	619-456-6517
Parviz Montazer	USGS	FTS 234-2115
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Kevin Knauze	LANL	422-1372
Richard Van Konyenburg	LLNL	FTS 532-0456
Daniel Mc Cright	LLL	FTS 532-7051
PETER MCGRATH	SAI	703 556 7224
Holly A. Miller	LLNL	415 423-1249
Peter Soo	BNL	8-666-4094
Kenneth W. Stephens	NRC (Aerospace)	(202) 488-6342
THOMAS JUNGLING	NRC	FTS 427-4143
EVERETT WICK	NRC	FTS 427-4393
Walter Eister	STD	FTS 233 3188
W. C. O'Neal	LLNL	FTS 422-8369
JESSE L. YOW JR.	LLNL	FTS 532-3521
Gary K Jacobs	ORNL	FTS 626-0567
Don Alexander	NRC	FTS 427-4210
Dale Perry	LBL	FTS 451-4819
Bob Silva	LBL	FTS 451-4316
John K. Bates	ANL	FTS 972-4395

ATTENDEES
NMWSI WASTE PACKAGE WORKSHOP WITH NRC
Tuesday, October 18, 1983

<u>Name</u>	<u>Organization</u>	<u>Phone</u>
Chuck Wilson	HEDL	(509) 376-5354
David Gregory	LLNL	(415) 422-7377
David Lester	SAI	(619) 456-6226
Bob LaRiviere	SAF	(702) 884-3784
LARRY RAMSPOTT	LLNL	(415) 422 4176
Jeffrey Hansen	LLNL	(415) 422-6454
Bob Black	LLNL	(415) 422-6472
Paul O'Brien	SNL	(505) 844-4284
Almy Jules	LLNL	(415) 423-1254

SUMMARY OF THE NRC-DOE
HYDROGEOLOGY WORKSHOP
SEPTEMBER 20-21, 1983

The following points were made by NRC:

Observation

1. Significant progress has been made toward defining the potentiometric surface especially to the east of the Solatario fault; however, more work needs to be done to define the characteristics of the anomalies in the hydraulic gradient to the north and west, and to understand the hydrologic significance of the anomalies. (The lack of a physical understanding of the anomalies seems to result in an inconsistency in the way the faults are treated in the modeling done at different scales, e.g. regional, sub-regional, etc.).
2. A great deal of data has been acquired since the January, 1983 meeting; however, publication of analyses and interpretations has been relatively slow. There is a need to make interpretations of the data available in a more timely manner.
3. Several alternative conceptual models have been developed for the unsaturated zone, all of which are consistent with the available data. A similar approach, i.e. considering reasonable alternative interpretations of the available data should be carried into other areas of the program.
4. There is a concern that measurement techniques proposed for the determination of unsaturated zone hydraulic properties may not differentiate between porous and fracture flow. This is an important concern because in the presentation on characterization of the unsaturated zone it was stated that, at least in some units, fracture flow is relatively insignificant. NRC considers the question of relative significance of fracture versus matrix flow to be open.
5. There is a need to examine the time variation of water quality data with respect to time.

6. The meeting provided a valuable opportunity for pre-licensing consultation.

Topics for Further Discussion

1. Characterization of the unsaturated zone.
2. Whether there should be a break-out from the exploratory shaft into the upper clastic unit.

Information Requested

1. A map of the piezometric surface.
2. A description of the strategy, rationale, and objectives of the test series planned for the C-well cluster.
3. A description of the strategy, rationale, and objectives of the unsaturated zone test plan.
4. Copies of the viewgraphs used by Parviz Montazer.

The following points were made by DOE:

Observations

1. The meeting provided good insight into the logic of NRC's technical staff to aid NNWSI in identifying technical issues that will have to be resolved later when we submit the SCP to NRC.
2. These meetings continue to provide the NNWSI technical staff with a good understanding of the potential regulatory needs.

Topics for Further Discussion

1. Disturbed zone - There still seems to be a difference in perceptions between NRC and NNWSI technical staff about the size of the disturbed zone and what constitutes a "significant" change. NNWSI desires additional discussions on this topic at a future meeting.

2. Paleohydrology - NNWSI recognizes that the link between future ground water recharge and the ongoing paleohydrology investigations is difficult and asks that NRC provide alternative approaches and investigative methods that would be acceptable for licensing. In the absence of direct evidence the approach adopted by NNWSI utilizes indirect evidence based upon several different methods and NNWSI wants to insure all viable alternatives are considered.
3. Modifications to 10CFR60 for the unsaturated zone - NNWSI requests a meeting with NRC to have NRC's technical staff explain the rationale behind the changes proposed to 10CFR60 for the unsaturated zone. NNWSI is preparing, a technical position paper about this subject and needs the benefit of additional technical discussions to sharpen our position.
4. The NNWSI program to characterize the unsaturated zone is pushing the state-of-the-art in hydrology and we ask for a meeting that presents NRC sponsored research and applied investigations aimed at characterizing this zone.

Information Requested

1. The NNWSI program would benefit by the receipt of monthly and quarterly progress reports from NRC contractors working on projects having significance to the NNWSI Program.

The following statement was made for the State of Nevada:

1. The State of Nevada appreciates the opportunity to participate in the NRC/DOE hydrogeology workshop. The technical dialogue was most informative to the state and its review of the NNWSI program. We would encourage future technical workshops of this kind. (Statement provided by Carl Johnson)

Agreements Reached

1. NRC and DOE agreed to hold a meeting regarding characterization of the unsaturated zone at an early time. Within two weeks, DOE will propose a date for the meeting and by October 31, NRC will propose a list of discussion topics.

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This Summary was prepared by Seth M. Coplan (NRC) and Maxwell Blanchard (DOE).

Seth M. Coplan 10/15/83

Seth M. Coplan
Project Manager
Division of Waste Management
U. S. Nuclear Regulatory Commission

Maxwell Blanchard
Chief
Geologic Investigation Branch
DOE-Nevada Operations Office

AGENDA
• NNWSI HYDROLOGY BRIEFING FOR NRC
September 20-21, 1983

Holiday Inn West
14707 West Highway 40 (Colfax)
Golden, CO
Phone: (303) 279-7611

Tuesday, September 20

0830-0900 Introductory comments -- DOE/NRC/USGS

0900-1130 Yucca Mountain hydrology (saturated zone)
 (includes
 15-minute
 break) Test-drilling program (Robison)-60
 Head distribution (Robison)-45
 Tracer Tests (Waddell)-30

1130-1300 Lunch

1300-1345 Subregional flow and transport model
 (Waddell, Czarnecki)-45

1345-1630 Paleohydrology
 (includes
 15-minute
 break) Relation to Information Needs (Wilson)-20
 Ongoing program
 Packrat midden studies (Spaulding)-40
 Flood-hazard studies (Glancy, Costa)-30
 Amargosa mapping (Wilson)-10

 Proposed investigations
 Lacustrine studies (Benson)-15
 Water-balance model (Nichols)-20
 Ground-water flow model (Waddell)-15

Wednesday, September 21

0800-1130 Yucca Mountain hydrology (unsaturated zone)
 (Montazer)
 (includes
 15-minute
 break) Conceptual model
 Surface-based test drilling
 Exploratory Shaft test plan

1130-1300 Lunch

1300-1400 Yucca Mountain and regional hydro-chemistry
 (Henderson)

1400-1415 Break

1415-1500 NRC caucus

1500-1630 Feedback (NRC) and wrap-up discussion (All)

REGISTRATION

NAME	COMPANY	TELEPHONE	NAME	COMPANY	TELEPHONE
Bill Wilson	USGS	FIS 234-2115	Gene Rush	USGS	234-2115
Jim Robison	USGS	" "	James R. Erickson	USGS	" "
JOE WILLMON	USGS	FIS 234-7277	Tom HENDERSON	USGS	234-2115
Bill Dudley	USGS	" " "	Sean L. Younker	LLNL	543-1110
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Jack Hess	Williams Assoc	702-645-4803	Michael J Carr	USGS	234-2261
Ben Ross	GeoTrans	703-435-4400	Parviz Montazer	USGS	234-2115
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Ellen Ogaard	LANL	FIS 843-6300	Dave Nichols	USGS	702 882-1381
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Georgette Dinwiddie	USGS	703-802-2916	Robert WISE	SAI	279.0701
Hef Elzefawy	NRC		BOB KNECHT	SAI	279.0701
Jack ROBERTSON	USGS		Howdy Pratt	SAI	
LINDA LEHMAN	NEVADA	(612) 894-9359	Patrick McKinley	USGS	234 2115
Teek Verma	NRC		Carl Romney	SAI	703 750 4937
JEFFREY FOGLE	NRC	(202) 27-4681	Scott Sinnock	SNL	846-0081
Seth M Coplan	NRC	301 427 4675	George B Loomsburg	Williams Assoc.	

SUMMARY OF NRC-DOE
GEOLOGY WORKSHOP
OCTOBER 4-6, 1983

The following points were made by NRC:

Observations

1. A substantial base of geologic and geophysical data have been acquired by the NNWSI. The meeting provided a valuable opportunity for review and discussion of the data at a broad level of detail. Having completed such a meeting, NRC now considers it appropriate to begin a series of meetings each of which focuses on a limited number of closely related issues so that the data can be reviewed and discussed at the greater level detail needed to further the process of prelicensing consultation.
2. While a substantial base of pertinent data has been acquired, these data have not yet been integrated into a tectonic framework for the region and the site. This is important because it is through the understanding provided by such a framework, that the release and transport scenarios involving tectonic deformation or volcanism can be identified and evaluated for the purpose of doing the assessments required by 10 CFR Part 60 and the EPA Standard.

In developing the requisite understanding of the regional and site tectonic framework, it is essential that all of the relevant data, i.e., geologic mapping, exploration geophysics data, seismicity, focal mechanism solutions, stress measurements, instances of Quarternary fault displacements and volcanism, paleomagnetic data, and others be integrated. The integration of data should give explicit consideration to alternative conceptual models that are consistent with the data and the range of uncertainties in the data.

3. There appears to be an inconsistency between the interpretations of geophysical data presented during this meeting which suggest no structural control of 40 Mile Wash and working assumptions concerning the same feature used by the hydrogeologists in presentations made during the recent hydrogeology meeting.

Topics for Further Discussion

1. Interpretations, completeness and relevance of the geophysical data.

2. Interpretations, completeness and relevance of the seismicity data.
3. Tectonic models for the region and the site.
4. Interpretations, completeness, and relevance of data from trenches across Quaternary faults (including field inspection).

Information Requested

1. Copies of the viewgraphs and slides used during the meeting.
2. Copies of all trench maps.

The following are the impressions of the meeting held by DOE:

Observations

1. It provided the DOE contractors (USGS and LANL) with a good understanding of questions important in a regulatory area.
2. It provided good insight into the logic of NRC personnel on how they will review geological data important to licensing.
3. The meeting was conducted in a professional and open manner which facilitated an effective exchange of information.

Items for Discussion at Further Meetings

1. The value of probabilistic approach to risk assessment considering the limited data base for establishing probabilities.
2. NRC logic in determining whether a hazard is acceptable or unacceptable.
3. Evidence required to establish an acceptable position that 40 Mile Wash is not a structurally controlled surface feature.
4. Basis for establishing that significant faults have been identified.
5. Definition of tectonically active and volcanically active areas.

Information Requested

1. What is required to demonstrate that DOE/USGS has considered a featureless area such as Jackass Flats?
2. Examples of work on faults in alluvium to show that it is possible to trench along the strike of a fault to determine nature of faulting.
3. Position as to whether seismic reflection is a viable technique to obtain structure information at NTS/Yucca Mountain.
4. Position of how variation of Tuff physical properties will affect formations capability to isolate waste.

The following comments were made by Carl Johnson for the State of Nevada:

The State of Nevada appreciates the opportunity to participate in this workshop. The technical discussion has been most informative to our review. Some specific comments are:

- It is suggested in the future the geology workshop be held prior to the hydrogeology workshop. The geologic background will make the hydrogeologic discussion more meaningful.
- It is obvious from the workshop, the USGS has collected much information about the site. We would encourage USGS to begin synthesizing this data.
- We would encourage the scheduling of a separate field trip to review the evidence for quaternary faulting in the site area.

Donald L. Vieth
Director
Waste Management Projects Office
DOE/NV

Seth M. Coplan 11/2/83
Seth M. Coplan
Project Manager
Division of Waste Management
USNRC

AGENDA FOR THE NRC/USGS GEOLOGY WORKSHOP
October 4-7, 1983
Colorado School of Mines
Metals Hall, Green Center Auditorium
Golden, Colorado
W. W. Dudley, 303-234-7277 or FTS 234-7277

TUESDAY, OCTOBER 4

- 8:30-9:00 Opening Remarks & Introductions
9:00-10:00 Regional geologic and tectonic setting - broad overview of geology and tectonics and implications or impact to Yucca Mountain - W. J. Carr
10:00-10:15 Break
10:15-10:45 Configuration of regional aquifer system - pre-Tertiary rocks - M. Carr
10:45-11:30 Regional gravity and magnetics - subsurface framework - H. Oliver
11:30-1:00 Lunch
1:00-2:00 Seismic reflection/refraction - status of seismic studies of Yucca Mountain area - W. Mooney/L. Pankratz/ T. McGovern
2:00-3:00 Seismology - regional and site seismic activity, relationship of seismic activity to active faults, and teleseismic p-wave delay - A. M. Rogers/W. S. Spence
3:00-3:15 Break
3:15-3:45 Geomorphology - Quaternary stratigraphy active processes, climate, mapping - D. L. Hoover
3:45-4:45 Neotectonics - Quaternary fault investigations - W. C. Swadley

WEDNESDAY, OCTOBER 5

- 8:30-10:00 Volcanism - rates, potential, and risk - B. M. Crowe
10:00-10:15 Break
10:15-11:30 Geologic setting of Yucca Mountain - distribution and continuity of volcanic rocks in the YM block - R. W. Spengler
11:30-1:00 Lunch
1:00-1:45 Borehole geophysics - Bulk physical properties and distribution of units - D. C. Muller
1:45-2:15 Paleomagnetic studies - magnetic properties of rocks to determine stratigraphic continuity - J. B. Rosenbaum
2:15-2:30 Break
2:30-3:30 Heat flow - Yucca Mountain and regional thermal gradients and anomalies - J. Sass
3:30-4:30 Open discussion

THURSDAY, OCTOBER 6

- 8:30-10:00 Structural geology - surface and subsurface distribution of faults and fractures at Yucca Mountain - R. B. Scott
10:00-10:15 Break
10:15-10:45 Aeromagnetism - status of survey at Yucca Mountain - G. D. Bath
10:45-11:45 In situ stress - Analysis of borehole hydrofrac measurements - J. Healy/C. Morrow
11:45-1:00 Lunch
1:00-1:30 Crustal deformation - newly established level lines and strain network - W. Carr/W. Prescott
1:30-2:00 Open discussion
2:00-3:00 Break and caucus
3:00-3:45 Closing session

(please print)

REGISTRATION

NAME	COMPANY	TELEPHONE	NAME	COMPANY	TELEPHONE
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Bob Wise	SAI	" " "	Harry Smeles	"	-6843
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McWell Blanchard	DOE	FTS 598-3662	Joe Willmon	USGS	234-7277
GC Dixon	USGS	598-4111	Jett Wagner	LLNL	422-1324
Des Stuart-Alexander	USGS	8-467-2353	Joy Fiore	SAI	FTS 598-3705
Bruce Crowe	Los Alamos	8-843-4299	M.D. Voegele	SAI	FTS 598-3784
Medwayley	USGS	234-2365	Howard E. Simpson	LANL	234-2146
W.J. Carr	USGS	234-2365	Robert W. Craig	USGS	234-2115
Michael D. Carr	USGS	234-2261	Daniel J. ...	USGS	234-2115
Bob Scott	USGS	234-2261	Lincoln ...	USGS	234-5222
W.N. YOUNGBERG	DOE	301-353-5428	RB Raup	USGS	234-2650
D.H. Chung	LLNL	415-422-0268 FTS 532-0268	S. D. Francis	LANL	834-5726
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H. LAWRENCE MCKAGUE	LLNL (45)	422-6694	Jim Robinson	USGS	234-2115
Seth M. Coplan	NRC	427-4675	Bill Spence	USGS	234-4041
Kristin Westbrook	NRC	427-4542	RON GEOFFRION	Los Alamos	FTS 843-51
MARTHA PENDLETON	NRC	427-4629	John Whitney	USGS	234-5260
Paul Prestholt	NRC	427-4177	Walter Mooney	"	467-2476
Catherine Russell	NRC	427-4020	A. W. Oliver	"	FTS 467-42
JEFFREY POHLE	NRC	427-4681	Joann M. Stock	USGS	FTS 467-219
FRANK W. SPANGLER	USGS	234-2146	Robert C. Jackson	USGS	FTS 467-42
Tom Schmitt	NRC	427-4370	Joe Rosenbaum	USGS	FTS 234-23
Lauri Horner	USGS	234-2391	Paul Vaniman	LANL	FTS 834-1165
			Brad Myers	USGS	" 234-511
			John G. Kelly	USGS	
			Hans Ackerman	"	
			Lee Pankratz	"	

(please print)

REGISTRATION

NAME	COMPANY	TELEPHONE	NAME	COMPANY	TELEPHONE
David Conover	SAI	279-0701			
Bill Tweenhofel	SAI	237-0780			
A.C. TARR	USGS	or 823-6769 234-5604			
HOWARD PRATT	SAI	(619) 456-6277			
Richard Saltus	USGS	(303) 234-2623			
William E. Wilson	USGS	234-2115			
Scott Sinyock	SNL	(505) 846-0081			
Martin Tierney	SNLA	844-1280			

CLOSEOUT COMMENTS OF NRC AND DOE ON
THE NNWSI WASTE PACKAGE WORKSHOP

Dublin, California
October 18-19, 1983

The following points are raised by NRC.

Observations

1. LLL, in considering environments that could affect the waste, did not show that they have considered the effects of salts (silica, calcite) that could be deposited when groundwater is vaporized. These deposited salts could plug the pores of the rock and prevent steam, and later water, from escaping from the emplacement hole. These deposited salts could also be redissolved and result in a higher dissolved salt content in water contacting the waste package.
2. LLL bases its waste form leaching or dissolution estimates on the assumption that leach rates are controlled by maximum silica solubility in the groundwater. This assumption is not yet accepted by the scientific community. For example, colloidal silica should be considered.
3. The sensitivity of the waste package to water flow and temperature should be considered. For example, the distance of the repository from the water table varies (a 6 to 8 degree slope was mentioned) and this could result in different waste packages experiencing different water flow rates and temperatures.
4. NRC encourages continuation of the spent fuel cladding studies and suggests that actual failed fuel rods be used.
5. The Draft EPA standard 40 CFR 191 is tentative and may be changed. If it is changed, NRC must reevaluate 10 CFR 60 to see if it must be changed.
6. Graphs should contain error bands. For example, data used to show differences may actually overlap if error bands are considered. Also, experiments should be replicated for each test condition.
7. The horizontal borehole design for spent fuel uses a 15 centimeter annulus of packing material that is encapsulated. Thus, an annular gap between the waste container and the packing material will be necessary to install the waste package. The benefit of the packing

material, therefore, is not obvious because the groundwater will flow through the annular gap rather than through the backfill.

8. The use of equilibrium codes in obviously non-equilibrium situations is not clear. It is not clear how kinetics are treated. For example, what are the effects of flow rate variation? Another example is that the observed compatibility of J-13 well water and Topapah Springs water may be just lack of time for reaction.
9. Parameter values should be estimated realistically, even when "conservative" values are used. Otherwise, there is no way to judge how conservative the estimate is. The estimated parameter values should also include realistic upper and lower bounds.
10. The selection of candidate container materials from only two generic classes of metals is very risky. It is especially risky to select three austenitic stainless steels because they are susceptible to stress corrosion cracking in the presence of chloride ion and oxygen.
11. The number of stainless steels tested should be minimized and the number of metals from other generic classes (e.g., titanium or zirconium-based alloys, carbon steels, and low alloy steels) should be increased.
12. The ranges of repository conditions should be defined so that meaningful corrosion tests can be designed. The conditions whose ranges need to be defined include temperature, water chemistry, pH, gamma dose rate, stresses on the canister, aqueous phase (water or steam) and oxygen level.
13. A range of tests should be selected which encompass anticipated environmental conditions; tests under accelerating conditions should also be carried out. The data bases obtained from these tests should be modeled to obtain constitutive equations for observed failure modes. Accelerating parameters may include higher temperature, higher stress level, and groundwater containing higher concentrations of impurities and increased levels of oxygen.
14. Multiple heats of each candidate canister metal should be tested to ensure that heat-to-heat variations are quantified and factored into the derived constitutive equation.
15. Very long-term tests (10-15 years) should be performed under prototypic conditions to investigate stress corrosion cracking, pitting, and uniform corrosion rates.

16. Weld qualification must include demonstration of acceptable mechanical properties and corrosion resistance.
17. Experimental effort can be minimized by selecting materials with as few documented failure modes as possible.

Items for Further Discussion

1. Susceptibility of container materials to stress corrosion cracking.
2. Reliability of the waste package, including demonstration of the reliability of the method itself.

Information Requested

1. Where can iron-bearing smectite for the packing material be obtained?
2. What information will be gained from the near-field hydrothermal tests and how does the information relate to the information needs of the project?
3. NRC is interested in all supporting analyses for the conclusions presented in the meeting.
4. Copies of all viewgraphs and slides used during the meeting.

The following points are raised by DOE.

Observations

1. The meeting provided the waste package development staff (LLNL) supporting the NNWSI project good insight into the questions important in a regulatory arena and the requirements necessary to address issues of importance.
2. It provided good insight into the logic of the NRC staff and its contractors and how they might review information important to licensing.
3. The meeting was conducted in a professional and open manner which facilitated an effective and constructive exchange of information.

Topics for Future Discussion

1. NRC's view point of what constitutes the physical evidence for a waste package containment being "substantially complete."
2. Discussion of the treatment of uncertainty analysis with respect to likely events and unlikely events. Attention should be given to testing requirements for selecting unlikely events.
3. Discussion of characterization of spent fuel - can we use an ensemble average or must we characterize the content of every package?
4. Discussion of the changes to 10 CFR 60 as they relate to the waste package in the unsaturated zone.

Information Requested

1. References by Peter Soo regarding the provisions of stress corrosion cracking of austenitic stainless steel.
2. Information on the level of detail that NRC believes is prudent in a detailed materials test plan.
3. Information regarding the level of design detail for the waste package that NRC believes should be included in the SCP.
4. Identification of references for test methods that can be used to accelerate testing of materials of a waste package.

Donald L. Vieth (Date)
Director
Waste Management Project Office

Michael J. Bell 11/16/83
Michael J. Bell (Date)
Deputy Director
Division of Waste Management

AGENDA

NNWSI WASTE PACKAGE WORKSHOP WITH NRC

October 18-19, 1983
Howard Johnson's Hotel
Dublin, CA

Tuesday, October 18

0900-0930 Introductory comments - DOE/NRC/LLNL

- 0930-1200 I. Waste Package Environment in the Repository
- Oversby/
Knauss (75) { a. Ground water chemistry as affected by thermal and radiation fields
 - o water chemistry after rock-water interactions experiments at 90°C and 150°C including experiments planned for FY84 in gamma field
 - Yunker (15) b. Hydrothermal effects in very near field
 - o rock response to near field conditions
 - Oversby (10) c. Current USGS estimates of ground water flux and flow mechanisms at Yucca Mountain
 - o annual volume of water contacting waste package
 - Oversby (15) d. Packing Material
 - o preliminary assessment/discussion of need for packing material for release control
 - Yunker (15) o potential functions under unsaturated emplacement conditions
 - Oversby (20) o preliminary candidates for packing material in tuff environment: importance of thermal conductivity of packing material

1200-1300 Lunch

1300-1500 II. Waste Form

- Oversby (60) { a. Characteristics of waste forms: assumed reference cases
- b. General approach to waste form testing: plans for acquiring necessary data
 - Bates (30) c. Saturated waste form testing
 - Wilson (30) d. Unsaturated waste form testing (Argonne National Laboratory)
 - e. Spent fuel testing program (HEDL)
 - o characteristics of spent fuel population
 - o investigations of role of cladding in containment and release control

1500-1700 III. Metal Barrier: Testing and Evaluation

- McCright { (30) a. Selection of candidate materials for container
- (30) b. Rationale and supporting data for material selection
 - o restrictions/specifications for container fabrication and welding
 - (15) o potential and probable corrosion modes to be investigated
 - (45) o test conditions to acquire supporting data and plans for long-term testing

Wednesday, October 19

- 0800-1000 IV. Waste Package Design and Analysis
O'Neal { (30) a. Design requirements/historical development of waste package designs
(15) b. Current reference conceptual designs for unsaturated zone
(45) c. Analysis of current reference designs
o thermal: very near field temperatures as a function of time and waste package design
o structural
o criticality
o economic
(20) d. Alternative conceptual designs: single or multiple metal barrier
(10) e. Future plans

1000-1200 V. Performance Assessment/Uncertainty Analysis

- Bell (30) a. NRC comments on Reasonable Assurance
Yunker (30) b. Anticipated environmental conditions in an unsaturated emplacement environment
o variability in characteristics of host rock
o potential effects of variability on performance of waste package
Revelli (30) c. Deterministic analysis of time to first release and long-term release rates
o potential use of WAPPA
o WAPPA subsystem model reviews to determine applicability to unsaturated emplacement conditions
o model development plans
Sutcliffe (30) d. Uncertainty Analysis
o reliability/uncertainty: approaches for predicting waste package performance
o preferred approach for waste package system

1200-1300 Lunch

1300-1400 VI. Planned Tests in Exploratory Shaft at Yucca Mountain

- Yunker (60) { a. Description of tests
b. Purpose of specific experiments: methods/procedures/parameters
c. Predictive modeling of results

1400-1500 NRC caucus

1500-1630 Feedback and wrap-up discussion

Phone Numbers for Messages

415-828-7500

415-829-2144