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TRANSCRIPT OF PROCEEDINGS

UNITED STATES NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFETY

SUBCOMMITTEE ON WASTE MANAGEMENT

In the matter of:)
)
GENERAL MEETING)

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2 UNITED STATES NUCLEAR REGULATORY COMMISSION'S
3 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
4
5 TUESDAY, AUGUST 18, 1987
6
7 The contents of this stenographic transcript of the
8 proceedings of the United States Nuclear Regulatory
9 Commission's Advisory Committee on Reactor Safeguards (ACRS),
10 as reported herein, is an uncorrected record of the discussions
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1 UNITED STATES NUCLEAR REGULATORY COMMISSION

2 ADVISORY COMMITTEE ON REACTOR SAFETY

3 SUBCOMMITTEE ON WASTE MANAGEMENT

4

5 In the Matter of:)
6)
7 GENERAL MEETING)
8)

Tuesday,
9 August 18, 1987

10 Room 1046
1717 H Street, N.W.
11 Washington, D.C. 20555

12 The above-entitled matter came on for hearing,

13 pursuant to notice, at 8:30 a.m.

14 BEFORE: DR. DADE W. MOELLER
Chairman
15 Professor of Engineering in Environmental
Health
16 Associate Dean for Continuing Education
School of Public Health
17 Harvard University
Boston, Massachusetts

18 ACRS MEMBERS PRESENT:

19 DR. FORREST J. REMICK
20 Vice-Chairman
Associate Vice-President for Research
21 The Pennsylvania State University
University Park, Pennsylvania

22 DR. CARSON MARK
23 Retired Division Leader
Los Alamos Scientific Laboratory
24 Los Alamos, New Mexico

25

1 ACRS MEMBERS PRESENT (CONTINUED):

2 DR. PAUL G. SHEWMON
Professor, Metallurgical Engineering Department
3 Ohio State University
Columbus, Ohio
4
DR. MARTIN J. STEINDLER
5 Director, Chemical Technology Division
Argonne National Laboratory
6 Argonne, Illinois

7 ACRS COGNIZANT STAFF MEMBER:

8 Owen Merrill

9 ACRS CONSULTANTS:

10 Konnie Krauskoph
Michael Trifunac
11 Frank Parker
Donald Orth
12 John Linehan
Jack Parry
13 Wayne Walker
Donald Orth
14 Keith McConnell
Fred Ross
15 Ron Ballard
J. Kennedy
16 John Bradbury
Paul Bender
17 Mr. Cameron
Robert Johnson [State of Nevada]
18 King Stablein [State of Nevada]

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1 P R O C E E D I N G S

2 DR. MOELLER: The meeting will now reconvene of the

3 ACRS Subcommittee on Waste Management.

4 Okay, John, the floor is yours.

5 DR. LINEHAN: Okay, Dade, I would just like to say

6 the item that we are deleting, the NRC staff comments on the

7 DOE mission plan. The reason we can't address that today is

8 the comments are still under management review and we can't

9 discuss them at this point in an open and public meeting. It's

10 a policy on --

11 DR. MOELLER: All right. Would it be possible then

12 for us to just bring up any questions that we have about the

13 mission plan?

14 DR. LINEHAN: Surely. I would be glad to answer any

15 questions you have.

16 DR. MOELLER: Okay, if I can find it, I had some, and

17 if other members of the subcommittee have any.

18 I found it, obviously, an interesting document, and

19 let me just ask a few things. Like it says on page 5, and I

20 realize you may not have a copy, but let me read it. It says,

21 "The need for improvements in quality assurance in the DOE

22 program has been identified by the DOE."

23 Well, glorious, you know, they identified it. I have

24 been hearing from you people for several years that you had

25 raised questions about their QA program. I would have thought,

1 you know, they might have said, has been jointly identified by
2 the NRC and the DOE.
3 They say -- has the NRC, page 28 and page --
4 somewhere else -- refers to the issues hierarchy that DOE has
5 set up and the issues resolution approach.
6 DR. LINEHAN: Yes.
7 DR. MOELLER: Have you people formally reviewed that
8 issues hierarchy and the procedure for resolving each issue?
9 DR. LINEHAN: We had a meeting with DOE on that
10 subject where they presented in a very broad and general form
11 on the issues hierarchy.
12 At that meeting, based on what was presented at the
13 meeting and reviews of pre-meeting materials, we concurred in
14 the hierarchy, the way they presented it.
15 DR. MOELLER: Does that mean you concurred in the
16 methodology or in the specific items?
17 DR. LINEHAN: I was just going to say it was the
18 methodology we concurred in.
19 DR. MOELLER: Okay.
20 DR. LINEHAN: We still have to see how they are going
21 to implement it, and the key to that is going to be the site
22 characterization plans. They gave us one or two isolated
23 examples as to how they would implement the methodology. And
24 it seemed reasonable and complete.
25 DR. STEINDLER: I don't understand what you mean by

1 concurred in the methodology.

2 DR. LINEHAN: Well, we reviewed the methodology that
3 they identified for lay note issues, how they were going to
4 present their issues. They have different tiers of issues:
5 very broad issues, going down to more specific. And the
6 approach they presented we felt was reasonable, and it would
7 allow them to -- it would provide a systematic way of laying
8 out the issues so that you could design site characterization
9 studies to collect the data needed to respond to the issues.
10 But when you get to a specific issue like ground
11 water travel time, effective porosity, how you are going to
12 resolve that issue, we didn't get to that level of detail. And
13 that's something we still have to see how they are going to --
14 DR. MOELLER: Well, I have mentioned several times at
15 this meeting that I am hopeful that this subcommittee, you
16 know, can see that issues hierarchy document and review it.
17 And a question that immediately comes up, here is NER
18 Reg CR4161. It's the critical parameters for high level waste
19 repository, a Lawrence Livermore report, and this is Volume III
20 on salt. I assume Volume I was basalt and II was tuff.
21 Well, if these are the critical parameters as seen by
22 an NRC contractor, and, you know, it's very well laid out and
23 easy to read, I would want to know then how do these critical
24 parameters compare with what DOE has suggested are the key
25 parameters which are their issues hierarchy?

1 DR. LINEHAN: Well, there is a number of documents.
2 Researchers come up with these critical parameter documents.
3 We have issued over the past few years documents called The
4 Issue Oriented Site Technical Positions which for each one of
5 the potential sites goes into the issues in each one of the
6 technical areas.
7 There is also the comments we have raised on the
8 draft EAs and the final EAs, the environmental assessments.
9 The key indeed is how DOE pulls all of these issues together.
10 And the SCP is the vehicle. The purpose of the SCP was to pull
11 all the outstanding issues together so that you had one
12 document that guided your data collection, your issue
13 resolution. And we feel the methodology probably applied could
14 do that, the way they have framed the issues. All of these
15 things can, you know, fit in under that.
16 DR. MOELLER: Okay. Another item, on page 30 they
17 talk about the performance allocation, and I am not sure that I
18 am quoting here, but am I correct that NRC has urged DOE to
19 develop a performance allocation approach?
20 DR. LINEHAN: We had first proposed it, and we have
21 had a number of meetings with the department where they have
22 proposed -- proposed to us how they would implement the
23 performance allocation in the SCP, and we have reached
24 agreement on it.
25 DR. MOELLER: And the way that will work then you

1 would assign, or they would suggest that no more than so much
2 weight can be given to this given barrier?
3 DR. LINEHAN: Well, what they would do first of all
4 in site characterization, the first step really is to make sure
5 that you do whatever testing is needed to obtain a basic
6 understanding of the site, a basic understanding of the
7 hydrology and the geology.
8 Then, depending on what credit you want to place on a
9 particular barrier in your overall scheme of things, what
10 credit you want, you know, a certain barrier to provide in
11 terms of the EPA standards, you design your testing program so
12 that you will get the level of data, the amount of information
13 you would need to take that much credit for a particular
14 barrier.
15 It has -- it has the making of assumptions, you know,
16 on a very limited data base. Because of the limited data base,
17 the approach requires that you look at it very conservatively
18 so that if you add up the credit from the various barriers that
19 you would be proposing, you would be well in excess of whatever
20 would be required for either the performance objectives we have
21 on the EPA standards.
22 DR. MOELLER: Jack.
23 DR. PARRY: John, we have discussed this matter on
24 several occasions, and I believe on each of those occasions we
25 have asked, or it has been suggested that a numerical example

1 might be provided the subcommittee to assist them in
2 understanding the procedure that you are proposing.
3 Is there such an example available?
4 DR. MOELLER: He's over here to your right. Jack
5 Parry.
6 DR. LINEHAN: I can't recall exactly the time frame,
7 but we gave the subcommittee a briefing on performance
8 allocation.
9 DR. MOELLER: Yes.
10 DR. PERRY: It was within the past two or three
11 meetings, and went into an example, I believe it was the waste
12 package --
13 DR. MOELLER: Yes.
14 DR. PARRY: -- as to how this approach would be
15 implemented. To my recollection, there has never been a
16 numerical example that would explain how the data that's to be
17 developed, either during site characterization or during
18 materials characterization of waste package, that is, waste
19 package materials, how they would be fractionated and defined
20 and proposed by DOE.
21 I have not seen that, John.
22 DR. LINEHAN: Okay, we -- I'm not sure the example we
23 had -- the example we had did not call any -- we have talked
24 about this for a number of years, Jack.
25 DR. PARRY: That's right.

1 DR. LINEHAN: And we have always taken the position
2 that, you know, it's up to DOE to go through that exercise.
3 But it's not something we are forcing on to DOE. DOE has
4 agreed with the concept and have adopted it, and they are off
5 and developing something. And it's -- in any area, you know,
6 we are not -- we are not in a position where we have the
7 resources to go through and develop examples of, you know, be
8 it a test plant or whatever we have differed on.
9 DR. PARRY: That's right. Excuse me, let me go on.
10 I'll review the points on that, too. DOE initially
11 resisted that, this approach vehemently, and I know because I
12 was on the other side of the fence at that time. And I failed
13 at that time to see how it was possible to project the
14 performance of fractions or portions of an undesigned system
15 about which you had not full information. They didn't know
16 what the ground water was like and they didn't know what the
17 rock material that was going to be in contact with the engineer
18 barriers was like.
19 And they have acceded to what I perceived at that
20 time and I still perceive it as the staff's vigorous pressure
21 to set up this system.
22 Now the thing that I thought was good that we had in
23 a recent presentation was an explanation of, look, in the site
24 characterization plan the NRC staff would like to have
25 everything brought together into one section. That is, all the

1 credits tabulated or what your expectations -- what DOE's
2 expectations were going to be. And I think that makes sense.
3 But to try and project that you are going to get 43
4 percent of the EPA standard is going to be met by the waste
5 package or by the backfill material lacks credibility to me.
6 I'm sorry, and as you quite properly not, we have differed on
7 this respectfully and affectionately almost, but I just think,
8 you know, it doesn't hold water.
9 DR. MOELLER: Well, I tried in reading this report,
10 of course, to get a little better handle on it. And let me
11 read a couple sentences. It's the first paragraph on page 31
12 of the amendments, and I'm quoting.
13 "Each performance measure has a goal. The goal is
14 not a target that the performance measure must attain if the
15 repository is to perform properly, and therefore it is not a
16 goal in the sense that it has to be met."
17 Now the first one is each one has a goal. The second
18 sentence is that it does not have a goal. The third sentence,
19 "It is simply a guide for developing a testing program, a guide
20 that states the licensing strategy quantitatively and can be
21 changed or even discarded once the testing program has been
22 established." And then there are two or three more sentences
23 in the paragraph of the same nature.
24 Well, you know, I cannot understand any of that.
25 Each sentence discards the previous sentence, or you know,

1 flip-flops the previous sentence. So I flagged that. I need a
2 lot more understanding on it.
3 I thought in the missing plan there is -- the
4 amendments -- there is a lot of good information. I
5 particularly found the information on the projections, the
6 amount of spent fuel that are going to be produced, those were
7 very helpful, where burn ups almost double what they used to
8 be.
9 DR. STEINDLER: There is a I think a semi-annual
10 compendium that Oak Ridge turns out which I hope is in our
11 library someplace that will do the same thing.
12 DR. MARK: Dade, I would like to say that in those
13 sentences which you find it a little bit troublesome to
14 understand, one can only of course agree, and they bloody well
15 must be rewritten or rethought.
16 DR. MOELLER: Are there other -- you know, I have got
17 quite a few, but those were some of the main ones. Are there
18 other questions or comments on this?
19 Suffice it to say when you do -- when the NRC staff
20 does have a position and a set of comments, we would like to
21 talk about them, perhaps at our next meeting.
22 DR. LINEHAN: Okay, fine, we'd be glad to.
23 I would just like to end on the performance
24 allocation, you know, we did have a session on it, you know, as
25 Jack and I have agreed. If you want another session, if you

1 want to go into particular points, you know, we could consider
2 that at the next meeting.
3 DR. MOELLER: Okay. I think that would be helpful,
4 yes.
5 DR. SHEWMON: But nobody ever does examples until DOE
6 does it some day in the indefinite future; is that it?
7 DR. LINEHAN: We have done some examples, but they
8 are not -- not to the level of detail that Jack wants. You
9 know, we have done it for certain parts of the system. And the
10 type of thing Jack is after, DOE, as I understand it, has done,
11 we have seen demonstrated up until -- in the draft of the site
12 characterization plan, which is available right now in the DOE
13 public reading room downtown that our staff has looked at.
14 DR. PARRY: Well, let me continue and tell you what
15 Jack wants, and it's not very -- to put it in those terms. But
16 the point is, is that I question the fairness of the staff
17 putting requirements for pressing respective licensees to take
18 up a mode of design and development when they can't themselves,
19 that is, the NRC staff cannot themselves illustrate their
20 approach.
21 DR. LINEHAN: Jack, I don't -- I think the
22 question -- we are not laying out a whole performance approach.
23 We are not going through a whole example. I don't think it's
24 fair to say we can't do it.
25 You know, a number of the things we are doing we're

1 leaving it up to DOE to link.

2 DR. PARRY: I still think that if you want to have

3 them follow an approach and you are specifying an approach,

4 that you should be able to give them a clear example of it, and

5 we have discussed this on several occasions. I asked for it

6 when I was out in Columbus and to try and lay it out, and I

7 didn't get it there, and we're still not getting it here.

8 DR. MOELLER: All right, let's go on then with the

9 overview of the quarterly progress report, and, Wayne, you will

10 do that?

11 DR. WALKER: Yes.

12 THE COURT: Wayne Walker is our speaker.

13 DR. WALKER: This quarterly progress report, the

14 briefing I am going to give you is basically -- what we have

15 done here is just kind of packaged in one document that we are

16 going to produce quarterly, updates of activities that are what

17 we consider critical to the program, or interaction between DOE

18 and NRC. And this is not going to be necessarily something new

19 to you. I think we have given it to you in bits and pieces

20 before. But this is an attempt which was asked for by the

21 commission.

22 When Deak sent his transmittal letter of our

23 commission plan comments to Mr. Rouche in DOE, he asked that we

24 produce this report, and he did specify that we look at some of

25 these activities which we have brought up previously and our

1 comments on the project decision schedule in 1985.

2 And we just -- so basically it's a mechanism for the

3 commission, ACRS and others to really see what's going on in

4 the program in a kind of concise way.

5 The next page there, the outline, that just shows you

6 what I'm going to talk about.

7 The purpose and rationale for the quarterly reports

8 were to provide the commission with timely information about

9 the pre-licensing phase of the Department of Energy high/low

10 waste program. And the next page shows the different activities

11 which I just spoke about.

12 We consider that these activities are going to be

13 used to monitor the paper by key performance indicators to

14 judge how well DOE is implementing the NWPA program, and we u

15 these activities to really monitor the DOE's performance. And

16 I guess if you would look at it that way, it's a way that the

17 public, the commission, the ACRS can monitor our performance

18 also.

19 When you look at Enclosure 1, it lists the -- there

20 is two pages in Enclosure 1, and it lists the six activities

21 which we came up with in the project decision schedule. I

22 won't read them to you. You can read them there.

23 And then the next -- the first page lists the -- the

24 first page of Enclosure 1 lists the six activities which DOE

25 came back with in their January 1987 draft mission plan

1 amendment.

2 DR. MOELLER: I think, Wayne, you ought to go through

3 those.

4 DR. WALKER: Okay.

5 DR. MOELLER: Because you are on the first page now

6 of Enclosure 1.

7 DR. WALKER: Right.

8 DR. MOELLER: Okay. Let's go through them briefly.

9 DR. WALKER: And maybe just to understand the

10 chronological how this went. The first page here came from

11 DOE's submittal in the January 1987 draft plan memo which Dave

12 has just gone through some comments on.

13 The second page of that Enclosure 1 -- this is part

14 of the report which I wrote, but the six items there are what

15 we presented in the 1985 comments we gave to DOE on the project

16 decision schedule. So we're talking about two different

17 documents, but that's just the way the activities were

18 presented, and DOE agreed with us on these activities, that

19 they were critical to the program, to the -- they could be used

20 as performance indicators.

21 The first one on page 1 of Enclosure 1 is the

22 interactions with the Nuclear Regulatory Commission on

23 technical issues between us and DOE. This is basically our

24 consultations with DOE, between us and DOE, and at various

25 meetings that we had.

1 In the quarterly report I think I referenced the
2 exploratory shaft meeting which we had recently in Texas, the
3 DOE hydrology meeting. It's those type of activities that we
4 interact with DOE on.
5 The next one, development of the licensing support
6 system, I think you have all met with some of the consultants
7 and not had a briefing on it, but it has been demonstrated to
8 many of the ACRS fellows I know.
9 DR. MOELLER: That's a computer data bank.
10 DR. WALKER: Right. That should be operational. I
11 spoke with Avi Bender who has the lead in NMSS on that right
12 now, and he mentioned that DOE has gone out with a proposal on
13 the licensing support system, and it should be -- I think they
14 are reviewing the submittals that they received, and it should
15 be awarded towards the end of September or first of October,
16 and operational by 1990.
17 DR. MOELLER: Jack Parry.
18 DR. PARRY: I did want to mention that we -- frankly,
19 I brought this LSS system, which I think is really excellent,
20 to the attention of Stanley Schofer, who is our computer person
21 responsible for computer operations for the ACRS. He has also
22 seen the facility and is working with the staff and intends to,
23 if not participate in, attend the meetings on the licensing
24 action that is ongoing.
25 DR. ORTH: Negotiated rulemaking.

1 DR. PARRY Thank you. I'm sorry. I couldn't
2 remember the term.
3 And we do hope and expect that that system -- that we
4 will have a terminal here, and other terminals may eventually
5 be made available to members.
6 DR. WALKER: It can be accessed from even the PCs.
7 DR. MOELLER: Good.
8 DR. STEINDLER: Tell me how that system differs from
9 standard information retrieval system of the technical
10 literature.
11 DR. WALKER: I don't know if I can tell you. I'm not
12 an expert on it. I know that --
13 DR. MOELLER: Well, it's the number of documents in
14 it if nothing else.
15 DR. LINEHAN: I think it's the number of documents.
16 It's the ability to store and pull up figures and graphs with
17 very good resolution.
18 DR. PARRY: Dr. Steindler, if you like, I will
19 arrange that a briefing, not a verbal one, but briefing
20 material --
21 DR. STEINDLER: I think I know what it is. I'm just
22 trying to figure out why it -- that can't be very cheap. I
23 would guess that it's tremendously expensive.
24 DR. SHEWMON: One of the things it can do is to
25 actually pull back annotated originals. So in that sense they

1 can reproduce things down to a fine scale. They also wanted
2 have a common vehicle where anybody who wanted to submit a
3 document for the proceedings must submit it on an acceptable
4 format to them. So in a sense it's a data base unique to this
5 operation.
6 DR. STEINDLER: Let me tell you what troubles me
7 about it. I think it will tend to become a data base into
8 which U.S-generated information is thrown, totally disregarding
9 most of the rest of the world. And if that in fact turns out
10 to be the case, I think it could be an enormous booby trap when
11 you finally get to a hearing.
12 I think somebody needs to exercise a reasonably large
13 amount of vigilance in that frame of reference.
14 DR. LINEHAN: I think that's a good point. I note
15 DOE is supporting work overseas as I understand it, and is
16 coordinating with several of the European countries.
17 We also, while we are doing -- we have the staff
18 doing reviews of data studies being conducted by various
19 countries. And in fact we are in the process of trying to in
20 order to better facilitate communications is to set up an
21 international meeting of regulators in the high level waste
22 area. And the main purpose would be to set up points of
23 contact so each country understood the programs and the
24 regulations, and the others the testing programs, and it's to
25 share this information. But that data would go into the

1 system, all of it.

2 DR. PARKER: I think there is one big difference,

3 Marty. We are using that already, and that means that you can

4 have the right on site. You don't have to go to a central

5 computer. You can get all the disks right there, and you can

6 access it yourself immediately whenever you want it. And the

7 first disk is extraordinarily expensive, but then the copies

8 are cheap as hell.

9 DR. SHEWMON: Frank, you are giving the reporter some

10 problem with your tete-a-tete here.

11 DR. PARKER: Sorry.

12 DR. MOELLER: Any other comments on that?

13 Okay, go ahead to the next item.

14 DR. WALKER: The next item would be the

15 implementation of and interaction with NRC on a quality

16 assurance program. I think you are going to get a little more

17 insight into that in the next briefing. But that's just

18 basically to give coverage of how in the QA area DOE is

19 progressing as far as what we are requiring of them, and how we

20 provide updates of audits which we go out on and this type of

21 activities.

22 Implementation of issue-resolution strategy based on

23 the performance allocation process, I think we pretty much

24 talked about that already, but that's another item.

25 And then the next one would be states and tribal

1 interaction. That's just to make sure that DOE is providing
2 the states with information necessary, or at least access to
3 information and giving them an opportunity to go to meetings
4 and interact on the various issues with this program.
5 Number six would be -- this number six item was --
6 DR. STEINDLER: Excuse me. On that one, is it the
7 job of the NRC to police the extent to which DOE communicates
8 with the states and the tribes?
9 DR. LINEHAN: The NRC has a responsibility under the
10 act to -- as far as the NRC actions go -- to work with the
11 states and tribes and consult with them.
12 DOE has taken -- and DOE has the same responsibility
13 in the act. DOE has taken the responsibility for distributing
14 materials to the states and tribes, providing them access to
15 data, to reports, things of that nature.
16 The list you are looking at right here are proposals
17 by DOE that they are making to make sure that the states and
18 tribes are involved in the program so they know what's going
19 on. It's not up to the NRC to police DOE, but the NRC has a
20 responsibility under the act that we cannot enter into meetings
21 and discussions with DOE unless the states have the opportunity
22 to participate, and that will only come about if DOE does keep
23 them up to speed, does get information out to them. But it's
24 not the intent to police DOE.
25 DR. WALKER: The next item is a new item that

1 well, it wasn't one of the six that we had originally presented
2 in our comments on the PBS, and that's -- this is something DOE
3 came up with in the amendment, recent plan amendment.
4 It's implementation of a program of licensing topical
5 reports, and we are in the process of -- we have had at least
6 one manager's meeting on this, and I don't believe there has
7 been a decision made on where we really stand on it. But I
8 think the licensing topical reports were used fairly
9 extensively in a reactor licensing process, and DOE is taking a
10 look at it, we're taking a look at it, and I don't think there
11 has been a decision made on how they are going to be used
12 exactly.
13 The potential is there to -- the possibility would be
14 there to use it.
15 DR. MOELLER: Well, what comes up on that though is
16 if DOE is not yet an applicant, how can you license one of
17 their topical reports?
18 DR. LINEHAN: What we would be doing is reviewing the
19 topical reports. It wouldn't be any licensing action.
20 DR. MOELLER: It would be informal.
21 DR. LINEHAN: It would be informal.
22 DR. MOELLER: Okay.
23 DR. LINEHAN: We have been -- if you remember some of
24 the briefings we have given over the past two to three years,
25 we have been trying to come up with various mechanisms whereby

1 we could work with DOE and the other parties in identifying
2 issues, laying out acceptable methodologies for resolving
3 issues.
4 We had always proposed we were going to use our
5 generic technical positions. Some of the issues we would take
6 to rulemaking possibly. We had been pushing DOE to come up
7 with some proposals on their own, what actions they would be
8 taking. And just recently, I believe it was in June or July,
9 they came in with a letter to us proposing the use of these
10 topical reports.
11 They want to use the topical report mechanism. They
12 have, as I understand it, they have not started working on the
13 topical reports, and they probably would not start coming in
14 for at least two years.
15 DR. STEINDLER: Has the staff agreed to this general
16 scheme?
17 DR. LINEHAN: We have not agreed on the topical
18 report mechanism.
19 DR. STEINDLER: Has the staff agreed to --
20 DR. LINEHAN: We haven't agreed and what we want to
21 do is sit down and on the reactor side of the house and find
22 out how they use the topical reports and what the benefits were
23 to them, if, indeed, there were benefits.
24 DR. STEINDLER: Do you intend to communicate a set of
25 criteria that will define the quality and content expected in

1 these topical reports?

2 DR. LINEHAN: We have just started to take a look at

3 it, but one of the things we -- in some of the brief sessions

4 we have had to date that we have identified is that we would

5 have the layouts of basic criteria to make sure that what we

6 were getting was meaningful so that we weren't just in a

7 position of reviewing whatever they came in with.

8 DR. STEINDLER: It strikes me, Mr. Chairman, that

9 that is an issue which, if properly used, is (1) beneficial,

10 and (2) the quality of those reports needs to be looked at very

11 carefully.

12 DR. MOELLER: I agree.

13 DR. WALKER: For the most part, you could see that

14 the issues that -- the actions or activities that DOE came up

15 with in the '87 amendment and the ones that we came up with on

16 our PBS comments correlated. So, those are going to be the

17 items which I am going to use to track DOE's performance in the

18 quarterly reports.

19 DR. LINEHAN: Excuse me. This is very typical of the

20 thing you pointed out when you were looking at the mission plan

21 work. DOE said they were going to do it.

22 Typically, as on the second page here that Wayne just

23 pointed out, we will lay out a number of actions or activities

24 that we feel need to be conducted. And what they will do is,

25 very often, essentially adopt them, but in a slightly different

1 form or format and then they are DOE proposals..

2 DR. WALKER: But I will try -- I am going to include

3 those in this report. And, basically, NRC and DOE are both

4 agreed that these activities are necessary for a successful

5 completion of the licensing review that we are required to do

6 in a three-year time frame.

7 DR. MOELLER: Would you discuss No. 6? The adoption

8 of conservatism? Because we read that at numerous times in the

9 quarterly report and I need to know more about it.

10 DR. WALKER: Okay. On the adoption or concerns --

11 that is just -- basically, it's giving us the assurance that

12 whatever approach that DOE is going to take that we can assure

13 that it is going to have enough conservatism in it that they

14 are going to be able to -- they have to prove that there is

15 enough conservatism in it that down the road they are going to

16 be able to license the repository, that we are going to be able

17 to.

18 I guess an example would be where -- that in their

19 designs, that they make sure that they take a conservative

20 enough approach to their designs that down the road, that they

21 are able to -- that we feel there is enough -- that they are

22 taking a conservative enough approach in their design that they

23 are going to be able to do when they factor into the

24 performance allocation and those type things, that they are

25 going to be able to prove -- I guess it is that early on that

1 they take a conservative enough approach that they are not
2 missing something in their designs. In other words, to make
3 sure that they are conservative in their designs now as opposed
4 to being maybe not considering all the uncertainties that may
5 be involved, maybe just picking some level that is not as
6 conservative as another level might be and then --
7 DR. LINEHAN: I think the key is the uncertainty that
8 Wayne has just hit on. If you look at our comments on the
9 environmental assessments, I think they are the best example
10 where there is a very limited data base right now. And we are
11 telling DOE that:
12 "As you design your testing programs for site
13 characterization, based on that limited data base, be aware
14 there is a lot of uncertainty and there are a lot of
15 alternative interpretations that could be given to that limited
16 data base. And make sure that whatever your testing program
17 is, if it is the hydraulic testing programs such as in the
18 Hanford site that we discussed at our last meeting, that that
19 is broad enough to envelop all -- the majority of the possible
20 situations you may find out there.
21 "Don't, based on your limited base, say: Hey, this
22 is what the hydrology looks like and I'm going to design a
23 testing program based on that particular conceptual model of
24 hydrology. Recognize there is a heck of a lot of uncertainty
25 right now."

1 And the whole purpose of site characterization is to
2 reduce this uncertainty.
3 DR. MOELLER: I guess my only -- one of my questions
4 would be: How do you know for sure what is conservative?
5 Because, sometimes, taking a conservative position on one thing
6 can place more demands on something else. In fact, sometimes,
7 a smaller or larger number may give you the reverse of what you
8 think.
9 DR. LINEHAN: I think the way we are looking at it,
10 though, just as they go in and conduct the testing programs.
11 You know, the sense that we're pushing it is that: Just make
12 sure that the program is broad enough to test the system that
13 is out there. Don't make a lot of assumptions that are very
14 optimistic right now about the ability of the system to do this
15 or do that. You are going to have to be able to prove it with
16 your testing program.
17 DR. STEINDLER: I don't sense that the NRC has a
18 clear idea of what they mean by adoption of conservatism. If
19 you are telling the Department of Energy that their technical
20 programs should identify the uncertainties and limits of error
21 in their data, if that is what you want to tell them, why not
22 say so in fairly clear English. You are going to get it anyway
23 because I think any reasonable amount of technical work
24 involves identification of the limits of error.
25 But, as you have it here, or at least as I thought I

1 was listening to it, I must say I couldn't figure out just
2 exactly what it is that you really want the Department to do.
3 DR. LINEHAN: If I could just try it once more, maybe
4 I could be a little clearer. What we found when we reviewed
5 the environmental assessments that was with a very limited
6 amount of data about a site, the DOE made conclusions about the
7 waste isolation capabilities of the site that we felt were
8 optimistic. That based on that limited data base, you could
9 come up with a number of different scenarios. In a number of
10 cases, they chose the most optimistic one.
11 The concern was that they would base their site
12 characterization program just on that most optimistic -- the
13 more optimistic range of scenarios, that they would presume
14 that they had a certain situation out there and, you know,
15 generally, it was more favorable towards waste isolation
16 capabilities.
17 What we were concerned about was that if they took
18 that approach they would go out there and do testing that would
19 ultimately prove what the situation was at the site. That is
20 that the testing program wouldn't be developed in a manner
21 where they could really test the site and get a true knowledge
22 of the site. It would be more geared towards these more
23 optimistic type of additions. They would make presumptions
24 that they already existed out there, you know, to an extent.
25 And what we are saying is that there is very limited

1 data on any of these sites really, now. Even though they have
2 been out at Nevada and Hanford for a number of years. And you
3 just can't say that this is the situation, that there is a
4 basis for not doing this type of testing or that type of
5 testing. And it is in that sense that we are saying: Be
6 conservative as you approach this. Be conservative in the
7 sense that you just don't pick the most optimistic scenario you
8 can come up with. Recognize it's a range of scenarios out
9 there, that whatever test program you develop, we say be
10 conservative so that it envelops all of the possible situations
11 you have out there.
12 DR. MOELLER: One of the -- and we will get into it
13 later, one of the key items that came out of our discussions
14 with the DOE people in Las Vegas was that on certain what could
15 be very key items, the message from the NRC is not clear. They
16 do not understand truly what you want. I think this could be a
17 good example and that I agree with Dr. Steindler that maybe the
18 title needs changing and then I need a page of written text
19 that really explains this to me, because that is why I brought
20 it up. I've read your quarterly report and I've read what else
21 I could and I still, it is not clear in my mind. So, if it is
22 not clear to us, it may not be clear to DOE.
23 DR. ORTH: A philosophical comment: I have taken
24 some of the discussion on conservatism to preclude DOE from
25 doing a lot of testing that it probably should have gone ahead

1 and done in the sense that they have been told that, "If you go
2 ahead and dig that hole, it may compromise something in the
3 repository. So, be conservative." So, the fact that nothing
4 has been done much in three years as was just alluded to, I
5 think is partially because of mixed signals on: What do you
6 mean by conservatism.
7 DR. MOELLER: Okay. Let's go ahead.
8 DR. WALKER: On the chart that has the contents of
9 quarterly reports, each quarterly report is going to contain
10 current status of the seven items which I have alluded to. And
11 then we are going to have each report -- I don't know how
12 familiar you are with them, but it will contain a summary of
13 the NWPA activities, just as an enclosure. And these NWPA
14 activities, nuclear waste policy activities are something that
15 we called an 18-wheeler. Some people know it as that. It is
16 basically a document that contains about 18 pages that has each
17 provision of the Nuclear Waste Policy Act and then it lists
18 what date that provision was supposed to be accomplished by,
19 the current schedule for it to be accomplished, and then the
20 NRC role. And this is just a document that we're using
21 internally to see how we stack up against what's required by
22 the Nuclear Waste Policy Act.
23 And then, finally, the report will contain any
24 additional significant activities as they occur in the three
25 month period that we will be reporting about.

1 DR. MOELLER: Okay. Let me offer some comments on
2 the first quarterly report. To begin with good: The enclosure
3 1 to the quarterly report, which we had seen previously, is one
4 of the best things I have seen. You go through each item and
5 where it stands and so forth. That is this tabulation which
6 is, as I say, is excellent and it is a good way in a brief
7 manner to bring people up to date on what's going on.
8 Where I had problems with the quarterly report were
9 as follows: First of all, I didn't find a good executive
10 summary at the beginning of the quarterly report. Essentially,
11 all other -- start and in about two pages they tell you what
12 this thing is all about. And then they give you the complete
13 report behind it. Well, that is not the procedure you have
14 followed here and you do take up these seven items. But I am
15 just giving you one person's opinion. I wanted a good snappy
16 executive summary. Make it three pages, if you want, but I
17 wanted that at the beginning. And I didn't find it. And I
18 really, therefore, when I finished reading it, I was not sure
19 of what all I had read.
20 Secondly, and this reveals, of course, a complete
21 bias on my part, but here is a quarterly report of all the
22 wonderful things or, you know, the progress that has been made
23 over the past quarter and there is no listing of any ACRS
24 meetings, no listing of any letters that ACRS has written on
25 this subject, no such letters are appended to the back of the

1 report. I am not saying we are the only people, the only show
2 in town, but to read a complete report and don't even see the
3 word, "ACRS" in it, struck me as unusual. And I am sensitive
4 to this for the following reason.
5 When we were in Nevada, we said -- they talked about
6 quality assurance. DOE did. And, so, we said to them: "Well,
7 we are sure that this is an important issue. It is one that
8 the ACRS has been involved with. In fact, we wrote a report on
9 it in May or April, whenever it was and sent it over. Sent it
10 to the Chairman, to Chairman Zech."
11 We said: "How helpful was our letter to you DOE
12 people?"
13 They said: "What letter? We have never seen it."
14 So, we said: "Well, fortunately, we have the NRC on-
15 site representative here."
16 "How helpful, Paul Prestolt, was our wonderful letter
17 to you?"
18 And he said, "What letter? We don't see your
19 letters. I'm not familiar with anything the ACRS is doing."
20 So, since they are not getting them through normal
21 channels, this might be one way to make sure that they receive
22 them.
23 DR. STEINDLER: Do you think that these quarterly
24 reports are going to be distributed broadly?
25 DR. MOELLER: Well, that is in my message, too. I

1 certainly hope so.

2 DR. LINEHAN: Well, I think the point you're making

3 about getting these things distributed, you know, there is no

4 question you are correct. This quarterly report, though, is

5 something that Shewmon requested. And it isn't a quarterly

6 report of the program. It is a quarterly report on specific

7 items he asked us to track in a quarterly report. That is why

8 it is in this format. It doesn't even touch on the majority of

9 accomplishments in the program. You know: what guidance we

10 may have issued, what meetings we may have held, what

11 agreements we may have come to, discussions we have had with

12 the ACRS, briefings we have had with other groups. It doesn't

13 go into anything but the specific items that the Chairman

14 requested that we keep him informed of.

15 The reason for coming up with something like this --

16 I'm not saying we don't have to revisit the format somewhat --

17 was to come down with very bare-boned type of thing. And we

18 talked before about the items we were tracking being

19 performance indicators. Coming up with something like that

20 that the commission and their staff could track or monitor to

21 get an overall sense of how the program was going.

22 There are other documents, you know, we have that

23 list the other things that we have accomplished in the program.

24 DR. STEINDLER: Well, what are those other documents?

25 DR. LINEHAN: There is a -- there is the high-level,

1 we call it a high-level waste products list. It's more than
2 products. It really lists the different activities we have,
3 what meetings we have had with DOE, what guidance documents we
4 have produced, or we are in the process of producing. There is
5 weekly information reports that we send down through the EDO, I
6 believe, that go to the commission. They do make their way
7 downtown, that list meetings we might have with you folks, with
8 the ACRS, with the Department of Energy, with states or tribes,
9 and what the significance of the meetings are. You know, any
10 significant conclusions, agreements we have come to.
11 DR. MOELLER: Well, perhaps --
12 DR. LINEHAN: Maybe we do need something that pulls
13 all this together, but the intent here, it wasn't to exclude
14 the ACRS or anyone else. It was just to respond to what the
15 Chairman and his staff wanted.
16 DR. MOELLER: Okay. And you do say that the focus of
17 this report is on the current status of the seven action items.
18 So, you know, you have clearly said that. But, to me, it was
19 the first quarterly progress report. I was looking for a lot
20 more and, in fact, I had flagged your: "Are there other items
21 that should be tracked?"
22 I would say right on the front: "There are many
23 other items that could be tracked, but this is all the Chairman
24 wanted." And maybe you have said that.
25 You point out on page 5 that there had been no formal

1 technical meetings. "There were no formal technical meetings
2 between the NRC staff and DOE's Nevada Nuclear Waste Storage
3 Investigation Project." I guess during this quarter.
4 I wondered. And it says in here, like, "The
5 information from BWIP is limited and we are having trouble
6 keeping up with what they are doing." And that came up
7 yesterday. And I guess I simply don't understand, still, if
8 you are to license that facility why you are constantly -- and
9 you have an on-site representative, you constantly, though,
10 complain about, you know, getting the information. And,
11 apparently, no one hears you. You know. I would have made
12 that right at the front here of the quarterly progress report.
13 I would have said: "In spite of our urgings and our
14 letters to you, Mr. Chairman, and to many other people, we are
15 still hampered by lack of information."
16 That is one of the most crucial messages that comes
17 out.
18 But, question: When we were -- it's on, again,
19 something -- oh, yes. Here you say, at the end of the first
20 paragraph on page 5: "In addition, these interactions have
21 been supplemented by periodically sending NRC Headquarters
22 staff to the DOE project officers offices to work with the NRC
23 on-site reps."
24 Well, the on-site rep in Nevada says that he is
25 hampered by the lack of travel funds at headquarters to send

1 people out like he needs them.

2 I would have cited that. You make it sound like --

3 DR. LINEHAN: Well, I don't think that is necessarily

4 the feeling at Headquarters. So, I agree that there are

5 restraints because of travel. And I think the travel budget we

6 do have does allow us to send people out a reasonable number of

7 times.

8 I, indeed, would like to have people out there more

9 frequently, but, you know, there is a limit to the amount of

10 money we have. There are some staff on the Nevada team, I

11 don't have them sitting here for this purpose, but with us

12 today for presentations or to answer questions later on, are

13 Keith McConnell and Shelly Abrams, who just over the past six

14 months I think have both been out to the Nevada site several

15 times.

16 We do not have the luxury whenever, you know, an

17 important DOE meeting comes up, of necessarily having people go

18 out. But, you know, we have things come up sometimes once or

19 twice a month and we have just got to be a little judicious in

20 how we make decisions who goes out and what we can afford.

21 DR. PARRY: Dr. Moeller.

22 DR. MOELLER: Yes.

23 DR. PARRY: John, not to belabor it or anything, but

24 I have had personal comments with your associates about the

25 difficulty on travel plans. It is not -- I really don't

1 believe that it is a specific thing just for Nevada. It is a
2 general comment that has been made. And I make it only
3 constructively.
4 DR. LINEHAN: It is, I think, in general, we could
5 make use of some more funds, but I think what you are hearing
6 is you are hearing individual staff members. And their input
7 is very important. But there has got to be a management
8 decision made as to what travel is necessary.
9 We just -- I went through an exercise with Mike Bell,
10 who is our Deputy Division Director, and Ron Ballard, who is
11 the Chief of the Technical Branch, where each quarter we sit
12 down and look at proposed travel.
13 For the last quarter of '87, the travel that the
14 three of us thought was reasonable fell within the dollars we
15 had. The travel that was necessary fell within the dollars.
16 Now, I am not going to say that there aren't trips that --
17 there are trips that will come up that we might want to send
18 people on, but I think, in general, using this quarter as an
19 example, there is adequate money there.
20 What we see is, on the part of the staff, I think
21 individual staff members -- and if I was in their shoes, I
22 would want to do the same -- want to get out in the field more
23 frequently. And I think what we are doing does allow us to
24 keep up with what is going on at the DOE projects and have a
25 good handle on the sites.

1 DR. MOELLER: Okay. Well, that is good to hear. We
2 realize there are differing points of view.
3 On page 8, you talk about: "Rulemaking will be
4 necessary to implement the licensing support system." Could
5 you tell us -- it says, 10C part 2 has to be changed. Could you
6 explain that to us?
7 DR. WALKER: That is the negotiated rulemaking.
8 That's during the process of authority.
9 DR. MOELLER: Why is it necessary?
10 DR. WALKER: So that the format, the information --
11 as I understand it, so that the format or the way the
12 information is going to be placed into the system is acceptable
13 to everyone right now before we get somewhere down the road
14 into licensing and someone says -- in other words, it's going
15 to be a negotiated rulemaking, I believe, between us and DOE
16 and I think the states and tribes.
17 DR. LINEHAN: Yes. It is between all parties in the
18 program. I think, first of all, if -- the purposes of the
19 negotiated rulemaking is to make it clear, get it in the rule,
20 that all of the parties have to submit information -- I'm not
21 sure if it as it is developed or within a reasonable time, get
22 it on the system so everyone has access to it. It is not going
23 to allow people to hold on to stuff until the time of hearing.
24 It is going to require that it be submitted in a certain type
25 of format so that it can be readily put on the system and

1 everyone will have access to it. And the ultimate goal is that
2 we won't go through this prolonged period of discovery, that
3 all of the documents will have been readily available to
4 everyone.
5 DR. MOELLER: All right. That is helpful.
6 DR. WALKER: Chip Cameron will be here later this
7 afternoon. He is working directly on that.
8 DR. MOELLER: On page 9, I had a question. And it
9 relates to QA and let me see if I can remember it. I wondered
10 how you can issue or how DOE can issue a site characterization
11 plan without having collected data that have been QA'd. You
12 say in the -- this is your item 3. You say: "DOE is committed
13 to having a fully qualified QA program in place when the SCPs
14 are issued."
15 Now, does that mean that the data in the SCP need not
16 have been QA'd because they only have the plan in operation at
17 the time they issue the SCP.
18 DR. LINEHAN: What we are facing in reality is that
19 data has been collected at the -- at least at two of the sites
20 for a number of years. And there were varying degrees of QA
21 that governed the collection of that data.
22 What we are saying is the site characterization plan
23 is the document that lays out -- it is sort of the start point
24 for the official testing of the site. We are saying that any
25 data that is collected, once you issue that site

1 characterization plan, should be collected under an adequate QA
2 program so that there is no question that it is suitable for
3 licensing.
4 DR. MOELLER: Okay. So, I was misinterpreting. In
5 other words, a site characterization plan, of course, tells
6 what data are necessary. And, therefore, from that point on is
7 a minimum you must have in place a QA program, acceptable one.
8 DR. LINEHAN: That is correct. And the data that has
9 been collected up until this point in time, if DOE wants to use
10 that in the licensing proceeding, they will somehow have to
11 qualify it. And I think at the last session we went over the
12 generic technical position we have of the qualification of
13 existing data which we -- a way of going about doing that.
14 DR. STEINDLER: Is it the intention of the staff to
15 implement on its own its QA plan in most of its aspects so that
16 the review of the DOE information, data, et cetera, is going to
17 be done in a fairly disciplined sort of way?
18 DR. LINEHAN: We, within the Division of High Level
19 Waste, we have an internal QA plan.
20 DR. STEINDLER: Is it comparable to what is expected
21 from the Department on QA Level 1?
22 DR. LINEHAN: It is -- I don't think it -- no. It is
23 quite different in the approach it takes.
24 DR. STEINDLER: In our discussion yesterday
25 concerning certain aspects of the research activity and the

1 potential absence of QA governance, at least in those areas
2 where we had looked and raised the issue as to how it was that
3 the NRC is going to be able to use their own data which came
4 about in what some might believe a fairly undisciplined way, to
5 evaluate the Department's information, which presumably has
6 been done at some level -- presumably Level 1 -- it is in that
7 context that the question that I'm asking deals with how the
8 staff intends to implement a QA program and at what level in
9 order to be able to evaluate the corresponding information from
10 the Department.
11 DR. LINEHAN: I can't go into all the details because
12 I just don't have them available. But the internal QA plan we
13 have is geared towards the main type of activity we do, which
14 is the reviews of DOE documents, the development of guidance.
15 You know, not the actual generation of data: working in the
16 field, working in the laboratory. This is the Division's plan
17 I'm talking about. And it is something we could brief you on.
18 We would gladly brief you on. It is laid out in the EA review
19 plan that we issued and went over with the subcommittee and it
20 is something that is also going to be contained in the SCP
21 review plan that we will be talking about later on today.
22 The question you raise about generation of data,
23 though, one of the things we are looking at internally, at
24 least for our technical assistance contracts is if someone is
25 out there doing laboratory testing, actually generating data,

1 you know, what type of QA program do they need? You raised
2 these questions at the last meeting we had and we are looking
3 into it. I don't have a definite answer for you right now, but
4 we recognize that we do have to consider that.
5 I really don't know in the research area what is
6 going on. But IQA is one area, if you would like, you know, we
7 could brief you on the program we have and some of the
8 essential elements of it.
9 DR. MOELLER: Okay. I realize it is not an NRC
T3a 10 responsibility, but it came up in Nevada and several of us were
11 -- carried away lasting memories of the discussion. And that
12 relates -- it is covered on pages 11 and 12 where you talk
13 about state contentions and the concept through which or the
14 program through which DOE provides funds to the states and the
15 Indian tribes and so forth so that they independently evaluate
16 the repository.
17 If I could get a message to DOE on this, it would be
18 that they should consider doing this on a matching fund basis.
19 Like, if I am a state and want to build a sewage treatment
20 plant, the Federal Government helps, but they don't pay for all
21 of it. If I am at a university and go to the National Science
22 Foundation for funding for some educational program, it is
23 generally on a matching fund basis. It may be 90:10, meaning
24 90 from the Feds and 10 from us or some aspects of it are 1:1.
25 I would think if each of these states were told: We

1 will give you a million dollars to pursue your own independent
2 evaluation if the state puts up a million in matching funds so
3 that you have a total of two million, then there would be some
4 controls on it. And I would highly urge that somebody consider
5 that kind of an approach.
6 Finally, in terms of the report, getting back to an
7 earlier point, I think like on the first page, it would help me
8 where you have the subject in caps: "FIRST QUARTERLY REPORT,"
9 et cetera, I would put an asterisk at the end of that and have
10 a footnote. "This covers only the topics that the Chairman --
11 or this is a special abridged report specifically designed for
12 the NRC Chairman or for the NRC Commissioners. Other
13 information on what work is underway may be found in," and lis
14 a couple other things. That would help me a lot.
15 Do we have other comments or questions on this topic?
16 DR. ORTH: Maybe one.
17 DR. MOELLER: Yes, sir.
18 DR. ORTH: We were told that this was a report only
19 on specific items that the Chairman asked for.
20 DR. MOELLER: Right.
21 DR. ORTH: I presume that there are continuing
22 discussions, though, to bring more items to their attention.
23 They may not always pick out the most important items.
24 DR. LINEHAN: Well, that is done in these weekly
25 reports that I mentioned to you where we raise to the EDO's

1 attention and to the Commissioner -- the Chairman's attention
2 what we think are the important items in the program.
3 DR. MOELLER: And they do, to repeat, they have a
4 weekly report or the NRC has a report for the week ending on
5 such-and-such a date. And it has, you know, 15 different
6 sections or division reports, one of which is High Level Waste
7 Management. And it gives you in about one page or two pages
8 the highlights of everything that has occurred during that
9 week. And it is very, very good.
10 DR. LINEHAN: And there is also fairly open lines of
11 communication with the Commissioners' staff on a number of
12 items.
13 DR. PARKER: It may presumptuous to tell the
14 Commissioners what to do, but one thing that struck me while we
15 were out that day, apparently, none of the Commissioners have
16 ever been to any of the three sites. And, since this is a hot
17 political topic, seeing the sites really makes a difference in
18 understanding what is going on there. Getting some of them, at
19 least one of them out to Nevada or BWIP it would seem to me
20 would be extraordinarily useful.
21 DR. LINEHAN: That, indeed, is going to happen I
22 believe in the fall.
23 DR. MOELLER: And I checked, too. I was impressed
24 with that comment. And Chairman Zech has visited BWIP.
25 DR. LINEHAN: Also, Commissioner Bernthal I believe

1 has been to BWIP.

2 DR. MOELLER: Okay. Any other comments?

3 DR. STEINDLER: When we were out in Nevada, the site

4 rep out there pointed out that he fires in monthly, I think

5 monthly reports to you folks.

6 DR. LINEHAN: Yes.

7 DR. STEINDLER: It would be, I think, useful to us if

8 we could at least view those if not routinely, which would be

9 desireable, periodically, at least, to get a feeling for what

10 kind of a situation he sees out there. I mean we are inundated

11 to a significant extent by DOE paper from NNWSI -- not clearly,

12 not so much from BWIP, but that's only one viewpoint. And the

13 other viewpoint that is from his viewpoint, which I think is

14 quite valuable and might be worthwhile doing: is there some

15 mechanism that you folks could implement that would get Dade a

16 copy or Kirk?

17 DR. LINEHAN: Yes, sure. That would be no problem.

18 Sometimes, the package that comes in from Prestolt are cooked

19 up at the Hampton site and it may be six inches or a foot

20 thick, but what's on top is anywhere from a three to

21 six-page memorandum of their own observations and that is what

22 we will get down to you. If you would like the enclosures,

23 then we can get those if you need them.

24 DR. MOELLER: That would be very helpful. I am glad

25 you brought that up. Any other comments on this topic?

1 Okay. Let's move on then I guess to the Los Alamos
2 QA Audit. Mr. Kennedy.
3 MR. KENNEDY: Good morning.
4 This morning, I would like to talk about the first
5 NRC staff audit of the DOE High Level Waste Repository Quality
6 Assurance Program. As you know, DOE is about to embark on the
7 site characterization phase or the extensive data collection
8 part of it, whereby they will be collecting the majority of the
9 data that will be used in the licensing application for one of
10 the sites.
11 Now, that data needs to be good data. It needs to be
12 valid data. It needs to be collected in accordance with the
13 quality assurance requirements in subpart G of Part 60. And
14 before they go off and collect it, DOE is committed to having a
15 nuclear quality assurance program in place in accordance with
16 the Commission's requirements. They have also asked the NRC
17 staff to audit their program before they begin, to confirm the
18 fact that the program is adequate and suitable for licensing
19 seven years from now. And that is not a requirement that they
20 do that, but it makes good sense because they don't want the
21 NRC coming in five years from now or seven years from and
22 finding their program inadequate, jeopardizing the use of all
23 that data for licensing.
24 Now, for the last several years, DOE has been putting
25 into place these programs and all the various organizations

1 working on the High Level Waste Repository Program. December
2 16th of last year, they identified the first areas, first
3 organizations that they felt had qualified QA programs; that is
4 QA programs which met our requirements. And we selected the
5 Los Alamos National Laboratory as the first one to audit,
6 specifically, the mineralogy/petrology work that is being done
7 out there in support of the Nevada Nuclear Waste Storage
8 Investigations.
9 First, a little bit on Los Alamos. They are one of
10 nine participating organizations at the Nevada site which also
11 includes some of the national labs such as Sandia and Lawrence
12 Livermore. It also includes the U.S./G.S and several private
13 contractors like Ricco and -- I can't remember the others
14 offhand, but several private contractors, too.
15 They are responsible for nuclide migration studies,
16 geochemistry, mineralogy and petrology. They are also the lead
17 technical organization for the exploratory shaft.
18 Now, we audited the mineralogy/petrology program
19 which provides descriptions of rock and fracture fill petrology
20 and mineralogy along transport pathways. And it consists
21 mostly of laboratory investigations involving such techniques
22 as x-ray diffraction, electron micro probe, scanning electron
23 microscopy, et cetera.
24 One of the reasons we chose it or several of the
25 reasons were, first, they are working on several of the key

1 site issues out at Nevada. In particular, the origin of the
2 calcite deposits in the veins; that is whether it is surface
3 water or subsurface water indicating volcanic activity.
4 Also, it is an R&D environment. It is a laboratory
5 organization, highly qualified scientists and it was a good
6 chance to go out and audit the implementation of how our so-
7 called hardware-oriented QA requirements in subpart G which
8 were taken from the reactor program were actually being
9 implemented.
10 DR. STEINDLER: Sir, when you do this, does the QA
11 program constrain itself to the verification that the samples
12 come from where they are or do you get into detailed how did
13 they calibrate their instrument, where did they go to school,
14 what do they have as a basis for feeling they know how to use
15 their instruments?
16 MR. KENNEDY: We did both. And I would like to get
17 into that. That is a very important issue, you know. Did we
18 just go out there and check the paper, as it were, and make
19 sure that they had records of where the samples came from or
20 did we also go out and look at more details of the technical
21 work?
22 DR. STEINDLER: I am rather distressed to hear you
23 reply that way because it seems to me at some point the
24 technical people doing the work end up doing nothing but
25 filling out forms instead of getting any work done.

1 MR. KENNEDY: That's a concern to me. And we did go
2 out and we did take technical staff with us, which I would like
3 to talk about and look into the technical work, the actual
4 quality of the technical work that was being done out there.
5 We did that, in fact, in a fair degree, which I would like to
6 talk a little bit more about later on.
7 I will say, you know, sitting here, there are
8 documentation requirements for licensing and it is not up to me
9 to interpret the regulations the way I see fit. There are
10 certain needs of licensing. There are certain requirements in
11 Part 2 and Part 60. And as onus as it is, you know, that is
12 just the way it is with the licensing process.
13 DR. SHEWMON: Well, one of the things that has been
14 concern to the committee is the relationship, if one exists at
15 all, between the QA program and the quality of the product.
16 MR. KENNEDY: Right. I've seen your letters.
17 DR. SHEWMON: Just a different sort of question is
18 whether the QA program ends up being the be all and end all if
19 you can't do anything else. That is another way to kill the
20 program.
21 MR. KENNEDY: That's right. You can spend all of
22 your time taking care of the documentation needs -- and this,
23 we saw -- we didn't see it out at Los Alamos because they were
24 doing quite a bit of technical work, but that was a real
25 concern out there was that the QA program would just take over

1 all of their time and they would be spending more time on
2 documentation than on doing real work. And that is a real
3 issue. That is not the way it should be. The program is not
4 going to move ahead that way.
5 DR. SHEWMON: But that is the way it is because that
6 is the way the policy says it should be or are you saying there
7 is some light at the end of the tunnel?
8 MR. KENNEDY: Well, hopefully, there is some light at
9 the end of the tunnel. I am saying there is a framework that
10 the Commission has for licensing which requires a certain
11 amount of documentation for adjudicatory process, to provide
12 evidence to the staff and outsiders like states and tribes so
13 that they can look at the work that was done and have
14 confidence in it.
15 At the same time, there is a certain amount of
16 flexibility that we have in interpreting what the requirements
17 are. And I feel the staff can go overboard on proper
18 interpretations of what's in the regulations. I think that is
19 what we need to do better is work with the legal people more
20 closely, understand licensing better, and work with the
21 scientists out there, say, at Los Alamos, find out what is
22 really needed and interpret the regulations properly so that
23 good quality technical work can be done, while at the same
24 time, sufficient documentation is available for licensing. And
25 that is not easy.

1 DR. SHEWMON: I'll grant that.

2 MR. KENNEDY: You can go too far the other direction
3 and eliminate the documentation or not pay it enough attention.
4 You might wind up with something a lot sooner. You can go too
5 far in the other direction and destroy people's morale and just
6 bog the program down if you get too involved in documentation
7 or needless documentation. Let's put it that way.

8 And that is kind of where I am. In particular, I
9 would like to get more into that because at Los Alamos, we now
10 have a chance -- we have been out to a site. We have worked
11 with the technical people. We understand and they understand
12 better what the issues are. I think it is a good opportunity
13 to resolve a lot of the issues of what QA is appropriate for
14 these laboratory-type investigations, this R&D type of work.

15 What is enough to get through licensing? What is
16 enough to provide evidence to the states and tribes, licensing
17 boards and NRC staff? So, I hear you.

18 Okay. A couple of objectives: There are three
19 objectives that we had for the audit. First, clearly was just
20 to independently evaluate an area that DOE believed to be
21 qualified by looking at implementation of both the QA program
22 and the ability of the Los Alamos investigators to perform
23 quality technical work. It is kind of a conventional purpose
24 of an audit.

25 There were two other purposes and objectives for the

1 audit, though. First was to give DOE a good bench mark for
2 what our expectations were and what the expectations more
3 generally of the licensing process are. As you know, DOE has
4 never had a major facility licensed by the NRC. Los Alamos, in
5 particular, does not have any staff to have been through a
6 nuclear licensing or testified as expert witnesses in a
7 licensing hearing, for example. So, it was a chance for them
8 to get a calibration, as it were, of what our expectations are.
9 And then, finally, the Division of Waste Management
10 or High Level Waste Management, now, has never, as an
11 organization, conducted audits before. We have been in
12 existence several years, but this is the first time that we
13 have actually gone out and done a formal audit like NRR does or
14 INE used to do on their inspections. So, it was one of the
15 purposes: To build a foundation for that.
16 By doing the audit, we had to put plans and
17 procedures into place. We had to qualify people, train them.
18 We also learned a lot by going out there and doing it. We will
19 do it better next time.
20 DR. MOELLER: Did you have an actual training
21 program? Formal? Or how did you train the people?
22 MR. KENNEDY: We trained them with outside quality
23 assurance training. In fact, we took advantage of the free
24 training that DOE has to offer. DOE offers training
25 internally. They also offer it to the states and tribes and to

1 the NRC staff. And, you know, some folks might say that's a
2 conflict of interest, that they are training us in things that
3 are not correct, but, actually, I took one of their courses and
4 they are pretty good, actually. And, also, more importantly,
5 they are geared to the repository program. Most of the QA
6 training that is available commercially is geared toward
7 reactors. And it just isn't the kind of thing we want to give
8 our earth scientists.
9 DR. MOELLER: Are these given locally and are they
10 given by government workers or do they bring in someone?
11 MR. KENNEDY: They bring in -- a couple of different
12 ways. Some of the training for the auditors, rather, it is
13 given by a contractor. I think it is UE&C out of Philadelphi-
14 They also have -- ONWI has also established a lead
15 auditor training program. And they are using Batelle staff to
16 give that. They give it throughout the country. I know
17 Batelle has gone to Albuquerque, BWIP, Washington.
18 DR. MOELLER: Now, let's see if I have that right.
19 The NRC auditors were trained by the Department of Energy and
20 then went out and audited the Department of Energy's program.
21 MR. KENNEDY: Some were trained, like our technical
22 staff took auditor training from the DOE. That's right.
23 DR. SHEWMON: You wouldn't want them uneducated;
24 would you?
25 DR. STEINDLER: No, no. I certainly wouldn't want

1 them uneducated.

2 DR. SHEWMON: And it was free.

3 DR. STEINDLER: And it was free. It was certainly a

4 bargain.

5 DR. MOELLER: What he has pointed out, though, is

6 that that was not the only training they had, but it certainly

7 -- I can see that it would be helpful to see what DOE teaches

8 in their training program.

9 DR. KENNEDY: Frankly, I don't know. On the surface,

10 maybe that doesn't look as good as it could, but I took it and

11 it is basic quality assurance.

12 DR. STEINDLER: I don't have any problem, but I think

13 you might have an interesting time answering some questions at

14 the first hearing where you have adversaries chewing on you

15 from one end to the other. Perhaps not. I don't know.

16 MR. KENNEDY: That's the point I think we need to

17 consider. The only thing I have considered thus far is what

18 the states have tried to do. In fact, I mean they are taking

19 the same training. So, they don't see it as DOE teaching

20 something that is not correct.

21 DR. MOELLER: Well, you could almost think of it like

22 mathematics. You know 2 and 2 equals 4, regardless of who

23 teaches it.

24 DR. STEINDLER: You could.

25 DR. MOELLER: Okay. Well, that's interesting. Go

1 ahead.

2 MR. KENNEDY: Okay. Let's see. A few details on the

3 audit. We had an eight-person team, six with education and

4 experience in geotechnical work, included our two geochemists

5 on the Nevada team, John Bradbury and Paul Bender, who are here

6 at the moment. They are a contractor --

7 DR. MOELLER: When you say on the Nevada team, what

8 does that mean?

9 MR. KENNEDY: That's the staff Nevada team. There is

10 a team of reviewers, I guess it's about eight or nine members

11 with individuals in each of the disciplines: geology,

12 geochemistry.

13 DR. MOELLER: Assigned to each site?

14 MR. KENNEDY: Assigned to each site. That's right.

15 We also had our on-site representative, Paul Prestolt was on

16 the team.

17 DR. MOELLER: And he is or he told us that QA was one

18 of his areas of expertise.

19 MR. KENNEDY: Yes, Paul is real good in that respect.

20 Paul has -- his biggest contribution is that he has worked

21 under a nuclear QA program.

22 DR. MOELLER: Yes.

23 MR. KENNEDY: And he was working on -- nuclear

24 plants. And that is real valuable experience.

25 DR. STEINDLER: You have as one of your objectives

1 the evaluation of the quality of the work of the folks at Los
2 Alamos.
3 MR. KENNEDY: Yes.
4 DR. STEINDLER: What kind of assurance can you
5 provide that the people that you had on the team would
6 recognize either good work or bad work when they saw it?
7 MR. KENNEDY: Well, would you like to speak to that,
8 John? Or do you want me to try it, first, and then you can
9 fill in where --
10 MR. BRADBURY: Well, why don't you try it, first.
11 MR. KENNEDY: I don't know if all three of them, but
12 they have had experience in some of the techniques that were
13 being utilized out there, like electron microscopy, for
14 example, scanning --
15 DR. MOELLER: Maybe if you gave us the technical
16 background of some of the members and even what real world
17 experience they have had.
18 DR. BRADBURY: Okay. Lately.
19 DR. MOELLER: Lately, okay.
20 DR. BRADBURY: We brought Paul and myself on this
21 meeting and I, myself, have experience in the electron
22 microprobe, x-ray diffraction, SEM, and these are the
23 techniques that they are using at Los Alamos.
24 DR. STEINDLER: You have experience. How? Doing
25 what with these instruments?

1 DR. BRADBURY: Analyzing ABS igneous rocks --

2 DR. ORTH: Okay. You worked in a laboratory doing

3 this sort of work for x-years or took a course in it once or

4 what?

5 DR. BRADBURY: I am an igneous petrologist trained in

6 igneous petrology. My degree is experimental igneous

7 petrology.

8 DR. STEINDLER: What degree?

9 DR. BRADBURY: Ph.D.

10 DR. MOELLER: And you, of course, worked in a lab

11 doing your doctoral research. Then you worked in a lab post,

12 after that?

13 DR. BRADBURY: No, that's not correct.

14 DR. MOELLER: You came to the NRC?

15 DR. BRADBURY: That's right.

16 DR. MOELLER: And how long has this been since you

17 graduated?

18 DR. BRADBURY: Three years.

19 DR. MOELLER: Oh, well, that's not very long, okay.

20 And some of the other people?

21 DR. BRADBURY: The other people have experience in

22 x-ray, for the most part. I don't -- I'm not sure whether they

23 had -- whether they have ever sat on a probe or not, but they

24 have had -- our contractor, I believe, may have sat on a probe.

25 DR. STEINDLER: Well, I didn't mean to have this

1 session in the sense degenerate into the requirement that the
2 audit folks provide a litany of their curriculum vitae, but the
3 question always arises, you know: How smart are the auditors.
4 My limited experience in trying to analyze Department of Energy
5 data for quality leads me to conclude that this is a very
6 difficult process. But, yet, you in fact -- and I would not
7 have been surprised if you had left that issue out completely
8 as one of your objectives or at least touched on it lightly.
9 But you made a big point of it. And because you made a big
10 point of it, I guess that's the reason for my question. And
11 I'm sorry, I didn't mean to have you get up and tell them the
12 last time was it you were in a laboratory. That's not the
13 issue.
14 But it seems to me that you have to be prepared to at
15 least address that if you insist on having that as one of your
16 significant objectives. I understand how you got to that
17 objective. You have been prodded by Paul Shewmon who keeps
18 saying, correctly: Are you guys running a quality assurance
19 program without knowing anything about the assurance of
20 quality?
21 DR. SHEWMON: I would cheerfully have said -- been
22 happy if he had said: We made sure they were looking at the
23 right rock and we trusted them to know what the hell they were
24 doing with their equipment.
25 DR. BRADBURY: Well, in fact, we didn't make sure

1 that they were looking at the right rock. We were limited by
2 the scope of this audit. We weren't allowed to audit anything
3 but the samples that they had received into their facility.
4 So, we didn't track the whole process from collecting the
5 samples through to the end, the conclusions that you draw from
6 it.
7 MR. KENNEDY: Because that's not ready yet. Because
8 only the internal Los Alamos program was qualified; that is,
9 ready for NRC audit.
10 DR. MOELLER: There was a problem in the field which
11 DOE recognized.
12 MR. KENNEDY: Out in the core storage, right. And we
13 didn't feel it was productive to go out there and tell them,
14 again: Hey, you've got a core problem, a traceability problem.
15 They knew that.
16 DR. BRADBURY: And, therefore, we couldn't say
17 anything about the quality of the work that they have done
18 because we -- they couldn't guarantee that these were rocks,
19 these samples were collected from the places that they were
20 collected.
21 MR. KENNEDY: Our intention is not to go out with
22 just QA folks and just look at the paper. We feel we do need
23 to go out with both. This is an issue of not just the staff,
24 but how do you go out and look at the technical work at this
25 point. It's not like a reactor where you have got all kinds of

1 codes and standards to use as a basis for accepting technical
2 work. There is no AS&E code. There are no high Triple E
3 standards. All of this --
4 DR. SHEWMON: There is always layers of: Does he
5 know how to turn on the microscope? Does he know how to get a
6 pattern? Does he really know how to interpret that pattern?
7 And about two levels of that, you and your auditors can check
8 him out and someplace down in there you are going to have an
9 extremely specialized audit team or you are going to have to
10 take his word for it.
11 MR. KENNEDY: Yes.
12 DR. SHEWMON: It is where you have to start taking
13 his word for it that I hope doesn't chase him down to doing
14 nothing but filling out paper, to no avail.
15 MR. KENNEDY: Exactly. I think another thing we need
16 to do that we haven't done yet is rely on peer reviews. That
17 is DOE is going to have to perform peer reviews. And we would
18 review the peer review process and look at the qualifications
19 of the peers and that would give us confidence that the
20 investigators are doing good work, in addition to some of our
21 own independent auditing.
22 Okay. More on the details of the audit. We had
23 three subteams, two were programmatic QA and one technical. It
24 was one week long, mainly because the program is not that
25 extensive right now. So, an eight person team one week would

1 be what we needed to get the job done.

2 Another unique thing was that we made --

3 DR. MOELLER: Excuse me. Were your projections

4 correct? Did it require just about as much time as you

5 predicted?

6 MR. KENNEDY: One week was about right, yes. I think

7 it would have been counterproductive to stay longer. We found

8 what we needed to find at week end.

9 One unique thing, and perhaps unique to this program

10 is that we had State of Nevada involvement. We invited them to

11 observe the audit team. They went -- rather, the observer,

12 Carl Johnson of the state, looked at all three subteams. He

13 attended all of our team meetings in the meeting. In fact, h

14 even wrote an input for our audit report.

15 One of our objectives is to try to give them

16 confidence in the work that we're doing. And that was the

17 mechanism for doing that.

18 Let's see. I wanted to address specifically the

19 technical portion of the audit because I thought you may be

20 interested in that. So, I made up a handout on that. We had

21 basically three objectives: To assess whether the detailed

22 technical procedures reflected accepted scientific methods; to

23 determine if the procedures were being followed and to assess

24 the ability of the Los Alamos staff to perform quality

25 technical analyses using the procedures. We did --

1 DR. STEINDLER: Excuse me. Before you get into
2 that, did you have an advance copy of the QA plan that they
3 were following?
4 MR. KENNEDY: Oh, yes.
5 DR. STEINDLER: So, you reviewed all of their written
6 documentation before you got there?
7 MR. KENNEDY: Extensively. Yes. For months. In
8 fact, including the detailed technical procedures, we spent I
9 would say, what, three months going over those, all of the
10 detailed procedures. Which was actually the next bullet.
11 The method was an extensive pre-audit review of the
12 key analytical procedures and other documents. The other
13 documents included the QA plan and procedures. We spent quite
14 a bit of time going over the detailed technical procedures on
15 sample preparation, electron microscopy, et cetera. From that,
16 we developed check lists that were used to interview the Los
17 Alamos staff during the week out there. Asked them questions
18 to see if they understood procedures, to see if they could fill
19 in the gaps in the procedures, because every single detail
20 cannot be specified in the procedure.
21 DR. MOELLER: And what kind of people? You
22 interviewed the technical staff. Tell me some "for instances."
23 MR. KENNEDY: Well, the principal investigators -- do
24 you want to address that, John?
25 DR. BRADBURY: Yes, we talked with principal

1 investigators working with the x-ray diffraction, with the
2 electron microprobe. They have a small staff. I don't
3 remember the number. It might have been -- it was less than
4 10. And, so, we spent time discussing the different problems
5 that may occur in trying to analyze fine grained rocks.
6 DR. MOELLER: So, essentially, at sometime you talked
7 to everyone?
8 DR. BRADBURY: Yes, we did.
9 DR. MOELLER: And did you talk to them individually
10 or in groups or both?
11 DR. BRADBURY: We talked to them individually,
12 sometimes more than one person sat in, but we would concentrate
13 our discussions with that one person.
14 MR. KENNEDY: And the principal investigators, I
15 guess they are all Ph.Ds and typically they have some folks
16 working for them, technicians and other technical individuals.
17 DR. BRADBURY: That's right.
18 DR. STEINDLER: Who wrote the -- were you able to
19 determine who wrote the procedures?
20 MR. KENNEDY: Yes.
21 DR. STEINDLER: Did the staff write them or did
22 somebody else write them?
23 MR. KENNEDY: John?
24 DR. BRADBURY: They were all written internally. I
25 think the staff -- the staff wrote some of them. At least they

1 had contributed quite a bit of time into editing them, at
2 least. But I think most of them spent -- they did some
3 complaining and, so, I'm sure they had a lot of effort put into
4 those -- writing those documents.
5 DR. PARRY: You noted in one of your handout sheets
6 that the State of Nevada also was involved.
7 Who was that and what was their background?
8 DR. KENNEDY: Carl Johnson of the state. I am not
9 sure what his title is, but he is the one who keeps the closest
10 oversight of the NRC and DOE activities. He comes to most of
11 our meetings with DOE, almost all of the meetings involving the
12 Nevada project. Now he has a geotechnical background. I know
13 that he has been a consultant in geotechnical work, a private
14 consultant. Beyond that, I am not sure. He is a senior fellow
15 and has been around, and he understands nuclear licensing and
16 he is very effective in fact.
17 (Slide)
18 Okay. Let's move on to the next page which contains
19 the major conclusions which first based on the interviews with
20 the principal investigators that we felt confident that the
21 combination of the existing technical procedures and technical
22 staff at Los Alamos can produce quality technical analyses.
23 But we did not agree that the QA program is fully in place.
24 And just in general, we felt that there is an insufficient
25 appreciation of the QA documentation needs for licensing within

1 Los Alamos.

2 The last one is not all that surprising, because Los
3 Alamos has never been licensed by the NRC or involved in a
4 licensing proceeding. And on the staff, they had no one who
5 had been experienced in nuclear licensing.

6 DR. STEINDLER: Can I interpret or can I ask a
7 question about that little book.

8 When you say that the team does not agree that the QA
9 program is fully in place, do you mean that the QA program as
10 described in the QA documents written by and followed by Los
11 Alamos is not fully in place, or do you mean that the QA
12 program as you would like to see it is not fully in place?

13 DR. KENNEDY: Can you say that again to make sure
14 that I have the distinction right?

15 DR. STEINDLER: The Los Alamos folks are following a
16 QA plan generated by DOE.

17 Are you telling us that the team does not agree that
18 the Los Alamos workers are adequately following the DOE plan or
19 are you telling us that the DOE plan is not what the NRC would
20 like to see?

21 DR. KENNEDY: It is actually both. They are not
22 following in all cases, although they are following it in the
23 great majority of the cases. But they are not always following
24 the plans and procedures that they have in place at Los Alamos
25 that have been proscribed by DOE.

1 Also, and this is an important issue, that plan is
2 not completely in accordance with the Commission's
3 requirements, the one that they are working to.
4 DR. STEINDLER: That latter point presumably should
5 have come out of your review three months prior to the actual
6 visit; did it?
7 DR. KENNEDY: It did. It did, and that is an issue.
8 One of the reasons -- here is the choice that we have. We
9 could have gotten the plan perfect or made an attempt to get
10 the plan perfect, the QA procedures perfect before we went out
11 and did the audit.
12 DR. STEINDLER: Acceptable, I think maybe is a good
13 term.
14 DR. KENNEDY: Well, okay, that is a better word. You
15 are right. We will never achieve perfection, and we do not
16 need to. But we could have gotten it acceptable. But our
17 history has been -- well, first off, there is not any plan
18 right now that we have gotten agreement with DOE on.
19 Typically what happens is that we review it and we
20 send comments out, and it takes six months to a year sometimes
21 to get a response to the comments. There is additional give
22 and take after that to resolve issues. And our strategy was
23 that we looked at the plan that they had, and we felt that it
24 was close and we felt that it was reasonable. You know, it
25 addressed all eighteen criterion.

1 We felt that it would be productive to go out now and
2 do an audit and identify detailed implementation issues rather
3 than wait which would likely be a year or even longer and have
4 all this work go on and maybe not be right. That was a
5 calculated decision, and I think that it was the right one.
6 Because it really would have taken quite awhile based on our
7 experience to date to have the plan meet the Commission's
8 requirements.
9 Now we did identify, by the way, in the course of our
10 three month review improvements that are needed in it. The
11 thing was that there was not time to get them settled. In
12 fact, we are sending out a letter to Los Alamos, or DOE rather,
13 Nevada, which identifies all of the comments that we have on
14 their plan, so that they can get their plan right in addition
15 to fixing problems that were identified in the audit.
16 (Slide)
17 I wanted to give you a feel for what some of the
18 findings and deficiencies were. There were four findings, and
19 fourteen deficiencies, and four observations.
20 And first, procedures for activities affecting the
21 quality of work potentially related to licensing. They were
22 not developed for some activities such as stop work, evaluation
23 of suppliers, annual suppliers evaluations. They were not
24 being followed in all cases. For example, there was a lack of
25 inspections of the core storage area within Los Alamos. And

1 they were not being followed in all cases with respect to the
2 use of laboratory notebooks.
3 Nor were they fully understood by the Los Alamos
4 staff. And that was an indication that some of the procedures
5 may need clarification because they were new, or that the staff
6 may need additional training on them.
7 Another important one was the second bullet or the
8 third bullet rather, which was that the internal audit program
9 at Los Alamos needs to be strengthened. Theoretically, the Los
10 Alamos program, the internal audit program there, ought to be
11 catching most of these programs before outside organizations
12 come in.
13 DR. STEINDLER: Did they have so to speak a dry run
14 audit internally before you got there?
15 DR. KENNEDY: Yes, they did. They had a two day
16 audit in February of this past year. It was like a three
17 person audit team. They did not cover the full scope of the
18 program. They did not really get into some of the meat. And
19 as a result, what happened was that the Nevada Project Office
20 came in I guess about two months later and identified a number
21 of significant deficiencies that Los Alamos had not detected
22 internally. And then, of course, we came along a couple of
23 months after that and identified some more deficiencies.
24 Now auditors are always going to come in and identify
25 deficiencies. But we felt that the nature of the deficiencies

1 were significant enough that many of them should have been
2 caught by the internal Los Alamos audit.
3 DR. STEINDLER: Do you grade your deficiencies or
4 findings in terms of importance?
5 DR. KENNEDY: The only grading that we had for this
6 audit was deficiency versus finding. In the future, it looks
7 like we are going to be grading them, because that is just not
8 enough. Deficiency, it turned out, the implication was that it
9 was too insignificant. And finding, I think that everybody
10 agrees after the audit, the way that we defined it was just too
11 harsh or too severe for some of the things that we came up
12 with.
13 DR. STEINDLER: Now a finding is the worse thing, a
14 a deficiency is a lesser?
15 DR. KENNEDY: Lesser. That was one of the major
16 things that we found from the audit, that you could define a
17 deficiency.
18 DR. SHEWMON: Take your last bullet down there,
19 certifications of personnel/training. I guess that the rules
20 that you operate under are based on taking reactor operators
21 and seeing whether they have the training to operate this
22 dangerous instrument that they have. And you go review their
23 training program, and you take a welder and see if he is
24 certified to lay down a weld like he is supposed to.
25 If you take the people in the laboratory doing these

1 tests, what beyond their curriculum vitae which would give his
2 education and publications would you find you need to certify
3 the competence of the individual to operate that machine that
4 he has been operating for five years?
5 DR. KENNEDY: Let me tell you what we think would be
6 appropriate. We think first that a position description
7 describing what the job is generally is appropriate, just like
8 we on the NRC staff has a position description that is
9 typically three pages long and describes at least in some
10 detail what the nature of the job is.
11 We feel that they need that out there as part of the
12 QA records, and in fact they may already have it. It was a
13 part of the QA records.
14 We also feel that a summary of an individual's
15 education and experience is needed in the file to demonstrate
16 that they are qualified. All that they had basically was an
17 assertion that they were qualified.
18 DR. SHEWMON: Everybody would have a vitae which
19 would say what his education was, what his experience was
20 although not for three pages long, and what reports he had
21 completed.
22 My question was what do you want beyond that, and one
23 answer was I want three pages saying what his responsibility
24 is?
25 DR. KENNEDY: It does not have to be three pages.

1 There needs to be a position description describing what the
2 needs are for the job and what the duties and responsibilities
3 are. I suppose that it could even be a page or maybe less.
4 And they need a record with at least some detail of what the
5 education and experience is of the individuals working in that
6 position.
7 DR. SHEWMON: Okay. Would a Ph.D. in geology from
8 Stamford be enough of a description, or does he need more?
9 DR. KENNEDY: For the cases that we looked at there,
10 I think that they need more. They would need more.
11 DR. SHEWMON: And part of your finding here is that
12 whatever they needed more than that they did not have, and you
13 explained it to them then as to what they needed?
14 DR. KENNEDY: We did not explain in detail exactly
15 what they needed, no. We said that they needed a position
16 description, and we said that they needed more detail to show
17 that an individual was qualified for the duties proscribed in
18 the PD.
19 DR. SHEWMON: Would publications in that area be
20 qualifications or not?
21 DR. KENNEDY: I imagine that they would be, yes.
22 DR. MOELLER: And I gather from the last item under
23 that bullet that there were no records of training outside of
24 Qa.
25 DR. KENNEDY: That is a related issue, yes.

1 DR. MOELLER: Apparently because they knew that you
2 were coming they clearly delineated or specified the training
3 of each worker in QA, but did not tell what else they had.
4 DR. KENNEDY: Right.
5 DR. MOELLER: Okay. I can see that.
6 DR. KENNEDY: I think that they may maintain in the
7 long run that not much training is needed for the technical
8 workers. They do not hire technicals and train them. They
9 expect people to know what to do when they come. They do not
10 train them. They are expected to know that when they come to
11 Los Alamos.
12 DR. STEINDLER: Is that very last line an issue of
13 records or an issue of training that you are raising? You say
14 no records of training outside of QA. You are in a sense
15 finding that there is an absence of the record?
16 DR. KENNEDY: It was more of a records concern.
17 DR. STEINDLER: It is a paper issue.
18 DR. KENNEDY: It is a paper issue, I have to admit.
19 We thought that it was a significant one, because licensing is
20 not going to occur for seven years or to get to a licensing
21 hearing for nine years. And these folks are not going to be
22 around or at least some of them are not going to be around.
23 And yet you are going to need some proof as to the fact that
24 these folks were qualified.
25 DR. STEINDLER: You are not setting up what I guess

1 is a rather hazardous criterion for method of qualification,
2 and that is a paper method rather than a production method. If
3 you want to find out if somebody knows how to do something, you
4 hand him a MBS standard to run through his machine and you
5 watch him do it. If he comes up with the right answer six
6 times in a row, there is a reasonable chance that he knows what
7 he is doing, and I am obviously oversimplifying.
8 It does not really make a heck of a lot of difference
9 whether or not there is a sheet of paper in somebody's file
10 that says gee, this guy has taken a course someplace, does it?
11 DR. KENNEDY: In terms of the quality of the work
12 that is being done in the lab.
13 DR. STEINDLER: That is right.
14 DR. KENNEDY: You are right. Actually I feel that we
15 went out and did both. I mean John and Karen, the woman from
16 Oak Ridge, and Paul interviewed these people and talked to them
17 at length to get a feeling of confidence that good work was
18 being done.
19 DR. STEINDLER: Okay. But the point is that you are
20 focusing your attention on the absence of records.
21 My question is why is that critical in this
22 particular instance? This is the records of training.
23 DR. KENNEDY: Or can we talk more broadly just about
24 the qualifications?
25 DR. STEINDLER: No, no. It is precisely the point,

1 the narrow point that I am trying to get at.

2 If the issue is you are trying to get some kind of

3 quality output, why is the record of training so important?

4 That is not the mechanism that I would think that the

5 NRC would want to use to determine whether or not the guy can

6 do quality output. I mean that is not the way the analytical

7 chemistry folks are tested against. In a sense, they are not

8 tested against the diplomas on the wall. They are tested

9 against a MBS standard.

10 And what you are saying is that a diploma on the wall

11 is just as good. And I guess that is the problem that I have.

12 I think that is not the right criterion that you ought to be

13 using.

14 DR. KENNEDY: Well, I do not think that it is just as

15 good personally. You know, they need to be doing good work,

16 and we need to have confidence that they are doing good work

17 and measure them against standards where they are available.

18 But you also need the documentation, too.

19 DR. STEINDLER: Well, let me be more extreme. We

20 have got a technician in our shop who has got a high school

21 diploma I think. And the only reason that I do not know that

22 is that I have never bothered to look. But I would not trade

23 him against anybody to run our scanning electro-microscope.

24 And if you ask him how much training have you had or show me

25 how much training you have had in the last 25 years, he will

1 probably punch you in the nose. But he can do wizardry thing
2 with that machine.
3 And so if you were to come in on a QA audit and say
4 gee, there are no records of this guy having either taken any
5 courses or having had any training, I think that it is a total
6 non sequitur to the quality of work that he does. I can show
7 you the quality of work in relation to an absolute set of
8 standards that are normally used in science.
9 DR. KENNEDY: You feel that you can substitute that
10 for a formal training program that is documented in the record.
11 DR. STEINDLER: When either the Department of Energy
12 or the Nuclear Regulatory Commission goes through and evaluates
13 data, that evaluation is an impersonal evaluation. It will
14 become totally immaterial to an outside evaluator whether or
15 not the person who has done the work has a Ph.D. and has
16 upteens records of training or not.
17 The issue will be whether or not that data package
18 which is going to be laid in front of somebody can stand the
19 standard test that the scientific community uses, can they get
20 the right answer against a set of standards, and can they do it
21 with reasonable precision. It is immaterial who does it.
22 DR. SHEWMON: Chances are this guy has gone off to a
23 short course or two that the vendor for the new instrument used
24 when they got their new SEM, but that still does not certify
25 that he knows and that you should trust his data. And I think

1 that is what bugs us. You take people who can do what they are
2 supposed to do, keep them from doing it to fill out paper
3 trails that still do not mean a damn thing to the peers who are
4 reviewing the output.
5 DR. LINEHAN: The question that you are going to have
6 to answer though when you get into the licensing hearing is
7 people are going to challenge the qualifications of an
8 individual. You know, how a test was run, the equipment that
9 was used, and was so and so qualified, if there was some
10 subjective judgment that was required, you know, running the
11 equipment. Those types of things do get challenged. I do not
12 think that it means that someone has to have a diploma though.
13 DR. SHEWMON: The way that that is handled in the
14 field is basically can somebody someplace else reproduce the
15 same results, and that is what you try to get out a good peer
16 review, and that is what you get out of somebody's professional
17 reputation. And it is how either of those things comes into
18 your paper trail or if there are not enough records of training
19 that is unclear to us.
20 DR. LINEHAN: But I think that those things that you
21 are talking about are used to demonstrate what we are after.
22 DR. SHEWMON: Well, they are not really what is done
23 here for certification.
24 DR. LINEHAN: I think that what we are after, and
25 correct me if I am wrong, Jim, is something like you are saying

1 it can be that. I know that the Commission when it comes to
2 health and safety programs or take the health physics area, you
3 know, some of the better people out there have been working in
4 the field for years and they do not have a masters in health
5 physics, they do not even have any college degrees.
6 But if there is something in the files that the NRC
7 can look at that that person is qualified by experience, and
8 that his peers have deemed that he is qualified to do this type
9 of work, that something like that is routinely put in the file.
10 DR. SHEWMON: I come from a place where the motto is
11 publish or perish. So I ask for how many papers the guy has
12 published and in what kind of journals, or where he got
13 coauthorship though he has not completed high school because of
14 the quality of work that he has done. But it is not clear that
15 this would mean anything on the scale which is designed to
16 certify welders to lay down good weld beads. You know, I am
17 abusing you some.
18 DR. MOELLER: Well, I am listening. And I directed a
19 Public Health Service Laboratory for some years. And we were
20 sent standards, you know, that were made up by our QA group
21 somewhere, and we did not tell our technicians that this was a
22 standard. We just made out like it was a routine sample and
23 gave it a number and ran it through the lab. And our lab was
24 totally judged on how close they came to the right number.
25 At the same time, I can hear the message, too. As

1 long as the records of the CVs of these people, as long as that
2 does not dominate things. If in eight years, as you were
3 saying, or ten, whatever it is from now, someone is reviewing
4 the data from the Los Alamos Lab and they say who was working
5 there at that time and what was their background, I can see
6 that it might be helpful to be able to pull that out of the
7 record. That was sort of what I was hearing.
8 DR. KENNEDY: John, did you want to say something on
9 the standards?
10 DR. BRADBURY: I was just going to say that we are
11 very sensitive to what you are saying. The technical staff
12 agrees that certification by itself is not enough. We have
13 proposed to the people at Los Alamos that they make a split,
14 for example, of some rock or any rock. Let them choose or we
15 could choose, this being the first time that they can choose.
16 Split the rock, and they do an analysis and we do an analysis
17 using our contractors, and see what the uncertainty is in using
18 a particular technique.
19 We did not get very far with that proposal. But we
20 did not push it all that far. This was the first of its kind.
21 We are essentially feeling them out in this regard, and we
22 definitely will use this technique, if I have anything to say
23 about it.
24 This gets around to our QA. One of the arguments
25 that they used against this was, okay, now we have two labs.

1 We, Los Alamos, has what we think a good QA program. We are
2 not too sure about you. Who is right and wrong.
3 Well, anyway we proposed it, and I think that it is a
4 good way of answering these questions. Now you must realize
5 that these conventional techniques are being used to analyze
6 rocks -- well, to analyze minerals that are not conventionally
7 used or not normally used to analyze with these materials. The
8 zeolites, for example, are very difficult to analyze using the
9 electron microprobe for that.
10 And they have spent many years developing the
11 standards to analyze these minerals against. And it is not a
12 clear cut and cut and dry technique. You are essentially
13 cutting the technique to its limit.
14 DR. SHEWMON: But that is inherent in getting into a
15 research process. You are out far enough in front of the field
16 so that you cannot go to six other established labs and say we
17 want to run a round robin on this.
18 DR. BRADBURY: That is right. Essentially they are
19 the ones that have something to lose by doing it this way. But
20 on the other hand, if it comes out. So we proposed it. And in
21 this particular audit, we did not use that technique. But I
22 envision it being used in the future.
23 DR. STEINDLER: Did you propose to use the Bureau of
24 Standards as your laboratory?
25 DR. BRADBURY: No, we did not.

1 DR. STEINDLER: Do you think that they would have
2 objected if you had?
3 DR. BRADBURY: I think that they would have
4 hesitated. The reason that I say that is one of the
5 investigators mentioned that he was doing state of the art
6 work, and that he thought that essentially no one else could do
7 what he was doing without his guidance. It is like he gets the
8 best answers, and people get pretty close. What he said is
9 that they get what might be acceptable answers but not as good.
10 DR. SHEWMON: And it is possible that he is right.
11 DR. BRADBURY: He has been working on it for eight
12 years and nobody else has. He is the expert. He has been
13 working on site specific materials.
14 DR. MARK: What does his pre-employment job
15 description look like? I mean I must say that some of what you
16 are telling me makes me absolutely sick and angry. I never
17 wrote a job description for any of the two hundred people that
18 I hired in my life and had somebody from the NRC come snooping
19 around and saying what is the job description for this guy from
20 MIT that you just hired.
21 DR. SHEWMON: Well, you have got to leave a paper
22 trail for the lawyers six years from now or ten years.
23 DR. MARK: Right. Is that not delightful. How to
24 waste time, I can hardly figure out a better way.
25 DR. MOELLER: I hear Marty saying, and it might well

1 be the best approach, and maybe you considered this.

2 If you had a laboratory that is doing what I will

3 call routine analytical measurements where NBS standards are

4 available, et cetera, have you considered eliminating your

5 audit and eliminating all paperwork, et cetera that would be

6 necessary and just having them agree that ten percent of all of

7 the samples that they run or some such percent will be

8 standards that the lab does not know about or does not know are

9 being put in the pipeline, that as long as their performance on

10 these standards is satisfactory that then that is all the QA

11 you need, or what am I missing?

12 DR. KENNEDY: We have not done that yet. In fact, at

13 Los Alamos as far as I know, they were not doing any

14 replication at outside laboratories, and they were not doing

15 any peer reviews yet.

16 DR. STEINDLER: Let me make a couple of comments.

17 From my experience, the Department is worried appropriately

18 about how to be able to answer the question how accurate are my

19 results. It is clear that if you are running a follic acid

20 which is the standard MBS standard that that is no problem.

21 There is a definition in the science in this country that the

22 Bureau has the accurate result. And if you can come to that,

23 then you are in good shape.

24 However, most of the things that are involved in the

25 data acquisition portion of the waste management program either

1 are state of the art, as you have indicated, or are activities
2 that may be routine but against which the Bureau for one reason
3 or the other has no standard.
4 The classic problems of determining leach rates of
5 waste forms, particularly glass for example for the last ten
6 years, and perhaps even more than that, ran head up against
7 that.
8 What the Department has done is in effect has set up
9 the materials characterization center at P&L as its standard
10 lab, and I may be elevating it to a little higher level than is
11 necessary, to its standard laboratory, and they have produced a
12 large batch of a bunch of things that they have called
13 reference materials.
14 Now they are not of the quality that the Bureau turns
15 out, but they are certainly adequate to test the performance of
16 a testing laboratory within the DOE complex. It is against
17 that system which I think makes sense for the NRC to at least
18 keep track of, and it is against that system that laboratories
19 and individuals are judged.
20 And it does not make any difference whether the guy
21 has got a PhD or a high school certificate if he gets the right
22 answer. And the right answer in this case is in a sense is
23 what is decreed to be the right answer. Consistency is
24 probably as important as anything else.
25 Ultimately, I think that the QA audits that are done

1 both by the Department internally, I would assume for the
2 Department internally, as well as the NRC should be asking the
3 question did the guy get the right answer. And whether or not
4 there is a paper trail of his degree I think is a little bit
5 less important, although I keep hearing John saying that
6 somebody is going to ask eventually. The right answer it seems
7 to be is the bottom line.
8 DR. MOELLER: For the radionuclide analyses of
9 environmental samples in Nevada, the EPA lab in Nevada I think
10 has the responsibility, and they have standards which they will
11 distribute to any state laboratory.
12 DR. STEINDLER: The environmental samples that they
13 standardize.
14 DR. PARKER: That is what I was going to say. EPA,
15 of course, does the same thing. They certify laboratories.
16 Have you followed their techniques in certifying
17 laboratories? I think that might be a very useful thing to do,
18 because that is pretty standard. And you cannot bring any
19 samples into court without them having been used by a certified
20 laboratory, and a paper trail showing that the samples have
21 been properly stored.
22 DR. STEINDLER: I think that it would be
23 inappropriate if the NRC reinvented those wheels which have
24 been established in the scientific business.
25 DR. MOELLER: Well, the American Industrial Hygiene

1 Association certifies industrial hygiene labs.

2 DR. SHEWMON: Who certifies labs to look at zeolites

3 and characterize them in apparently the relevant way that the

4 labs are here?

5 DR. STEINDLER: You may find that there are some

6 areas where you have nobody.

7 DR. MOELLER: Would you care to comment?

8 DR. KRAUSKOPF: I am curious as to where the USGS

9 comes into all of this. They have done a great deal of work on

10 the mineralogy and topography of the Nevada samples.

11 Will they undergo a QA audit also?

12 DR. KENNEDY: They will, yes. I know that they are

13 in the process of putting a program into place now and have

14 been for the past couple of years, yes.

15 DR. SHEWMON: Could that process also -- well, it

16 might be useful to see if you could certify it as your

17 reference lab or whatever it was called for the EPA and do that

18 as your QA audit, or have it stand in its place for things at

19 this level.

20 DR. KENNEDY: One of the things that I hear you

21 saying is be creative. You know, do not just go out there with

22 a little requirement of Appendix B of Part 50 and say where is

23 it. But we are looking for confidence in the work, and that is

24 what we are looking for and evidence. Looking at things like

25 replication by outside labs, and looking at peer reviews, and

1 looking at other techniques for doing that aside from each of
2 the specifics, or maybe to take the place of some of the
3 specifics of Appendix B of Part 50. Is that right?
4 DR. STEINDLER: I would agree, yes.
5 DR. KENNEDY: I think that is appropriate. You know,
6 we do not have the answers to all of these questions. That was
7 one of the reasons for going out there was to identify what the
8 questions are and what the issues are, particularly in this lab
9 environment, and then work with Los Alamos in the arena.
10 DR. MARK: I am still very uneasy and perhaps even
11 worse than that. When you talk of can the guy take a piece of
12 zeolite and tell you what is in it, you are really talking
13 about a tremendously low level of work. It may be important
14 and it may be necessary. But you are asking if the fellow ha
15 any brains, you are not getting even close.
16 I am, of course, not a chemist and I would not
17 reassure you if I were to tell you what was in zeolite. But I
18 might perhaps be able to tell you something about whether you
19 get the right products when you punch the keys. You know, do
20 you get the square root correct and things like that.
21 But that is so trivial, and that could be described.
22 What I wanted and what I think that you wanted or any person
23 that you are talking about cannot be simply written down,
24 punched out, and measured in that way.
25 DR. MOELLER: Okay. Let us wrap up. You are near

1 the end. And then we will take a break.

2 (Slide)

3 DR. KENNEDY: Okay. We had some other concerns. We

4 felt that DOE needs to look at the impact of our audit

5 conclusions on the ongoing work at Los Alamos, and they are

6 doing some laboratory work now, and they are doing some work

7 that is in effect site characterization data.

8 And they need to look at the audit conclusions and

9 see whether there are things that need to be corrected

10 immediately or whether the qualifications of the staff is

11 something that they can work on over the next few months so

12 that it does not jeopardize in any way the ongoing work.

13 We feel that they need to assess the implications of

14 the audit results on other program areas outside of Los Alamos,

15 particularly in light of their commitment to have a program in

16 place by the time that the SCP is issued.

17 Dr. Steindler brought this up earlier. That we went

18 out there and audited against the existing plan at Los Alamos.

19 That plan is not fully in accordance with our requirements. We

20 are just about to send out our comments on the plan based on

21 our several months review. And that needs to be fixed and made

22 adequate.

23 And finally, since the Nevada Project Office did an

24 audit a couple of months before we did, we feel that it would

25 be helpful if they went and looked at that audit in light of

1 the results that we came up with to see whatever improvements
2 are necessary.
3 (Slide)
4 Now where from here. This is the first one, and we
5 need to know where we are headed now. The first thing is the
6 audit report which is in the works now and will be issued this
7 month. The next thing is that really one of our near-term
8 objectives is to work with DOE to get a program that is
9 qualified, that is in place at Los Alamos, and that we agree is
10 adequate for the type of work that is going on there.
11 And I think that is an important objective. We need
12 to work with DOE on settling the issues that were raised and
13 making that program right and suitable for licensing. And it
14 is not just that one organization. I think that it is kind of
15 a major milestone. Because it would be the first that was
16 qualified that met the NRC's licensing requirements and could
17 become a model for many of the other organizations.
18 The one step that we feel that would be helpful for
19 them to take to help achieve that objective, not just to work
20 wit us, but we feel that it would be helpful to them if they
21 brought in persons or a person experienced in the licensing
22 process to help them get their program up to speed. And I
23 understand that they are doing that. I think that they hiring
24 a consultant to work directly with their folks out there.
25 Beyond Los Alamos and the Nevada project, we are

1 thinking ahead to the other sites, because each of them is
2 different. They all have different programs and different
3 individuals running them.
4 Right now, we are planning on going out to be with
5 and auditing their large scale pump testing, and that is
6 scheduled right now for December. That is when DOE expects to
7 be ready.
8 And then finally on follow-up, like I said in the
9 beginning, one of our objectives here was to build a foundation
10 for future audits by us. One of the things that we did was we
11 conducted a poll of I guess about fifteen people involved in
12 the audit, the Los Alamos staff, the technical staff, and the
13 TDO, the Nevada staff, the project office, the team members and
14 others as to what did we do well and what could we improve on.
15 We got a lot of suggestions, and we will be carrying those out
16 in the future.
17 DR. MOELLER: Are there other questions or comments
18 on this topic?
19 (No response.)
20 DR. MOELLER: I guess our main thing that we are
21 leaving you with as I hear it is that if you had a laboratory
22 that is doing, and I hesitate to use the word, routine
23 analytical or conducting routine analytical procedures, then
24 you might look, as you say, be innovative and look toward
25 laboratory certification not for the NRC. But if they are

1 willing to have their lab certified by the professional
2 organization well-established and well known for handling that
3 type of an operation, then such certification should be
4 seriously considered in lieu of checking the details of their
5 QA program.
6 DR. KENNEDY: I agree. I think that would be
7 helpful, yes. It would help us.
8 DR. MOELLER: It would help. Okay.
9 DR. STEINDLER: I guess that I ought to add that we
10 ought to be sensitive to the fact though that a fairly large
11 fraction of what the audit teams from NRC are going to
12 encounter may well be if not state of the art, part of a very
13 narrow community of folks doing that kind of work. It seems to
14 me that the NRC needs to adopt some kind of a sensible policy
15 by which they are going to evaluate the quality of that work.
16 If you cannot go to the Bureau and you cannot go to
17 the EPA folks in Las Vegas and you cannot go to the USGS such
18 as they are, then somehow or another you need to address that
19 issue, and you need to do that with the scientific community at
20 your elbow giving you advice, not shuffling paper. And that is
21 an issue that you ought to address fairly quickly.
22 Because if you are going to continue these audits and
23 going around and visiting the DOE sites, you are going to
24 encounter that in every facet of all three projects.
25 DR. MARK: Also, the higher grade of the work that is

1 being done and the questions that you are going to count on
2 them to answer, the less QA program there will be. So do not
3 ask for it.
4 DR. SHEWMON: Or the less relevant, the more
5 traditional the approach is going to be.
6 DR. KENNEDY: And the more that you rely on judgment
7 to qualifications and experience of individuals.
8 DR. SHEWMON: You can find the other expert in
9 zeolite and get his comments, and that maybe will be the best
10 you will do.
11 DR. MARK: If they have hired some clerk to handle
12 the QA, then you are just wasting your money. And if they
13 have, then they are not very good.
14 DR. KENNEDY: So peer reviews, for example, would
15 become much more important as a way of giving confidence.
16 DR. MARK: The peer review program in the health
17 department at Harvard.
18 DR. MOELLER: Fifteen minutes.
19 (Whereupon, a recess was taken.)
20 DR. MOELLER: The meeting will resume and we will
21 pick up with a report on the site characterization plan status.
22 And what we will do is probably go through this. Then when
23 it's completed if it's roughly noon, between 12 and 12:30, we
24 will recess for lunch, and then after lunch we'll pick up with
25 the report of our field trip of several weeks ago, and that

1 will replace the item which we have already covered, the
2 quarterly progress report.
3 Okay, Mr. Johnson, you are the speaker for this.
4 DR. JOHNSON: We will have two speakers.
5 DR. MOELLER: Okay.
6 DR. JOHNSON: King Stablein and I will be discussing
7 our plans to review DOE's site characterization plans, and I
8 will refer to site characterization plans in this talk as SCPs.
9 We turn to page 2 of the handout. I will be speaking
10 from this handout.
11 With respect to our briefing objectives, first, I
12 would like to provide an overview of the site characterization
13 plan process and content, and second, I will be giving also a
14 overview of NRC's plan to review DOE's SCP. And then third,
15 King Stablein will be going into more detail with regards to
16 the objectives, the scope and approach of our SCP review.
17 Turning to page 3, to help you understand our plans a
18 little bit better, I have prepared some brief background on the
19 SCP process and content.
20 The Nuclear Waste Policy Act and 10 CFR 60 define the
21 SCP and SCA process. Here, DOE is required to conduct a site
22 characterization program to support the license application.
23 Doe prepares a site characterization plan, the SCP, and issues
24 it to all parties; that is, NRC, state and tribes and other
25 interested parties.

1 The SCP is issued before the exploratory shaft
2 sinking begins.
3 Now NRC will review the SCP and prepare what we call
4 site characterization analysis, the SCA. And we will be doing
5 this within six months after SEC issuance.
6 Now following this, DOE will be preparing semi-annual
7 progress report throughout the duration of the site
8 characterization program. These progress reports, as the name
9 implies, will just be updating the initial site
10 characterization plan, providing changes to the plans, new
11 information that has been received from the whole
12 characterization process, and identifying new issues and new
13 approaches that the program would have to resolving these
14 issues.
15 DR. MOELLER: Say that again, because they will issue
16 a site characterization plan, and then quarterly thereafter DOE
17 will update this plan.
18 DR. JOHNSON: Semi-annually.
19 DR. MOELLER: Excuse me, semi-annually they will
20 update it. And this will reflect changes in the types of data
21 they think they need to collect, et cetera.
22 DR. JOHNSON: Reflect changes in their overall
23 program.
24 DR. MOELLER: Okay.
25 DR. JOHNSON: Whether it's just changes that result

1 from the day to day collective, or changes in the approaches
2 that they use, or changes resulting from NRC comments, state
3 comments, whatever.
4 DR. MOELLER: Well, that should --
5 DR. JOHNSON: Keeping track of the direction of the
6 program. So the site characterization plan is not just a one
7 shot plan.
8 DR. MOELLER: Okay.
9 DR. JOHNSON: It really evolves through the whole
10 site characterization time period and is adjusted by DOE as new
11 information, new experience is gained and that it's commented
12 by all the various parties throughout site characterization at
13 these six-month intervals.
14 DR. MOELLER: Well, in a sense that -- I think it's
15 very good idea, and I think it also takes a little bit of the
16 pressure off of both you and them to be sure that when it's
17 formally issued initially, that it's the last word. I mean you
18 want it up to date, but it doesn't have to be everything.
19 DR. JOHNSON: That's correct.
20 DR. MOELLER: Okay.
21 DR. JOHNSON: And a little bit later I will make a
22 point of that. It's not containing all the details that
23 everyone would want to know about the testing program, and I
24 will try to explain that a little bit more. But you are quite
25 right, it's not the end all; it's not everything.

1 DR. MOELLER: That's good.

2 DR. JOHNSON: It's just really the beginning, and the
3 framework for the whole program.

4 NRC will be reviewing these semi-annual progress
5 reports as they come out. And we view this whole process of
6 SCP and our review of the SCP through the site characterization
7 time period as the primary mechanism for pre-licensing
8 consultation with DOE. It's the primary way in which we can be
9 giving guidance back and forth on a real time basis with DOE.

10 And it's also very important to recognize that the
11 Nuclear Waste Policy Act also set it up as a mechanism for
12 other parties as well. It states and tribes certainly, you
13 know, will be commenting on this document itself. It's not
14 just a document for NRC, but it's all the parties involved in
15 the program.

16 Moving on to page 4. With respect to the SCP
17 content, the Nuclear Waste Policy Act and 10 CFR Part 60.17
18 generally define the content of an SCP. NRC's regulatory guide
19 4.17 was issued in 1982, and it was revised recently in 1987,
20 and this particular document provides DOE with detailed
21 guidance on the format and the content of SCPs.

22 Well, based on Reg Guide 4.17, DOE developed what
23 they called an annotated outline for the SCP. And this is a
24 document that provides more detailed guidance for the DOE staff
25 and their contractors to write the SCP. It also addresses

1 additional information beyond what's needed for 10 CFR 60.

2 Specifically, it provides more information, or DOE

3 needs to address information related to their siting

4 guidelines, that is, Part 9.60. And specifically here we are

5 talking about ease of cost of the development of the

6 repository. So the annotated outline goes beyond the Reg Guide

7 4.17 and it's a document that incorporates Reg Guide 4.17, plus

8 other DOE needs for their own program and their own regulation.

9 The current version that is being used is the April

10 1987 revision. But over the years there have been a number of

11 consultations between NRC and DOE to review this annotated

12 outline, and we have had comments and meetings with respect to

13 it, and we have agreed on the consistency of this annotated

14 outline with Reg Guide 4.17.

15 We have also agreed on the level of detail that would

16 be in an SCP through meetings with DOE and reviews of their

17 parts of the annotated outline.

18 If want to leave you with a message that we are using

19 both documents, the Reg Guide 4.17, which is NRC's, and we are

20 also recognizing the value of DOE's annotated outline, and we

21 believe these two documents are consistent.

22 DR. STEINDLER: What is the level of detail that you

23 finally agreed to?

24 DR. JOHNSON: I will try to simply answer that, but

25 the SCP can be considered to be an umbrella document that goes

1 down to -- I'll use this as an example. It would -- in the
2 finest level of detail in the SCP would identify the types of
3 tests, or the types of analyses that would be done. It's more
4 or less of a listing, whereas other detail, that is, describing
5 the actual test plan, or actually providing test procedures,
6 technical procedures for a particular test method or analysis
7 technique, that level of detail would not be in the SCP. That
8 would be in separate documents that would -- some of them would
9 come out at the time of the SCP. Some of them -- many of them
10 would come out later in the program prior to the start of the
11 work.
12 So the SCP lays out some -- and I'll be getting to
13 that on page 5 actually -- more of the idea of what the SCP
14 will contain, but it doesn't contain detailed test plans or
15 test technical procedures.
16 DR. STEINDLER: You expect to find a complete set of
17 references in the SCP?
18 DR. JOHNSON: The SCP will be supported by a thousand
19 or so technical references that support, you know, the
20 descriptions of the site, the various aspects of their testing
21 program. We'll have references.
22 DR. STEINDLER: Eight thousand references or
23 thousands?
24 DR. JOHNSON: On the order of maybe thousands
25 references.

1 We turn to page 5, this is a perfect lead in to
2 looking a little more closely at the overall content of the
3 SCP, and this outline that I have here follows Reg Guide 4.17
4 and the annotated outline.
5 The SCP has two parts. Part A provides a description
6 of the overall repository system, and this description is in
7 Chapters 1 through 7. There are site descriptions based on the
8 available data in areas like geology, hydrology, chemistry.
9 There will be a conceptual design of the repository, a design
10 of the waste package.
11 And then Part B, which really is the most important
12 part of the plan, describes DOE's site characterization
13 program. This is in Chapter 8. It's a complicated chapter and
14 it begins by identifying the issues related -- that need to be
15 resolved for licensing.
16 For each issue DOE will identify what they call an
17 issue resolution strategy which incorporates the concept of
18 performance allocation, and would identify the broad strategy
19 that DOE feels needs to be taken to resolve each of the issues
20 they identified.
21 Now as a result of this performance allocation and
22 the strategy that DOE puts together information needs will be
23 identified. That is, what information needs to be collected to
24 resolve that issue by the characterization program.
25 Now the next step here, the next section of Chapter 8

1 will deal with the investigations that DOE identified that are
2 needed to collect the information. Their investigations are
3 broken down broadly here: site investigations, repository-
4 related investigations, investigations related to seals, waste
5 package and performance assessment.
6 Another part of Chapter 8 includes the exploratory
7 shaft facility description. And here the surface and
8 subsurface facility is described. This is for the exploratory
9 shaft facility. And the activities that will be conducted from
10 exploratory shaft will be described, and an evaluation will be
11 done with respect to the potential adverse affects on waste
12 isolation from exploratory shaft facility. That is, the
13 construction of the facility are tested or done from the
14 facility.
15 Another part of Chapter 8 deals with milestones and
16 schedules. This looks at the sequencing of testing, the
17 duration of testing, and it covers all aspects of the
18 investigation that DOE has identified in the earlier parts of
19 Chapter 8.
20 Another section of Chapter 8 deals with the quality
21 assurance program. And lastly, there is a portion of
22 decontamination and decommissioning for the exploratory shaft
23 facility if it is not developed as a repository.
24 If we turn to the next page, I have kind of a diagram
25 here that simplifies the view of the site characterization plan

1 relative to other detailed information. And here I will try
2 repeat my point about the level of detail.
3 If we look at the site characterization plan diagram
4 here think of it as a general plan. This is an umbrella. It
5 provides the initial framework for the overall program, the
6 rationale for the program and so froth. And realize that that
7 document is supported by, on the left side here in your
8 diagram, the number of technical references, conceptual design
9 reports, various analyses that might need to be supporting the
10 SCP.
11 It's important to also note though -- going back to
12 level of detail -- that on the right-hand side the details of
13 tests and procedures are not in the SCP, but they are in
14 separate documents that DOE refers to as study plans and
15 technical procedures.
16 While they are separate documents, some of them may
17 be released at the time of SCP, but many of them are related to
18 work that's upcoming in the future and they will be provided to
19 all parties for review after the SCP.
20 We turn to page 6. Now that I have gone through a
21 little bit of background on the SCP, I would like to discuss
22 the staff's plan to prepare SCP review plan. I would like to
23 repeat the fact that Reg Guide 4.17 and the annotated outline
24 are really guidance to DOE so that DOE can prepare the SCP.
25 Our SCP review plan is guidance for the NRC staff to

1 review DOE's SCP. So our review plan is really NRC's plan to
2 review DOE's plan. Kind of look at it that way, and it can be
3 confusing at times.
4 Now we are developing our review plans for major
5 documents in response to a requirement of our division's
6 internal quality assurance plan. We are also doing it, of
7 course, just out of common sense to have a common focus for our
8 staff and our contractors to know what's needed to do this job.
9 We also feel that this review plan will provide
10 consistency in the staff's review of the three SCPs that DOE is
11 planning on putting out.
12 Now we are currently revising a 1983 version of an
13 SCP review plan, and we are revising this plan based on the
14 experience we gained in writing a draft and final environmental
15 assessment review plan, and as the experience gained in just
16 conducting those reviews of the EAs. Trying to fold that
17 experience into writing this plan so that we can learn from
18 that experience. We think it's better this time around, and do
19 things more efficiently.
20 We are preparing a generic plan applicable to all
21 three sites, and we are also preparing a site-specific section
22 related to Yucca Mountain at this time, because that is the
23 first SCP that DOE will be issuing.
24 We will also be in the future preparing site-specific
25 sections, of course, for Hanford and Deaf Smith, but that would

be later. Our focus right now is on the generic plan and the Yucca Mountain part of it, the site-specific part of it.

DR. MOELLER: Well, now, you had an SCP from DOE for what, BWIP?

DR. JOHNSON: That's right, for BWIP Hanford.

DR. MOELLER: But they will redo that.

DR. JOHNSON: That's correct.

DR. MOELLER: Then you also have prepared an SCA, so you will redo the SCA. Okay.

DR. JOHNSON: That's right. That will be a the point of reference document.

DR. MOELLER: Yes.

DR. JOHNSON: The plan as we are developing it right now consists of three parts. We have a general review plan, technical review plan and administrative plan.

If you turn the page to page 7 and look at the general content of the general review plan. This consists of purpose and objectives, scope and approach to our review. It will also contain a general product description and summaries of state and tribal involvement with our review. Very importantly, the last item, it will discuss the relationship of our SCP review to other staff activities during the site characterization program.

I'm referring to here the staff will have, or be involved with detailed reviews on test plans and technical

1 procedures, and we will want to put into the con -- we want to
2 put our SCP review into the context of this overall involvement
3 with the staff and review of the program.
4 Now King will be in his presentation in a minute, he
5 will be going more into this general part of the plan, so I
6 won't go into more details here. This is the part that we have
7 best developed at this time, and we felt this as a good
8 starting point to brief you on this part today.
9 DR. MOELLER: Will the three areas, the general
10 review plan, the technical plan and the administrative plan, be
11 in separate sections then of the SCA?
12 DR. JOHNSON: There will be one document called the
13 SCP review plan, and it will just --
14 DR. MOELLER: Oh, it will blend the --
15 DR. JOHNSON: -- consist of three parts. It will
16 just have three parts --
17 DR. MOELLER: Well, will different people carry out
18 each portion of the review them? The three portions will be by
19 different people?
20 DR. JOHNSON: No, the three parts really serve to
21 give guidance to the staff in three different area. The first
22 part will hopefully very simply orient the staff to the actual
23 objectives and mission of the review in a very simple form, and
24 then the technical part of the plan will have more technical
25 details related to their discipline; how they would conduct

1 their own part of the review.

2 Then the administrative portion is really kind of

3 what the management will use to kind of organize and conduct

4 the review; that is, schedules and milestones and so forth. I

5 was going to get into that on the next page.

6 DR. MOELLER: Well, I guess I was just trying to

7 understand. These plans are guidance to the staff in reviewing

8 the SCP and in preparing the SCA.

9 DR. JOHNSON: That's correct.

10 DR. MOELLER: We should not interpret the fact that

11 there are three separate plans to mean that there will be three

12 separate reviews. They are just guidance to the staff in

13 dealing with different aspects of their review.

14 DR. JOHNSON: That's right. They all serve a

15 different function.

16 DR. MOELLER: Okay.

17 DR. JOHNSON: If you look at page 8, repeating just a

18 little bit. The technical review plan content will consist of

19 acceptance criteria and review criteria.

20 The acceptance criteria would be those items that the

21 staff will use to determine if the review can begin. And this

22 is primarily to determine if the SCP is substantive enough

23 relative to Reg Guide 4.17 and the annotated outline. It's

24 just looking to see if there is material there to review.

25 We're not looking at whether we agree with the material or not.

1 We are just seeing if there is substance there enough to begin
2 our review. That would be the acceptance criteria.
3 Now the review criteria would be --
4 DR. LINEHAN: Robert, let me just interrupt.
5 DR. JOHNSON: Sure.
6 DR. LINEHAN: A lot of people have a blank page 8.
7 So you may just want to explain it a little more.
8 DR. JOHNSON: Is that right?
9 DR. LINEHAN: Yeah.
10 DR. JOHNSON: Oh, I'm very sorry.
11 Is that true for everyone?
12 DR. LINEHAN: I know over here the ones we are
13 looking at. Maybe we are the only ones.
14 DR. JOHNSON: I'm sorry for that. Maybe people would
15 raise their hand that didn't have an 8? Do we have some extra
16 ones that have --
17 (Show of hands.)
18 DR. MOELLER: You need about five.
19 DR. JOHNSON: I'm talking kind of right through it,
20 so you may not miss much.
21 DR. MOELLER: Well, first of all, the technical
22 review plan then determines if the SCP has adequate data to
23 even go further.
24 DR. JOHNSON: The acceptance criteria part of the
25 technical review plan would identify and be the mechanism for

1 the staff to determine if the review should begin, if there is
2 enough information there to begin.
3 DR. MOELLER: Okay.
4 DR. JOHNSON: And then the next step is once you have
5 determined that, then you will review the material and develop
6 your comments. So the technical criteria, both generic and
7 site-specific, would be what the staff would use to assist them
8 in coming up with their comments.
9 DR. STEINDLER: I'm sorry. I guess I don't
10 understand the notion or the concept of determining whether
11 there is enough material in a site characterization plan to
12 begin its evaluation.
13 If that's all the data there are, I mean what kind of
14 criteria do you write down?
15 DR. JOHNSON: Let me clarify. It's not related to
16 having enough data to begin the review, because it is in the
17 beginning of their program, and that's not the objective.
18 The objective is that we have set up requirement --
19 not requirements, but we have set up guidance on what should be
20 addressed in an SCP, and Reg Guide 4.17 and agreements with DOE
21 and the annotated outline what kind of things DOE should
22 discuss in an SCP, what information they should have in there.
23 And we're just looking to see that DOE has been consistent in
24 following the guidance and the agreements that we have to make
25 sure that there is material in there, describing the various

1 programs, and material in there describing the rationale for
2 their programs and so forth.
3 So it's in no way making a judgment on whether there
4 has been enough data that has been collected to proceed,
5 because that's really what site characterization is about.
6 Okay, moving on page 8, I had a column here on the
7 administrative plan content, and I'll just talk through that.
8 It's the types of items that you would need to conduct a
9 review, to manage a review.
10 The review steps and the review activities would be
11 described. A general schedule would be identified; that is,
12 the duration of the various review steps. The organization and
13 responsibilities of the various people involved with the review
14 would be defined. And the general resource commitments
15 identified.
16 And very importantly, the next one is to describe the
17 product. We will have an outline for the site characterization
18 analysis. Like we have done for final EA review, we will
19 probably have a sample of the actual product so that it will
20 help the staff envision what they are aiming for, what the
21 product would look like.
22 We will also have a section on our internal quality
23 assurance requirements. We will have a section on records
24 management, what kind of records we would expect the staff to
25 keep to support these site characterization analysis. And

1 lastly, we will have a number of review procedures that give
2 more specific guidance to the technical staff in certain areas
3 on how to produce things.
4 Move to page 9; hopefully, everyone has page 9.
5 Lastly, in the preparation of our plan right now, we
6 have three task groups. There is a task group for each part of
7 the plan: The general plan, the technical plan and
8 administrative plan.
9 And on each task group we have a project manager. We
10 have technical staff representatives, and we have
11 representatives from OGC.
12 Our intent here is to involve all the parties that
13 are going to be doing the review of the SCP in the development
14 of the plan.
15 We will have regular management reviews and briefings
16 so that through the process and early on we can involve upper
17 management to get their feedback.
18 We are currently finishing up what we call point
19 papers and outlines, and these types of products are simplified
20 representations of the plan so that we can more easily get
21 agreement on fundamentals of our review and also more easily
22 facilitate the coordination between the people involved that's
23 writing the plan.
24 We plan on having an internal draft of the total plan
25 by the end of August, and then a final plan by the end of

1 September. We would be providing comments to the commission
2 and copies of the final plan to the commission, ACRS, DOE and
3 the states and tribes for their information.
4 DR. STEINDLER: Can you tell me what you expect the
5 contribution of the OGC representatives to be?
6 DR. JOHNSON: Well, they are working with us on
7 interpreting 10 CFR 60, helping the staff and just bouncing
8 ideas off of each other from a legal standpoint, from a hearing
9 standpoint to kind of look ahead to what would be required by
10 the licensing, or what might be required during the hearing
11 process to make sure that what we are coming up with in the
12 staff's review plan can have those needs in mind.
13 DR. ORTH: When you say tasks, then you don't really
14 mean they have clearly defined tasks. They are just a group,
15 what you said here; just a group of people that are wandering
16 around helping you?
17 DR. JOHNSON: No, we have a task group where
18 individuals are identified. They work together on developing
19 the case, the general plan. There are a number of people that
20 work on the general plan. There are a number of people that
21 work on the technical plan, and then others that work on
22 administrative plan. So it's an identified group that has a
23 leader, a project manager, and they will produce that part of
24 the plan with the review of the people and the staff.
25 For instance, under general plan, I think we have

1 four people. There is a representative, the project manager,
2 King Stablein on here. We have two representatives from the
3 technical branch, and then we have a representative for OGC,
4 and they all work together as --
5 DR. ORTH: Then these individuals are not the task
6 group of project managers, a task group of technical staff.
7 DR. JOHNSON: No.
8 DR. ORTH: Okay.
9 DR. JOHNSON: It's an inter-branch task group trying
10 to represent all the people that have an interest in doing this
11 review.
12 We want to have a plan that represents the staff
13 collectively.
14 Okay, that was the end of my presentation. As I said
15 before, King Stablein will be giving more details with respect
16 to the general plan. That is, he will be talking about the
17 objectives, the scope and the approach of our SCP review.
18 DR. MOELLER: Okay, do we have additional comments or
19 questions on this?
20 If there are none then, King, we will move ahead with
21 you.
22 DR. STABLEIN: Thank you very much.
23 I head up the task group for the general SCP review
24 plan, and I do have three or four people who work with me, and
25 who have helped to develop the point paper which you have

1 before you today. It has four pages to it.

2 The SCP is going to be 7 to 8,000 pages it would

3 appear at the current time. And all of the effort that we are

4 putting into this developing a review plan is to enable us to

5 be able to cope with this huge document in a reasonable period

6 of time. We are committed to review it within six months, and

7 it is our intent to provide to the staff the blue print to that

8 review such that they can confidently proceed, and they don't

9 have to be wondering what am I supposed to do when confronted

10 with this document.

11 So as I go through this today, this general review

12 plan, what I have attempted to do, and what my group has

13 attempted to do is to begin the process of enabling the staff

14 to effectively and confidently review that 7,000 page document.

15 Now the activities that the DOE will be engaging in

16 at the time of site characterization are designed to collect

17 the information they need to support a license application.

18 And the site characterization plan is to describe the program

19 by which they would like to obtain that information.

20 We, the NRC, are required by the National Waste

21 Policy Act to review and comment upon those parts of the SCP

22 that fall within our purview, and hence, we are developing this

23 review plan to help us fulfill that regulatory responsibility.

24 We have defined a three-fold purpose for our review.

25 The first one is to determine whether the SCP has that basic

1 information required by Part 60 and other documents that Robe
2 has mentioned to be in the SCP.
3 The second purpose is to identify whether DOE's
4 program, as they have lined out in the CP and the references
5 and selective study plans which will accompany the SCP, whether
6 their program will in fact enable them to obtain the data they
7 need to support a license application.
8 And, thirdly, to assess whether that program as
9 presented in the SCP and the accompanying document will have
10 significant adverse affects on the waste isolation capabilities
11 of the site.
12 So will their program be affective in getting the
13 data, and while they are getting the data, will they pose any
14 threat to the waste isolation capabilities of the site.
15 DR. MOELLER: In that though you -- the last one you
16 pretty much defined, have you not, in terms of how many shafts
17 that it can drill, and what diameter, et cetera?
18 DR. STABLEIN: We haven't defined for them how many
19 shafts they can drill or the diameter. We have had meetings
20 with them on the exploratory shaft at which these things have
21 been discussed. And we have come to some agreements with
22 Nevada, but there are many open items related to the
23 exploratory shaft which may only be resolved by the material we
24 receive in the SCP or with the SCP.
25 DR. MOELLER: Well, I knew you have told them not to

1 drill any exploratory shafts until what, the SCP has been
2 issued and you have had a chance to review it?
3 DR. STABLEIN: Right. The way the regulation reads
4 now they have to consider our comments on the SCP, and in
5 particular, the shaft-related.
6 DR. MOELLER: But at the moment then you have not
7 laid down any rules to them. They have to tell you what they
8 plan to do, and you will then evaluate whether it might have
9 adverse affects on the capabilities of the site.
10 DR. STABLEIN: That's right.
11 DR. MOELLER: Okay.
12 DR. JOHNSON: We have, if I may add a little bit, in
13 1983 provided letters to each of the three projects identifying
14 information that we felt was needed to address the topic of
15 potential adverse affects on isolation.
16 And since that time there have been a number of
17 interactions with each of the projects on those particular
18 questions, or information we identified. And each project is
19 different and we have cited a different approach to the
20 construction of the shafts. So there are particular site-
21 specific concerns that can evolve for each of the sites.
22 So we have identified to DOE over the past few years
23 our questions, the information we feel needed at each of the
24 sites. So that's an ongoing process.
25 DR. MARK: Could you divert for just a moment? I

1 have got a site and I have got an exploratory shaft. What are
2 the parameters, what are the considerations that go into your
3 thinking in assessing the negative aspects of such a shaft?
4 Obviously the diameter is one that you lay down. But
5 what else do you do with it? How do you think you know what
6 the negative aspects of a shaft are?
7 DR. STABLEIN: Although I'm not an engineer, we have
8 engineers on the Nevada team who are very knowledgeable about
9 shaft construction and the possible adverse affects.
10 DR. MARK: Oh, oh, the construction I think it would
11 be better handled by the Bureau of Mines rather than you guys
12 anyway. But --
13 DR. STABLEIN: Well, with regard to negative aspects,
14 one of the biggest is the rock damage that you may cause as you
15 sink the shaft, opening up new pathways for water to move to or
16 from the repository.
17 DR. MARK: Having been out at Yucca Mountain two
18 weeks ago, there isn't any water path. I mean all the pathways
19 in the world are there, but there is no water. That's the only
20 negative thing. I think every year they have a couple inches
21 of rain, and if that fell down the shaft, who would care?
22 DR. STABLEIN: This is not always the case in Nevada,
23 and given the long time period that we considered --
24 DR. MARK: What is the case at Nevada then? The case
25 at Nevada, as far as we know, a few inches of rain a year, for

1 our five.

2 DR. STABLEIN: Most years you don't have too much

3 rain, but some years they have floods out there.

4 DR. MARK: Not on top of Yucca Mountain they never

5 have floods.

6 DR. STABLEIN: In and around Yucca Mountain they do

7 such that the water could run down the shafts and into the

8 ramps, and it has been judged by the surface water hydrologists

9 that there is a need to consider the possibility of flooding

10 and its affects at Yucca Mountain.

11 DR. LINEHAN: Again, it's the time frame though that

12 we have to be concerned about with EP extended. You know, what

13 is going to be occurring there over the next 10,000 years.

14 DR. SHEWMON: I don't think he has visions of Noah's

15 Ark coming down on top of it, but of ground water running in.

16 And in that sense a flood of the mine. Certainly not the water

17 level rising to the top of Yucca Mountain. I find that

18 incredible.

19 DR. MARK: Well, with the shaft --

20 DR. LINEHAN: No, we're talking about surface water.

21 DR. MOELLER: The shaft is from the top of Yucca

22 Mountain.

23 DR. SHEWMON: Fine, okay. Well, surface water might

24 possibly.

25 DR. MOELLER: Not if they bore in horizontally.

1 DR. MARK: Look, I understand if you go down to the
2 lower level of Yucca Mountain, you can have water on the
3 ground. You have got to at least pay attention to that. But
4 the shaft I think comes in either horizontally or from the top.
5 And what I'm after is in what way do you lay hands on that and
6 worry about it, or do you only do it as seen from Washington?
7 You say there might be three inches of water and it
8 might run down this hole. If you go out there and look at
9 that, you know there isn't three inches of water. It will
10 never run down that hole. There would be no water coming in
11 from the sides whatever if the shaft is from the top.
12 DR. STABLEIN: Yes, I would like to correct one
13 thing, or one image we kind of have. The shaft isn't at the
14 top of Yucca Mountain. It's in a major wash, or near a major
15 wash. So just for context, we need to understand that it's not
16 sitting up at the top of the mountain.
17 DR. KING: If you're talking of a shaft from the
18 bottom of the mountain, then there is a wash, and you have to
19 worry about the water there. But is the shaft to be there?
20 DR. STABLEIN: Yes, it is.
21 DR. MARK: Where is the shaft?
22 DR. STABLEIN: It's in Coyote Wash, I guess.
23 DR. MOELLER: We will show slides this afternoon that
24 shows where the vertical shafts will be. We did not, or all of
25 us did not go over to that while we were out there.

1 DR. VERMA: In addition to the surface water, we
2 should also be concerned with the porched water. There is a
3 possibility that you may have porched water conditions. And
4 the drilling of the shaft when you put the shaft, you may open
5 some fracture or new pathways that porch water may come into
6 the shaft.
7 DR. MARK: Yes, but your -- I understand something
8 about porched water, either it's there or it isn't. If it
9 isn't there, then there is no worry about it. If it is there,
10 you either know it or you don't.
11 Are you going to assume there is porched water, or
12 are you going to look and assert there isn't, or what?
13 DR. VERMA: We will never be able to character our,
14 or DOE will never be able to characterize that size, that
15 certain people will say, hey, there is no porch water
16 conditions there whatsoever. You have to keep that in mind.
17 DR. MARK: Therefore, you will assume there is an
18 ocean of porched water whether there is anything or not; is
19 that the case?
20 DR. VERMA: I didn't say ocean. I said there are
21 porched water conditions there, and in arid zones that sort of
22 conditions do exist.
23 DR. SHEWMON: Porched water could come and go over a
24 year, or certainly a matter of centuries. That's your
25 position, is that it?

1 DR. MARK: Century is not a year.

2 DR. SHEWMON: Well, they have a rain storm every

3 other decade or something, in which they flood this, and that

4 might porch some water. I don't know.

5 DR. MARK: I'm very frightened of the whole picture

6 here as to the way one can approach it, because I know there

7 are many things you don't know. And if you assume the worst

8 case on every point, you will have a terrible time. And I

9 believe we are building ourselves into that.

10 So you say we have got to consider porched water

11 whether there is any there or not.

12 DR. VERMA: The conditions that are favorable,

13 because we will be looking at the future climatic changes.

14 DR. MARK: About which we know absolutely nothing, or

15 what? Are you going to assume there is a new ice age?

16 DR. VERMA: No, but that's climatology and how you go

17 about assessing the future climatic changes. But you have to

18 take that into account, but if the conditions favor --

19 DR. MARK: But if you don't know what it is, you

20 can't take it into account unless you merely assume some bad

21 possibility. Is that what we are committing ourselves to?

22 DR. JOHNSON: What we are looking for here is how DOE

23 in their SCP evaluates a potential for adverse affects on waste

24 isolation from any of their characterization activities. Shaft

25 being one problem. It would be looking at what they would

1 expect could happen and how they plan on mitigating those
2 potential adverse affects.
3 So if they make certain assumptions about the
4 availability of surface water in the future, for each future
5 10,000 years, we would expect to see, or we would be looking
6 for how DOE has incorporated those assumptions into their
7 designs of the shaft seals.
8 So if their program identifies, you know, the
9 potential for these conditions, and then designs for them, in
10 other words, they have a seal program that is going to prevent
11 that water from getting down there, then DOE has addressed the
12 question of, you know, potential adverse affects and they
13 mitigate it.
14 So the point I think King is making here in a review
15 plan is that this is an item in the rule that we need to be
16 looking at. We need to see how DOE has addressed it for each
17 of the three sites. Each one will be a little different based
18 on the conditions at the site. We will see how DOE's designs
19 are accommodating those potential adverse affects, and look at
20 their testing program to see how that testing program will
21 confirm some of their assumptions about these potential adverse
22 conditions.
23 So that's really the point we are making here in our
24 SCP review. It's an important area to review. DOE is going to
25 be presenting their analysis in the SCP and we will be

1 reviewing that analysis.

2 DR. MARK: Now you are not content just to go back

3 through the Holocene period and say the highest the water ever

4 got in the last 10,000 years was this. Therefore, we will

5 assume that that's all you have to worry about?

6 DR. JOHNSON: I think what we need to do is just look

7 at what DOE's case will be for each of the particular sites.

8 And for the Nevada site, we will be seeing what they assume.

9 you know, will be potential conditions, and then likely what

10 their design would be in response to those conditions.

11 DR. LINEHAN: We're not asking DOE to do the

12 impossible in this peer review group that goes back and looks

13 at past history, you know, and comes up with some consensus

14 about what the potential is over the next 10,000 years for

15 surface water, or changes in ground water. You know, that's

16 the type of thing we would accept from DOE. We know that there

17 is a lot of uncertainty here, and we are not going to be able

18 to pin it down, and they may not have to assume the absolute

19 worst case.

20 But there has got to be some type of consensus in the

21 technical community as to what's going to happen at that site

22 over the next --

23 DR. MARK: There can never be that. The best the

24 technical community can do is say what may have happened in the

25 last few thousand years. To look ahead to the next 5,000, the

1 field is open, and they can say is the water going to get 10
2 feet deep, or it's only 3 feet deep, and there is just no basis
3 for either of them making that statement.
4 The only basis you have is something you know. The
5 rest of it is something you can guess or posit, and what are
6 you guys going to do? Are you going to say, well, the water
7 might be twice as deep as you say, or what?
8 If you do hang yourself on what there is evidence
9 for, having happened, if there is a trend, I mean the water
10 level is higher now than it was a thousand years ago, then of
11 course you can extrapolate from that.
12 But are you in a measurable world at all? You keep
13 saying we have to guess what will happen in the next 10,000
14 years, and you know when you say it you haven't the foggiest
15 idea.
16 DR. LINEHAN: I myself in this area don't have the
17 foggiest area because, you know, I am not an expert. I have no
18 hydrology --
19 DR. MARK: But there aren't any experts on the next
20 10,000 years. Don't go looking for them.
21 DR. LINEHAN: No, but there are experts in different
22 areas, you know, whether it be ground water hydrology, whether
23 it be climatology; those are the type of people we are going to
24 have to rely on to give us some indication --
25 DR. MOELLER: Let's ask Mike and Connie if you can

1 offer any guidance, you know, clarifying remarks on this.

2 DR. KRAUSKOPF: First, I think you make it a little

3 bit worse than it actually is. We have very good evidence that

4 in the last 100,000 years the climate has not been very

5 different from the present. That is, the rainfall may have been

6 as much as three times the present at some times in the past.

7 DR. MARK: Look, I am totally prepared to accept

8 anything in the way of evidence as to what has happened in the

9 past.

10 DR. KRAUSKOPF: Okay.

11 DR. MARK: So if we get a high water mark from the

12 past, we should use it because it might happen again.

13 DR. KRAUSKOPF: Well, that's all right. So for the

14 next 10,000 years I think it's a reasonable guess that you are

15 not going to have rainfall more than three times the present.

16 Now admittedly that's a guess. I don't know any more than you

17 know. But --

18 DR. MARK: I think you do.

19 DR. KRAUSKOPF: But I think that's the only thing we

20 have to work with.

21 DR. MARK: All right. You see if all of this

22 discussion were with respect to evidence from the past and

23 forecasting that that will give us a bound, then I would not be

24 upset. But when it said we have got to allow for what will

25 happen in the next 10,000 years, then I get upset because I

1 know they don't know anything about that, but we do know
2 something about the past, and allow for that. Fine.
3 DR. KRAUSKOPF: I guess we agree then.
4 DR. MARK: Okay.
5 DR. MOELLER: Let's go ahead.
6 DR. STABLEIN: Let's move on to the scope of the
7 review. The actions that we would suggest taking to
8 accomplish the purpose stated. First of all, to ensure that
9 the SCP satisfies the basic regulatory requirements and the
10 NRC-DOE agreements concerning what needs to be in an SCP, the
11 basis information. We've alluded to that already. Robert's
12 mentioned the documents that might be of interest in
13 accomplishing that.
14 The next few steps all involve Part 60, and that's
15 basically the heart of the review, is to analyze DOE's SCP
16 relative to Part 60. First of all, relative to subpart E,
17 which is technical criteria. Also subpart G, part 60, which is
18 the key way aspects of the SCP. 60.15 deals with this topic
19 that we've been talking about here just shortly ago, which
20 emphasizes the adverse effects on repository performance from
21 the site characterization activities. We also wish to look at
22 60.21 and 60.31, content of application and construction
23 authorization just to make sure that it's not something covered
24 by the material in subparts E, G, and 60.15. The staff is
25 currently analyzing those sections of Part 60 to determine

1 that. And then finally to provide the results of the staff
2 analyses as input for the director's required statements on the
3 SCP. 60.18 calls for a statement from the director as to
4 whether we have objections to the SCP as it's laid out. It
5 also calls upon him to make recommendations and a statement on
6 the planned use of radioactive materials. So he can make
7 objections, he can make recommendations, comments --- he has a
8 range of possibilities and it's up to the staff to provide him
9 input such that he can go forward with them.
10 DR. MOELLER: Who is the director?
11 DR. STABLEIN: He is the office director, NMSS and
12 then Hugh Thompson directed it.
13 Now it's been the approach to the review, that the
14 first step is the acceptance review, which Robert has talked
15 about a bit before. It's been decided that there will be an
16 acceptance review to determine if the SCP is adequate in whole
17 or part to begin the review. And we're in the process of
18 developing the criteria for this acceptance review. I've
19 listed some of the documents that are under consideration to
20 make up the criteria and several of those are ones that you
21 heard mentioned before: 60.17, Reg. Guide 4.17, and so forth.
22 I'd like to point out that to the last one, add a
23 little Roman Numeral X, an examination of selected sections
24 beyond titles or key words to ensure that they are substantive
25 content for review. Just to emphasize that this is not a

1 checkoff review, but it's one where we will be looking to
2 ensure that we do have enough there of substance to review, and
3 not that they've simply omit what was supposed to be in the
4 annotated outline, the Reg Guide 4.17.
5 DR. MOELLER: But what's your intent, if your
6 examination is that, "no, that isn't enough," you are just
7 going to not look at any other part of it? Just fire the whole
8 thing back and say "fill it out," or are you going to review
9 it in detail and note the issues that are missing?
10 DR. STABLEIN: I would probably let John answer this
11 more thoroughly if the possibility exists of sending back to
12 the DOE, but that's not the only possibility under
13 consideration.
14 MR. LINEHAM: It's really going to depend on what's
15 missing. One of the things we're faced with is the six-month
16 review period. It's a massive document, and a lot of the
17 subject matter is interrelated, where, you know, if there's a
18 piece missing, it may affect your review in geology,
19 geochemistry, hydrology, you know, it may not be worth -- we
20 don't want to waste staff time and effort unless the document
21 is in order, you know, worth reviewing. I'm not necessarily
22 saying we're going to reject either. It depends on what we
23 find missing, and we will go back to DOE with that. But it's
24 really going to depend on what we find, what the problem areas
25 are? If there are any.

1 DR. STEINDLER: But there has been an agreement on
2 the detailed outline?
3 MR. LINEHAM: Yes. All of the --
4 DR. STEINDLER: Good. That outline's detailed enough
5 so that at least the topics have been agreed to? So that you
6 would not expect the prime holds in that at that level?
7 MR. LINEHAM: That's correct. And some of these
8 other items that are listed here, agreements on level or
9 detail, we've had meetings with DOE and we have gone down, I'd
10 say several tiers. And what is needed in the various areas of
11 the SCP.
12 DR. STABLEIN: Okay, assuming that we accept the
13 document for review, the second step is to prepare and to go
14 through a site characterization analysis. The primary review
15 focus is going to be the review relative to Part 60 subpart E,
16 "Technical Criteria." And the emphasis there will be on
17 identifying whether the program as presented in the SCP
18 references will yield appropriate site data supporting findings
19 on the performance objectives eventually. Because what this is
20 all about is repository performance. And at this stage, in
21 their program in the siting criteria are among the most
22 important things to look at. A thorough early review of the
23 SCP material related to those criteria is very important.
24 Whereas the design criteria, it's a little different
25 story inasmuch as they're in an early stage in their designs,

1 and hence, an intensive detailed review of the designs may be
2 premature.
3 What is not premature is to look at the rationale as
4 establishing what site data they need, the designers need, so
5 that their designs are able to contribute to meeting the
6 performance objectives.
7 And finally, there is some concern about reviewing
8 performance confirmation, because some of the long-term site
9 characterization testing may well carry over into the
10 performance confirmation phase, like the couple thermal
11 mechanical test. And so at this stage is again what we need to
12 keep in mind is the review of the overall test strategy and
13 rationale relative to performance confirmation.
14 Now, the six-part focus of this review of this part
15 of the review -- and these are kind of the key things we're
16 trying to get the staff to look at and focus on. Has the DOE
17 presented a site characterization plan that can achieve a basic
18 understanding of the sites? Obviously they've got to
19 understand the site well enough so that, when something
20 unanticipated shows up, some problem that they don't know of
21 right now, they have enough knowledge of that site to be able
22 to deal with that in the natural or the engineered barriers.
23 Secondly, has DOE addressed all the major issues
24 relevant to the site? First of all, we would be looking at
25 definitions of fundamental, generic terms, like "substantially

1 complete containment," how they've defined the engineered
2 system boundary, and engineering issues related to the site,
3 like the boundary of the disturbed zone, and scenario
4 identification methodology.
5 After that we move on to the site specific issues,
6 the ones that have already been identified in places such as
7 the final EA comments, the list of what are called the "site
8 busters," the big issues that have been identified that could
9 be fatal to the site, the fault activity at Yucca Mountain, for
10 example, and exploratory shaft related open items that Robert
11 mentioned being initiated in a letter in 1983 and we've been
12 tracking ever since in interactions with the DOE right up to
13 the present time.
14 Thirdly, has DOE correctly identified the kind and
15 amount of information needed to resolve those issues? And so
16 having identified the issues, have they identified the
17 information that they're going to need to resolve the issues?
18 Fourth, have they lined out strategies, programs and
19 investigations that can provide that information needed to
20 resolve the issues? And here it's important to keep in mind
21 the integration of the programs, the cross disciplines, since
22 this is a multidisciplinary study, the site characterization
23 activities.
24 DR. MOELLER: What does it mean if the investigations
25 "lined out?"

1 DR. STABLEIN: That's probably a colloquialism. I
2 could have used a better term. Have they laid out strategies
3 and programs, is what would have been a better program.
4 DR. MOELLER: Thank you.
5 DR. STABLEIN: Fifthly, have the investigations that
6 they've laid out to provide the information been planned so
7 that one test does not interfere with another test? The
8 possibility exists that they could interfere with their own
9 data gathering activities, so they have to have their spatial
10 and time sequencing of tests so that they don't interfere with
11 eachother.
12 And finally, have they laid out their site
13 characterization activities such that they can be carried out
14 without adversely affecting waste isolation capabilities of the
15 site? We've already talked about the possibility that in
16 putting down the shaft and doing the shaft testing, they could
17 affect capabilities of the site.
18 The primary portions for review of the SCP with
19 regard to subpart E of Part 60 would be sections 8.2, 8.3 and
20 8.4. Robert gave you a breakdown of the SCP earlier. These
21 are the sections that lay out the issues and how they plan to
22 resolve them and have them planned. This doesn't mean that we
23 would ignore chapters 1 - 7, where they provide us the
24 information that they currently have on the site. But the way
25 we would envision the review going, comments made on those

1 chapters should be incorporated into comments in chapter 8, in
2 terms of their significance to issues, information needs or
3 plans.
4 We've commented on chapters 1 - 7 already in the FEA
5 comments, Draft FDA comments -- there's no point in going back
6 and offering them comments just on those without casting those
7 comments in terms of the site characterization plan, which is
8 8.2, 3 and 4. And we would, at this time we're thinking that
9 this part of the review can be carried out utilizing DOE's
10 issue hierarchy, which is correlated with subpart E of Part 60,
11 and we would cast our comments, if possible, in terms of the
12 issues hierarchy's structure, so that we are reacting to their
13 document in the structure that they've laid out and that
14 they're most familiar with. Hence, hoping to maximize
15 communication back and forth here, as we work with them on the
16 site characterization plan.
17 Okay, that's the primary focus of the review, is that
18 subpart E. We will also be reviewing relative to subpart G the
19 Q/A portion. And here the focus is whether the DOE has
20 developed a Q/A program that provides assurance that the
21 information collected to resolve issues is of demonstrably good
22 quality. The primary SCP portion for review will be 8.6 which
23 is Q/A portion. And this part of the review will be conducted
24 in accord with 60.150 - 154, and the NRC review plan, which Jim
25 Kennedy, who spoke to you earlier today, is responsible for.

1 Q/A programs for site characterization of high-level nuclear
2 waste repositories.
3 And finally, I mentioned before, review relative to
4 60.21 and 60.31, as appropriate as we discover anything that
5 isn't covered by the other portions of the review.
6 That's about as far as I'm prepared to go today in
7 explaining how we intend to review the SCP. I welcome any
8 questions that you have.
9 DR. MOELLER: Don?
10 DR. ORTH: To do a good job of doing such things as
11 what to mean -- whether they've made out all of the
12 investigations that have to be done to resolve all the major
13 issues, et cetera, you're going to need at least equivalent
14 expertise, if not better, to what DOE has. How many people do
15 you have lined out to answer all this 7,000 pages in six
16 months?
17 DR. STABLEIN: Well, the basic group is the Nevada
18 team, which has five dozen people in it. Enhancing that group,
19 we have other staff as needed, and we have our contractors as
20 well. You asked for a number and I'm not giving you a total
21 number, I realize that.
22 But I'd like to emphasize, and I've already
23 recognized the massive nature of the document, what I'd like to
24 emphasize is the preparation that's going into getting ready
25 for this review, because you're perfectly correct that we

1 wouldn't have a prayer of doing this review if we're not
2 totally ready when the document comes in. And the preparations
3 have been going on over the past several years in terms of the
4 issues, but to be more near-term about it, Robert mentioned one
5 of the other task groups, which is currently developing the
6 review criteria in each discipline, such that the staff would
7 be ready and knowing what it is that they're looking for, how
8 they plan to be looking for it. This is all intended to have
9 us ready to do the job on the review.
10 MR. LINEHAM: Another point to this technical review
11 criteria is we are not going to review everything. We're going
12 to have to pick and choose those things that we can review.
13 Because of the volume that's gong to be presented.
14 MR. JOHNSON: Let me identify the site-specific
15 issues and some of the generic issues that we're developing in
16 the review criteria -- that's intended to focus the staff on
17 the selective portions that we would really get into in detail
18 of our review. But we would be presenting those and results of
19 our review of those selected items as examples of maybe
20 concerns that we have of the certain aspect of review of this
21 program. So that we would be asking and recommending DOE to
22 look at their overall, let's say, geochemistry program, see if
23 the concerns that we've identified in our selective review are
24 also in other parts of their programs. So we would be
25 maximizing the use of our staff -- it's has limitations. The

1 document is large, but we're trying to focus our review such
2 that it would be effective, look at the primary concerns for
3 the site, and then we'll use the concern that we come up with
4 as sort of indicators of DOE's program in those particular
5 areas and ask them to look at their program from a broader
6 perspective.
7 DR. MOELLER: Remind us again, when does it all
8 start? When will the first SCP? When is it scheduled?
9 DR. STABLEIN: It's currently scheduled for September
10 28.
11 DR. MOELLER: And then you have six months from then?
12 DR. STEINDLER: That's right.
13 DR. STEINDLER: Will September 28 be the first day
14 you will have seen any portion of chapter 8?
15 DR. STABLEIN: No, it's currently available in DOE's
16 public reading room. It's not just available to us, it's
17 available to anybody in the states and tribes that are aware of
18 that. And our staff has been going down and getting -- in fact
19 all the team members have been down to see the chapter 8.
20 Now it has continued to be revised almost up to the
21 present time, but we have kept current with it as much as
22 possible.
23 DR. STEINDLER: You have to go down to see it rather
24 than having somebody mail you a copy? Another figure of speech
25 is, in the "real world?"

1 DR. STABLEIN: We did receive chapters 1 - 7 in the
2 mail, but you asked about chapter 8. We do have to go down to
3 see it. But given that it's several thousand pages, it's
4 pretty convenient to look at it down in the reading room.
5 DR. MOELLER: And you don't -- you have not made a
6 copy and brought it back with you?
7 DR. STABLEIN: No, we haven't.
8 DR. MOELLER: Does that imply you haven't started any
9 portion of the exercise of analysis of what's in that?
10 DR. STABLEIN: At the present time we are engaged in
11 developing how we're going to review that document. And in
12 looking at it, the people who are on the technical review task
13 group, are folding that information, what they see, into their
14 review criteria, at least I suspect they are. I'm not on that
15 task group.
16 So that we are getting the jump on it in that
17 respect. But we are not conducting a review of the draft SCP.
18 MR. JOHNSON: Our readings are for developing our
19 plans and for familiarizing the staff that are doing the review
20 with the document, so that they just know it better. It can
21 help them understand it better.
22 DR. MOELLER: Your review plan will be completed
23 prior to the issuance of the SCP?
24 MR. JOHNSON: Right.
25 MR. LINEHAN: Just what, then, of the draft that is

1 available in the public reading room, in some areas, and I
2 believe in chapter 8 it's one of the big areas, it's going to
3 be significant. The final SCP will be significantly different.
4 There were quite a few changes that were made. DOE is in the
5 process as I understand of still making them, so since the
6 document was changing and the indication was that it would be
7 significantly, we decided it wasn't worth the effort to start
8 any type of detailed review on the draft.
9 DR. MOELLER: Okay, a question: once that arrives,
10 if our past experience has been true, we hardly see you people,
11 you know, you're off working 24 hours a day. What role would
12 this Committee, subcommittee possibly, have? What role would
13 be helpful to you, or what could we do while you're review is
14 underway? Is there anything that -- any role that we should
15 anticipate, or any function that we might anticipate being
16 called upon to help on?
17 MR. LINEHAM: To be honest with you, we hadn't
18 considered any specific role for the ACRS. What our plan calls
19 for is to present it to the Commission. Out of the six-month
20 period that we have, five months is allotted to the actual
21 review and preparation of the SCA and then a month for
22 Commission review.
23 DR. MOELLER: Okay, you'll give it to the
24 Commissioners one month before the deadline for them to do a
25 reading and feedback to you?

1 MR. LINEHAM: We're not sure what the mechanism is --
2 yes, there will be something. We're not sure what the
3 mechanism is.
4 DR. MOELLER: Well, it's quite possible we could
5 check with the Commission. They may want to have us review it
6 concurrently and give them our input.
7 All right, we can check. You know, I'm trying to
8 feel my way along, our way along. But that's one distinct
9 possibility. They may very well ask that it be given to us at
10 the same time. Okay.
11 DR. STABLEIN: You have to remember that there are
12 only five of us.
13 DR. MOELLER: That's right.
14 DR. STEINDLER: King's got a whole dozen.
15 What is the nature of your product? Are you planning
16 a fairly detailed description of where you think the pros are
17 most likely -- the negative aspects of the SCP are? Or is it
18 going to be a terse listing of, "the following sections are
19 inadequate, period?"
20 DR. STABLEIN: I can be corrected on this, but I'm
21 currently working on what the product should be, the site
22 characterization and that analysis. And my concept of it, and
23 I think in talking to Robert and the other staff, is that it
24 certainly wouldn't be a terse listing of problems. It would be
25 substantive comments of a major order. And in the comment

1 itself, I would anticipate we would be making it clear what the
2 problem is, such -- and the significance of it, and I don't
3 know about the recommendations portion. We have the right to
4 give recommendations according to Part 60. But my concept
5 would be fairly large comments of a major order, rather than
6 some terse, non-communicative listing sort of thing. I'd like
7 to ask John or Robert to add to that, though.
8 MR. JOHNSON: I think King is right in characterizing
9 maybe the bulk of the document as a number of specific
10 technical comments in each of the technical areas, but there
11 will also be a summary or a synthesis of these technical
12 comments relative to the major items that King broke out there,
13 so there will be kind of a way to communicate to a number of
14 different audiences. On the technical scale and more at the
15 management scale. They're interested in broad conclusions
16 relative to major parts of the program. So we would be also in
17 these broad summary areas making conclusions, identifying if we
18 have objections, or if we don't have objections, and also
19 making recommendations as seems to be fitting a particular
20 problem. So it should be a combination of broad conclusions
21 and objections as well, supported by specific technical
22 comments.
23 DR. MOELLER: And to help me now, the date you'll
24 give it to the Commissioners is roughly March 1, 1988? I
25 guess your report is due March 28?

1 MR. JOHNSON: Is that the five months?

2 DR. MOELLER: If I added it right?

3 MR. JOHNSON: Roughly.

4 DR. MOELLER: Any additional comments or questions on

5 this topic?

6 Well, this has been helpful to hear how you're

7 developing your plan, how you intend to go about the review.

8 We appreciate your coming down. Thank you, Bob, and King, for

9 your help.

10 Okay, we'll recess. One hour for lunch.

11 (Whereupon at 12:30 p.m. the hearing was recessed.)

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1 A F T E R N O O N S E S S I O N

2 (1:30 p.m.)

3 DR. MOELLER: The meeting will come to order. The
4 next item on our agenda under the rearrangements within the
5 agenda is a discussion of the Subcommittee's visit to Nevada.
6 We reported this morning on the meetings at the University of
7 Arizona. And I will give a brief summary, and then we will
8 call upon other members of the Subcommittee for comments.
9 And I understand that Keith McConnell has or I know
10 that he has slides which he took of our visit which we would
11 like to take time to show.
12 I think that all of you have a copy of the summary
13 report of the ACRS waste management field trip. Let me
14 emphasize that this summary represents my thoughts, and it is
15 not something that even the Subcommittee has gone over and
16 approved. But nonetheless, I used it as a vehicle to remind me
17 of what we saw and to summarize my general impressions.
18 On page three, item III, it begins the summary of the
19 DOE presentations and our interactions with the people in Las
20 Vegas. And III-A refers to the presentation by the NRC on site
21 representative. I think that all of us were very impressed
22 with Paul Prestholt, the NRC on site rep. And he has a
23 background in geology and QA, and I am sure that most of you
24 know that.
25 He also impressed us as having a solid grasp of the

1 project, and he stayed with us throughout our briefings by DOE
2 as well as our tours the next day out through the site at Yucca
3 Mountain.
4 There are a couple of items that I thought were
5 important that Paul shared with us, and that the DOE staff also
6 shared with us, and was the fact that they said that the NRC
7 needs to give more attention to the guidance being provided to
8 the DOE staff. And this was not universal. It was just on
9 several key items.
10 But at present, they claim that such guidance
11 sometimes is less than effective. Some terms are not clear,
12 and certain terms are not clear. And the DOE staff does not
13 always understand what NRC desires to be done.
14 And one thing that came up on which they indicated
15 that they would like specific clarification on was the fact
16 that the NRC regulations which are based on EPA standards
17 specifies limitations on groundwater travel time. And they
18 felt that what is important is is the rate at which the
19 radionuclides in the water move.
20 And they thought if that is true, if they have a
21 clear interpretation of what is important, and if the NRC
22 concurred, then some sort of a clarification would be helpful.
23 DR. STEINDLER: Was not the question that was raised
24 as to what really is meant by groundwater travel time in an
25 unsaturated system?

1 DR. MOELLER: Yes. That was another part of it.

2 DR. STEINDLER: How do you define groundwater travel
3 time in an unsaturated system in order to be able to determine
4 whether or not you comply with the regulations? I thought that
5 was the issue.

6 DR. MOELLER: I think that probably was more than
7 what I have cited. Another item was Mr. Prestholt's expression
8 or indication that at certain times it appeared that a lack of
9 travel funds at headquarters had restricted the amount of help
10 or the number of people who could come out and support him on
11 particular items on which he felt that he needed support.

12 We checked that out this morning with the NRC staff,
13 and they indicated that, and as we well recognize, that this is
14 Paul Prestholt's vision of the situation or his impression of
15 the situation. And the headquarters staff felt that when
16 people really were needed that they are being made available.

17 They also expressed the opinion that there was little
18 Commission interaction with the NRC high level waste operations
19 in the field. And in fact, they indicated to us that insofar
20 as they knew, no Commissioner had ever visited any of the
21 sites.

22 Later I talked to Chairman Zech, and he said that he
23 had visited the BWIP site. And then we were also told this
24 morning that perhaps another Commissioner.

25 Now there were also questions about the availability

1 of written reports pertaining to the high level waste
2 repository investigations and related work. We were somewhat
3 disappointed that neither Mr. Prestholt or any of the DOE
4 people who appeared before us, which included Sandia, and Los
5 Alamos, and headquarters people, had seen any of the recent
6 ACRS letters on the subject of high level waste management and
7 disposal.
8 We also recognize and we had not asked for them and
9 been turned down, but we recognize that we do not see the
10 quarterly reports or the monthly reports, whatever that are
11 submitted to headquarters by your on site representatives.
12 Having met Mr. Prestholt, we began to think that
13 maybe his reports would be of interest to us, certainly this
14 summary at the front of the report. And this morning again the
15 NRC staff indicated that they indeed could make these available
16 to us. And we fully recognize that we see more paper now than
17 we can handle. But those reports sounded like they might be of
18 interest.
19 Lastly, the question was raised in a discussion as to
20 whether the three sites currently proposed were all receiving
21 comparable attention from say DOE and perhaps from NRC also.
22 And that just came up. We thought that it was a good question
23 to contemplate.
24 We then heard a presentation by the State of Nevada
25 representative Carl Johnson. And he, of course, he described,

1 as you are more familiar than we are, his organization and how
2 many people work with him and so forth. And then he outlined
3 for us the six critical issues that he saw in relation to the
4 Yucca Mountain proposed repository. And three of these he
5 considered to be critical, and these were future faulting and
6 other tectonic events, future vulcanism, and possible
7 interference by humans, particularly from the standpoint of
8 exploring of natural resources.
9 He also indicated that he was concerned about the
10 potential impacts on the site of future underground nuclear
11 weapons tests at the Nevada test site. At that point, the DOE
12 staff became to me what seemed like a little bit irritated,
13 because they felt that they had gone over that particular
14 question with Mr. Johnson on several occasions.
15 They pointed out that limitations on the shaking of
16 the ground in the City of Las Vegas would in some sense perhaps
17 assure protection of the Yucca Mountain region. They also went
18 over future trends, geographical trends, and where future tests
19 would be conducted. And they tended to claim that if anything
20 the sites will be moving farther away from Yucca Mountain
21 rather than closer to it.
22 With respect to his presentation, we observed a
23 number of somewhat eye opening items. And I do not know where
24 we got this number, but we were clearly given a number that the
25 State of Nevada had received $100 million from DOE over the

1 last six years in support of their capability to conduct
2 independent evaluations of the Yucca Mountain site.
3 I noted later that in DOE's annual report to Congress
4 dated April of 1987 that they listed a total of about $7
5 million for the last three fiscal years, 1983 through 1986,
6 going to Nevada. So somewhere we heard it wrong. But yet I
7 must admit that he told about this in excess of one million
8 contracts that they was granting to various Nevada
9 universities. So it could be that neither one of these numbers
10 is correct, but that is what we had.
11 The thought occurred to me which I expressed this
12 morning that perhaps one approach that DOE should consider, and
13 we realize that we are talking to the NRC, but one approach
14 that DOE should consider would be to have the states and Indian
15 tribes who are receiving funds receive such funds on a matching
16 basis. I mean if the State of Nevada had to put up a million
17 dollars for every million that the DOE gives them, they might
18 not keep saying that they are not getting enough money.
19 If you look at EPA's grants to states for the
20 construction of sewage treatment plants, those are always on a
21 matching basis. And I cited this morning my own experience,
22 for example, in dealing with the National Science Foundation
23 for grants. They and many other government agencies require
24 universities to put up matching funds in order to qualify for a
25 given grant or even a contract.

1 Mr. Johnson indicated that the Governor of Nevada has
2 thoroughly indicated that he is opposed to the siting of the
3 repository in the state. And since Mr. Johnson clearly pointed
4 out to us that he is a political appointee and must be
5 responsive to the Governor, we wondered a little bit about the
6 objectivity of his reviews.
7 Also we found that although the State of Nevada and
8 the NRC would appear to share identical objectives, that is to
9 keep DOE honest and on the ball, insofar as we could determine,
10 the two organizations do not conduct any research activities on
11 a cooperative basis.
12 And although Mr. Prestholt certainly was up-to-date
13 on what Nevada was doing, we thought that maybe there could be
14 a closer interaction there than currently exists. If there are
15 constraints on that, that might change the picture.
16 Then as a third item on the meetings on the first day
17 in Las Vegas, we heard presentations by the DOE staff and its
18 contractors. I think that those presentations represented a
19 lot of sound preparation. Having talked to some of them, I
20 understood that they had rehearsed extensively for their
21 presentations, and the lectures clearly indicated such
22 preparation.
23 Donald Veep, who began with just a few words to us,
24 said that they are trying to gather sufficient scientific data
25 either to support or to deny the acceptability of a repository

1 at Yucca Mountain. And that they are also striving for
2 intellectual honesty in pursuit of these goals. He came across
3 quite well. I realize that he is no longer there. But at
4 least his message sounded good.
5 We then heard individual presentations by DOE
6 representatives on site characterization, on the groundwater
7 travel time, geologic faults, vulcanism, and hydrothermal
8 activity.
9 Some of the questions that we raised I summarized in
10 our report. And during the DOE presentations, they had a
11 person there who was the facilitator, and her job was to keep
12 the meeting if she could on time or on schedule, and also to
13 pull out key questions that might have developed into lengthy
14 discussion, to pull those out and write then on the board and
15 to come back to them at the end of the meeting, or leave them
16 for written responses.
17 So at the end of the meeting, we asked DOE with their
18 concurrence that they provide written responses to the
19 Committee on these items. Now again I do not recall that all
20 of these will be covered, but I think that certainly some of
21 them will be.
22 And some of those topics then was how will the
23 integrity of the completed repository be determined. That is
24 you might seal shafts in a field exercise or in the laboratory,
25 and you might say, well, it works there, so I assume that it

1 works in the repository. But we wondered what assurance can
2 DOE give to the NRC that the shafts as sealed in the true
3 repository will have the integrity that is claimed.
4 Then we asked what is important, the travel time of
5 the groundwater or the radionuclides that it contains. And I
6 think that the travel time in the unsaturated media should be
7 added to that.
8 We asked how were the retardation coefficients
9 determined, and in fact could more information be provided on
10 all of the geochemistry work from the standpoint of how was it
11 assured that collected samples were representative, that their
12 analyses were accurate, and that the interpretation of the
13 resulting data were properly conducted.
14 Then Dr. Trifunac, the previous one being Dr.
15 Krauskopf, then Dr. Trifunac asked about information regarding
16 measurements of the stress fields in the area, where did the
17 numbers come from, and that details of the calculations should
18 be provided.
19 Fifth, indications are that the underground nuclear
20 weapons tests have altered the water tables in the area. This
21 I think was Frank Parker. We asked for data on these changes,
22 some information on that subject.
23 And then we asked for the procedures for determining
24 performance allocation for the various parameters within the
25 repository, that they be carefully documented and provided to

1 the Subcommittee.

2 And then we encouraged them in the future when they

3 make speeches that they seek not only to meet the NRC

4 regulations, but that they also indicate that they have a

5 common goal of protecting the health and safety of the

6 environment and the public.

7 Then the third day which was the second day in Nevada

8 we had our site tours or field trips, the first day of course

9 being an indoor meeting for the entire day and discussions and

10 hearing lectures and so forth.

11 On the third day, we did see the drilling rigs. I

12 have often thought since coming back about the critical time

13 factors in trying to get a repository constructed, and it

14 seemed to me that some of the advances in drilling that we saw

15 at the Nevada test site might, you know, speed things along

16 when they reach that point, because it is certainly impressive.

17 And I do not remember off the top of my head the name

18 of the young man who took us through, but he certainly knew

19 what he was talking about, and he could answer our questions.

20 It was a very interesting experience.

21 We then went into the G tunnel, and we saw the welded

22 tuff there. And I would leave it to the experts, but the thing

23 that I took away with me was the fact that it was highly

24 fractured and cracked. Within the Yucca Mountain where the

25 welded tuff layer is thicker and cooled more slowly, we are

1 told that everything there will be much better. You know, I
2 will wait and see.
3 We went into the spent fuel tests at Climax and went
4 down into the granite excavation and saw the remote handling
5 machine, and we saw where they had placed the Turkey Point
6 spent fuel elements and so forth.
7 Again certainly that was positive as far as I was
8 concerned in that they certainly showed for the three year
9 period that they could remotely handle fuel, lower it into a
10 semi-repository in granite, and leave it there for three years,
11 take measurements, and then retrieve it and take it away.
12 We saw the Sudan crater, and then lastly we went up
13 on Yucca Mountain. And while we were on top of the mountain,
14 we saw where the base camp or whatever you would call it would
15 be. Some of us saw where the exploratory shafts would be
16 drilled. And while there, the two or three USGS staff members
17 who were doing tests were there, and they had all of their
18 charts and graphs. And they spent an hour and a half or two
19 hours in giving us presentations on what they are doing, what
20 they have observed, and so forth. That was extremely useful to
21 us.
22 So all in all, I cannot speak for the Subcommittee,
23 but on this aspect I can certainly say that it was an extremely
24 beneficial experience for me personally. And now when I read a
25 document about something, I can at least picture or sort of

1 feel what I am reading about.

2 And everybody had gone far out of their way to meet

3 each and every need, and to answer all questions. And I want

4 to commend again the DOE staff. They were well organized, they

5 were well rehearsed, and I felt that they did not avoid

6 questions. They tried very definitely to answer the questions

7 that we had asked.

8 Yes, Carson, and then we will go around.

9 DR. MARK: One thing. You mentioned Paul Johnson.

10 DR. MOELLER: Carl Johnson.

11 DR. MARK: Carl Johnson's presentation. That bit

12 about the possible horrible consequences of explosion testing,

13 it was absolutely out of whole cloth, was totally unreasonable,

14 had no basis whatsoever in fact, and it was just pitiful. And

15 unfortunately, it sounds good. We should be aware of that.

16 There was nothing whatever to the concerns that he

17 attempted so hard to raise. First, there has been no effects

18 from any testing that have gone on. Second, there is no

19 likelihood that those tests will continue to go on. Third,

20 they will not necessarily go any closer or anything.

21 So he was just building that up out of publicity type

22 pitch. And we should certainly be aware that that was buffonry

23 of the most atrocious sort.

24 The other slight thought that came to my mind, and

25 again your account was excellent, it covered everything, the

1 DOE might very well do a little more than they seem to be doing
2 about offering to take people through some of the sorts of the
3 things that we saw just as public education.
4 If anybody went through that G tunnel and asked am I
5 going to be worried if there is radioactive stuff stuck in
6 here, he will get the answer right away, I am not going to be
7 worried. If he went on top of Yucca Mountain and said maybe
8 there is a flood, he will say, well, maybe not here, and he
9 will forget it.
10 They could do an enormous amount of public relations
11 which they do not seem to be doing. Now that is not the NRC.
12 The NRC worries too much here and there in unlikely scenarios.
13 The business of seismicity on which Mike can speak well
14 obviously had to be wondered about, but it obviously does not
15 mean a thing.
16 Supposing that you have a tremendous seismic shock
17 down in the storage room, who cares. Maybe some containers
18 crack, so what. The only thing that could really remain as a
19 worry is volcanism, and that is the one thing on which a little
20 bit of forecasting does seem to be possible. If there is no
21 hot magma downstairs, then there is no volcanoes about to come
22 out.
23 The other thing that was mentioned this morning, of
24 water, it seems to me that instead of being so careful not to
25 drill any holes or to drill a few more and come up with the

1 announcement that there is not any and there will not be any
2 short of a few hundred years of climatic cycling.
3 DR. MOELLER: On your volcanism, let me offer a
4 couple comments. Either the DOE or the NRC staff, I do not
5 remember which, perhaps it was the DOE staff, said -- no, it
6 was not, it would have to be the NRC people -- said that
7 volcanism, you know, was a recent concern, because this one
8 mountain that you could see off in the distance may have been
9 active as short of 20,000 years ago.
10 Having said that, then they pointed out to us, number
11 one, that historically, and I do not even know the word for how
12 much energy a volcano releases, anyway that amount of energy
13 had been going down. So we were on a downward trend. Do I
14 understand that wrong?
15 DR. MARK: That may be what they say, but I do not
16 think that there is any evidence that we know anything about
17 that.
18 DR. MOELLER: Well, that is what I heard. And the
19 second thing that they said was that the risk analyses which
20 they had done showed that even that if you had volcanism in a
21 repository say in the Yucca Mountain, a repository, that you
22 got a milirem or so, you know, to the nearby people.
23 DR. STEINDLER: Are you attributing this to NRC or to
24 DOE?
25 DR. MOELLER: Well, the concern was NRC's, I guess.

1 DR. STEINDLER: The other ones that raised the iss
2 about the centercone out there where we have got conflicting
3 analyses, and the most recent one is about a 10,000 or 20,000
4 year old happening.
5 DR. MOELLER: Correct. Now the NRC raised the
6 concern, I guess, the data that we were told, those two facts,
7 tended in my mind to sort of say or tended to cause me to
8 question the true importance of this even if it should happen.
9 I mean if it is less than a milirem under the most conservative
10 projections of dose, then it did not seem to me to be all that
11 important.
12 DR. MARK: I would differ with you, Dave.
13 DR. MOELLER: Okay.
14 DR. MARK: I do not think that anyone knows how to
15 say whether it is a milirem or a dozen rem.
16 DR. MOELLER: Okay.
17 DR. MARK: If you have a spewing out into a vaporized
18 phase of the stuff in the repository, who is to say what might
19 happen. I do not think that they have any basis for saying
20 that they know. I think that you have to go back, and here I
21 very happily go back, to the unlikelihood that there will be
22 any volcanic action at that spot of the sort that matters, and
23 that is where I think that we should hang our case.
24 If you will remember Jim Wright, a colleague of
25 yours, Connie, a geologist from Stanford.

1 DR. MOELLER: Jim Wright, does that ring a bell?

2 DR. KRAUSKOPF: That does not.

3 DR. MARK: Maybe I have it wrong.

4 DR. KRAUSKOPF: John Stuckles?

5 DR. MARK: A very nice man, who used to come see us.

6 And I said Jim Wright, and I am probably wrong.

7 DR. KRAUSKOPF: Bob Wright?

8 DR. MARK: Bob Wright.

9 DR. KRAUSKOPF: On the staff, he was on the NRC

10 staff.

11 DR. MARK: No. This guy was from Stanford.

12 DR. KRAUSKOPF: George Thompson.

13 DR. MARK: George Thompson. Anyway he in answer to a

14 question once said that you can hope to have about a 5000 year

15 warning if vulcanism is likely in some particular location. He

16 said beyond 5000 years, you simply do not know. It could move

17 around. It is a matter of what is going on downstairs. But

18 you could have a warning of that sort.

19 Now they have got warnings of that sort out here, and

20 they know that there has been vulcanism, and they know that it

21 is possible that it could happen again. We in Los Alamos live

22 on the shoulders of 1000 feet of tuff that came out of the last

23 time that happened. There is no indication that it is likely

24 soon, and that is all that we have to go on.

25 But if there is a volcano through this, then all of

1 the canisters have gone and all of the stuff is in the air, a
2 it depends on whether anyone lives there or not. Now at Yucca
3 Mountain, no one lives there, so it does not matter anyway.
4 But an estimate of an milirem is almost certainly meaningless,
5 because you do not know what you start with.
6 DR. MOELLER: Okay. That is a good point. Mike and
7 Connie, when we get around to you, you can talk about the
8 biological effects, because we are covering seismicity and
9 those topics on this side of the table.
10 DR. PARRY: Dade, I think that the staff has some
11 comments, clarifying comments that they wanted to make.
12 DR. MOELLER: Keith.
13 DR. MCCONNELL: Keith McConnell from the High Level
14 Waste Division. I just wanted to address one question that
15 came up when he was making his presentation about the releases.
16 And I asked him about the report that he was referring to, and
17 he mentioned Logan and others in 1982. Well, recent analysis
18 by John Trap within the NRC has shown that that report is dated
19 and probably not accurate. So any releases gotten from that
20 report are probably not accurate either.
21 DR. MOELLER: Thank you.
22 Martin, did you have any comments?
23 DR. STEINDLER: I am still trying to calculate that
24 number of milirems if you have volcanism through a fully loaded
25 repository. And it is not very many microcuries per square

1 foot if you make any kind of back of the envelope estimate.

2 DR. MOELLER: Paul.

3 DR. SHEWMON: Two comments. One when Paul Prestholt

4 was talking, Forrest Remick asked him if they had any plans for

5 readiness review, something that has been used in the reactor

6 viewpoint. And Forrest thought that it had been quite

7 productive and would urge it for the site. And if he were

8 here, he might well urge it now.

9 The other thing had to do with this groundwater

10 travel time. There are fissures which the water races on

11 through if there is a rainstorm, but the retardation for

12 uranium and most any other isotope was very high. And so

13 whether or not what the water does is germane to public health

14 and safety was something that we argued about, and something

15 that I would like to hear from the staff again on sometime.

16 DR. MOELLER: Don did not go with us.

17 Mike, did you have any comments in terms of

18 observations?

19 DR. TRIFUNAC: Somebody had mentioned this already,

20 but I think that it would be useful to maybe look a little bit

21 more at the effects of testing on the water table. Because

22 there are a couple of pictures that show that to the north and

23 northwest of the site that the underground water table is like

24 300 to 400 feet higher than it is under the site. And I could

25 not understand from what I had or from the presentations what

1 would cause that sudden change in the water table and possibly
2 some strain change, tectonic or some other kind, where it would
3 get higher beneath the site. I think that would be interesting
4 to try and understand.
5 I am not quite sure that I would agree with your
6 comment that testing is really to be ruled out from the point
7 of view of activating the existing. There has been evidence in
8 the area and it is well published and documented that the
9 testing did create pressure in the faults. Of course, this is
10 known for the surface. We do not know to what extent the
11 faults moved at some depth.
12 DR. MARK: I am still not really following you.
13 DR. TRIFUNAC: And that does not mean that we are
14 addressing here the issue of shaking. It may have much more an
15 important effect on creating paths for the water.
16 DR. MARK: The testing could affect the water table.
17 DR. TRIFUNAC: That is a supposition. I am talking
18 about the faults.
19 DR. MARK: Which you mentioned.
20 DR. TRIFUNAC: There is a strain, a tectonic strain
21 in the region. Earthquakes have occurred there and will occur
22 in the future at a certain rate. And that strain is released
23 tectonically whenever it happens to go up only it is hastened
24 by some triggering mechanism, one of which may be an explosion
25 in the area. And it has been well documented that these faults

1 did move into the test site region during and after explosions.
2 DR. MARK: Within what range?
3 DR. TRIFUNAC: In the range that the Yucca would be
4 from some of the future explosions.
5 DR. MARK: Yucca is forty miles away.
6 DR. TRIFUNAC: You cannot say that it will not, okay.
7 This is not a phenomenon that has the large formation. The
8 consequences, it is a triggering mechanism.
9 DR. MARK: What kind of mechanism?
10 DR. TRIFUNAC: A triggering mechanism. And I think
11 that one thing that we should look at, and I not so concerned
12 about it necessarily but that I think that we should look at,
13 is that the material being what it is and having seen that the
14 water does not really go much deeper than ten or fifteen
15 meters, whatever it was, but in some of the underground tunnels
16 that we have seen that there was water coming along in some of
17 the fractures.
18 And I can imagine that some of the faults were
19 slightly disturbed and moved a little bit and possibly helped
20 the water get down there in a new path that we do not see now.
21 I think that is a feature that may be worth looking at.
22 DR. MARK: I do not really want to argue with you.
23 But insofar as direct impulse type --
24 DR. TRIFUNAC: I am not talking about direct impulse
25 at all.

1 DR. MARK: At all. That should be scratched off
2 entirely.
3 DR. TRIFUNAC: I did not talk about. I said that I
4 am not concerned about it.
5 DR. MARK: No. You talked about changing the balance
6 of things as they sit.
7 DR. TRIFUNAC: Yes. There is a strain there which is
8 there which has nothing to do with explosions. Explosions just
9 hasten the release.
10 DR. MARK: Can change the time scale status.
11 DR. TRIFUNAC: The time when the critical stresses
12 that are there in the required formation reach the critical
13 level for the rush to take to place.
14 DR. MARK: I guess I say that I do not believe that
15 it is at all likely or measurable or appreciable. Forty miles
16 is a tremendous distance for these little puffs of energy that
17 we are talking about.
18 DR. TRIFUNAC: This is only one parameter. There are
19 other things that you have to look at.
20 DR. MARK: Yes.
21 DR. TRIFUNAC: Because it is the strain.
22 DR. MARK: It should be thought about. I do not
23 argue against that.
24 DR. TRIFUNAC: But I am not talking about ground
25 washing vibration effects at all. There was another thing that

1 is totally different from this, and this may be reflecting my
2 ignorance. I do not really know and I have not taken any time
3 to try to find out what is the rate of the emplacement of the
4 waste, and what is the total volume of the waste that will go
5 there.
6 But I thought of the possibility that maybe thirty or
7 forty years from now that it turns out that there is much more
8 waste than we have been thinking about. And there is a lot of
9 time and effort involved in developing the siting and building
10 the facility and all that. So with that really brief
11 introduction, I look at the geometry of the setting of the
12 site.
13 And on one side, there is sort of a steep wash. And
14 on the other side, there is a little bit more mild slope.
15 There are some faults on the site. And I think that if I am
16 not mistaken that somebody mentioned that basically if somebody
17 decided to expand the area that it could be expanded in only
18 one direction, and I could have gotten that wrong.
19 But the point that I am trying to make is that there
20 is so much effort going on that it would be silly to find out
21 that you are trapped in two or three dimensions that you can
22 expand only possibly in one dimension if it turns out that our
23 calculations on how much can be stored there are wrong. And if
24 it turns out to be a nice site and everything else is worked
25 out, it would be nice to know that you can move elbows a little

1 bit left to right.

2 DR. MARK: I, of course, start with the assumption

3 that this testing is going to stop in five years or so

4 entirely.

5 DR. TRIFUNAC: I am not talking about testing now at

6 all. I am talking about the size of the repository okay, so

7 much to the surface, so much to the groundwater, okay, so much

8 to the left of that canyon-like thing that we were looking at

9 the top, okay. Geometrically, you are limited.

10 DR. MARK: Very.

11 DR. TRIFUNAC: Okay. I think that it is a trivial

12 example, but we built a library at a the university. And

13 before it is finished, we realize that it is by a factor of

14 two, too small.

15 DR. MOELLER: They could put the waste on microfiche.

16 DR. TRIFUNAC: Now just one more comment, and I am

17 repeating myself actually. I am not saying that I believe that

18 volcanism is or is not important. I do not look at the

19 calculations from the point of view of the release at the end,

20 because that is not my expertise. But if I look at the kind of

21 calculations that come down, I am not convinced that I want to

22 buy the outputs of these calculations as an input for the

23 substantive calculations.

24 They may be off by orders of magnitude and still be

25 all right, but maybe not. The calculations, some people refer

1 to them as being old, but the people that I have talked to who
2 have seen these calculations admit that there were some
3 assumptions in the calculations that just would not hold any
4 weight at present. So I think that it would be worthwhile just
5 to redo this in a little bit more careful way and address the
6 issue.
7 The other comments which I made on previous
8 occasions, there is not need to repeat. It would be a good
9 idea to understand the possible geometry of the marshes of the
10 blocks in that area to understand better the manner in which
11 the faulting would take place if it does take place. That
12 might help with the design of the facility and so forth, but I
13 will not go into that anymore. That is about all I have.
14 DR. MOELLER: Thank you, Mike. Connie.
15 DR. KRAUSKOPF: I would agree with Dade that the
16 presentation that we heard on geochemistry from a gentleman
17 named Egert was probably the least satisfactory of the DOE
18 talks that we heard. We were presented with tables of
19 retardation factors, but we heard very little about how the
20 retardation factors were obtained, and how the specimens were
21 obtained which were used in the experiments.
22 The retardation factors have no meaning at all unless
23 the experimental work from which they come is very precisely
24 specified. And we heard very little about where the specimens
25 came from and just how the experiments were done.

1 Now I may be too harsh in this. I rather imagine
2 that the geochemists who are working for DOE know this
3 background, but that certainly was not apparent from what we
4 heard.
5 Regarding volcanoes, if I can stick in my oar in this
6 argument, I do not share Carson's worry about volcanism.
7 DR. MARK: Please. I was not worrying about it.
8 DR. KRAUSKOPF: Oh. I thought that you said --
9 DR. MARK: I was trying to dismiss it.
10 DR. KRAUSKOPF: I thought that this was what you said
11 what your principal worry.
12 DR. MARK: I think that it is the only remaining one.
13 DR. KRAUSKOPF: I would argue with my nameless
14 Stanford colleague about a 5000 year warning of volcanic
15 activity. Just after the Second War, I was sent to the Mexican
16 volcano Perekateen. You may remember reading about it.
17 Perekateen appeared in a farmer's cornfield one day with no
18 warning whatsoever. There was not even five minutes warning.
19 So I do not think that we can depend on 5000 years.
20 But it strikes me that volcanic activity anywhere except
21 directly under the repository would probably do no harm at all.
22 I mean suppose that the surface were covered with a lava flow,
23 suppose that there was a fall of ash on the repository. It
24 would just improve things as far as I can see.
25 The only worry is this very remote possibility of a

1 volcanic eruption starting right under the repository. Now I
2 have no idea whether the consequence would be one milirem or a
3 million milirems. But I think that the chance is so remote
4 that this is one chance that we can take.
5 After all, the recent volcanic activity has been out
6 on the plat several kilometers away from the site. And I
7 really think that this is one worry that Mr. Johnson can forget
8 about.
9 I would like to say a few things about the G tunnel.
10 That is quite an impressive demonstration. This is an
11 impressive demonstration. This is a tunnel that is driven into
12 a welded tuff, very much like the Topapah Springs tuff at the
13 projected waste site. So it is a very good place for
14 experimental work. And I think that Roger Zimmerman there was
15 doing some very good work for DOE in just seeing how the tuff
16 will react.
17 As I believe either Dade or Carson said, there were a
18 few places in the tunnel where there was a fissure in the sheer
19 zone and there was a little water apparently coming in from
20 above. And Dade is also correct in saying that the rock was
21 quite extensively fractured.
22 I do not know whether this is something to worry
23 about or not. It seems to me that DOE is missing an
24 opportunity for a larger scale experiment in G tunnel or in the
25 new tunnel driven from G tunnel.

1 The difficulty with the work in G tunnel is that the
2 tunnel, of course, is well ventilated. It has to be so that
3 people can work in there. That means that if you put a heater
4 experiment in, as Mr. Zimmerman did in several places, and he
5 found, of course, that the moisture in the rock was driven away
6 from the heater, the trouble is that those experiments are
7 unreal, because they are driven only a few centimeters or a
8 meter or so into the wall of the tunnel where the wall is
9 exposed to this ventilated air. So it does not give you a real
10 picture of what conditions would be like in a repository.
11 I wish that part of the tunnel could be sealed or a
12 branch tunnel could be sealed, and heaters could be put into
13 the tunnel to give temperatures like those expected in the
14 repository, and simply have enough monitoring instruments
15 around to see what happens to the water, and the sides, and the
16 roof of the tunnel.
17 It strikes me that the water is going to be driven
18 away from the tunnel. And I wonder if you had such an
19 experiment, even if there were one of the periodic damages on
20 the surface, if the water would get anywhere near the heated
21 tunnel.
22 But I thought that this experiment would be possible
23 to stage. It is very much like some of the experiments going
24 on at the BWIP site in New Mexico. And I should think that it
25 would be very much worthwhile. You could practically duplicate

1 the situation of a repository in the rock that is not quite as
2 favorable as the Topapah Springs is, and you could really get
3 some idea of just what heated waste in the tunnel like that
4 might do to water that comes down from the surface.
5 DR. KRAUSKOPF: Now the problem in the unsaturated
6 zone, and I think is one of the great unknowns and it's
7 surprising that, with all the work that ground water people
8 have been doing over the last century, that practically nothing
9 seems to be known about the behavior of water in the
10 unsaturated zones.
11 Certainly in a place like Yucca Mountain, water that
12 falls on the surface for the most part doesn't go very far. It
13 soaks in and then as soon as the sun comes back out it comes
14 right back out and is gone. But occasionally, of course, on
15 the Nevada desert, there are real downpours and more water does
16 get into the soil and the story is that it probably, some of
17 it, eventually gets through the 600 meters or so down to the
18 permanent water table.
19 And I'm quite willing to believe that. In fact, the
20 USGS people that we talked to up on Yucca Mountain had some
21 measurements that they had made a couple of years ago -- I
22 think 1984 was the last time there was appreciable rainfall
23 there, and they have a borehole into which they can put the
24 neutron sensor to determine the water content of the rock
25 around the borehole. And they showed us some rather

1 instructive pictures of the water content as it had changed
2 over the three years since 1984, and it looked as if a slough
3 of water had moved down a few meters into the rock and around
4 the borehole in that time. And on the basis of that experiment
5 and similar experiments, predictions have been made that there
6 is some slight movement of water all the way through the
7 unsaturated zone to the water table. The calculations as to
8 how much movement there is I think you can pretty much
9 discount. I asked the USGS man on Yucca Mountain what he would
10 predict about this and I asked him how he would judge the
11 predictions that he had heard at the talks at Las Vegas, and he
12 said that he really had no idea just how long it would take for
13 water to get down there and how much of it would eventually get
14 down.
15 I think this is one of the great unknowns. I wish we
16 had an expert hydrologist here to correct me if I'm wrong. But
17 I think it is possible that there is some movement of water,
18 but certainly it is very slight, and I should think that with
19 an experiment in G-Top -- you might be able to get some better,
20 a better fix or just how limited this flow of water might be.
21 Oh, golly, I've been giving you quite a lecture,
22 Dave, I think maybe that's enough.
23 DR. MOELLER: We've all been listening. Do you have
24 anything else?
25 DR. KRAUSKOPF: Well, on the subject of earthquakes,

1 here I certainly do not speak as an expert, and I would wonder
2 just what harm an earthquake would do? Certainly you don't
3 want an earthquake while the repository is being loaded -- it
4 might interfere with the surface installations, but once the
5 repository is built, suppose there is an extensive earthquake?
6 Things will get shaken up a bit but usually engineering
7 experience is that underground installations are not very badly
8 disturbed by the shaking of a quake. Even if the Ghost Dance
9 Fault should move, which is the fault that goes right through
10 the repository, I don't see quite what harm it will do the
11 repository? It might temporarily open a new path to the
12 surface, that water could penetrate. But I think this would be
13 a fairly short lived incident and I don't think the repository
14 would suffer permanent damage.
15 Well, please take that with a grain of salt.
16 DR. MOELLER: Say, we're running somewhat behind
17 time, however, Keith, do you want to show your slides? I think
18 they would be nice to share with everyone.
19 DR. McCONNELL: Dr. Moeller, once you've finished, I
20 have a couple overheads to retrace our itinerary.
21 DR. MOELLER: Fine, do that.
22 (Slide.)
23 DR. McCONNELL: This is just a simplified map of the
24 test site with Yucca Mountain being over on the western border
25 here and Mercury, our departure point, being over here. And

1 what we did was basically leave and go north through Frenchman
2 Flat, up to the control point area, which is right here,
3 crossing into Yucca Flat, and over to the drilling facilities,
4 where they had all the drill bits and everything similar here.
5 I'm not sure exactly where it is. When we moved up and crossed
6 over here, and went into this area, near Bullfrog, or fairly
7 near Mesa G-Top, came back down and ate lunch in Area 12, went
8 over and over to the Climax Stop, which is this granitic body
9 here, and went into the Climax facility and came down and went
10 into the Sedan Crater area, and went all the way and crossed
11 over and went into Jackass Flats where the EMAD facilities were
12 and then over to Yucca Mountain.
13 DR. MACK: And just show us where is Bullfrog Count-
14 DR. McCONNELL: I don't think I could do that. I
15 don't know.
16 (Slide.)
17 These two faults are of interest because they were
18 activated by weapons testing in Yucca Flat.
19 DR. MOELLER: When you say they were "activated,"
20 they were not there before, they were created, or they had
21 started moving?
22 DR. McCONNELL: The Carpetbag Fault was not there
23 until the Carpetbag Event, and it formed. The Yucca Fault was
24 there and they knew about it, but there was displacement on it
25 during some of the other testing.

1 What I'm going to do is just jump over to Yucca
2 Mountain. There were some questions this morning about where
3 various things were. This is a detailed topographic map of
4 Yucca Mountain. The projection to the surface of the perimeter
5 drift of the repository is here. This is an early diagram
6 that's been changed. This is basically the surface projection
7 of the perimeter drift here.
8 Now we went up, came up to the top of the mountain.
9 And then went down to the south. Then we came off the mountain
10 and went over to the Exile Hill area and looked at the Bow
11 Ridge Faults and veins in the Bow Ridge Fault. What this
12 diagram does is it gives you some perspective to the
13 relationship of the repository itself. The Solitario Canyon
14 Fault claims the western boundary. The abandoned wash goes
15 down Ghost Dance Fault and actually cuts the repository. The
16 Drill Hole Wash borders it on the northeast and the Bow Ridge
17 Fault in a series of embarcations, or smaller faults, bordered
18 on the East. The Midway Valley Fault actually probably extends
19 up what would be the surface facility area.
20 (Slide.)
21 This is the incline into the repository drawn on
22 here. And over here the exploratory shafts themselves -- this
23 is the top of the mountain here. The exploratory shafts are in
24 Coyote Wash right in here.
25 (Slide.)

1 And we have some photographs. Any questions?

2 (Slide.)

3 You probably remember this slide from yesterday.

4 This is the group as it was in Tucson. I guess several people

5 in the town on the second and third day and this is the

6 photograph of the SAI Building there in Los Vegas. This was

7 taken there the first day of the meeting.

8 (Slide.)

9 And then we jump to -- I don't have any photographs

10 of the drilling facility itself, so we jump to G-Top.

11 (Slide.)

12 And this is a photograph from a previous trip the

13 staff made out there. Because of restrictions on photography

14 we've interspersed photographs that we've taken from previous

15 trips in. But they basically are all pictures of what we say.

16 (Slide.)

17 This was the block test that Mr. Zimmerman showed us.

18 (Slide.)

19 And I think this is one of the heater tests, that we

20 also saw today.

21 (Slide.)

22 I also don't have any photographs of the Climax

23 facility, although we do have a little pamphlet back in the

24 office of photographs in place of machinery and everything, and

25 if anybody's interested we could always get a copy made.

1 (Slide.)

2 This is a photograph taken from the old Climax

3 tungsten mine which some of you may have heard of. The Climax

4 facility is just off the photograph right here, the tungsten

5 mine we're standing on basically.

6 (Slide.)

7 This is Sedan Crater right here.

8 (Slide.)

9 This is just a closeup view of the crater itself.

10 (Slide.)

11 This is a downview off Yucca Mountain taken off the

12 top of Yucca Mountain. That's Paul Preston standing there.

13 (Slide.)

14 And then looking out to the west from Yucca Mountain

15 into Crater Flats, and looking at these two cones, this is the

16 black cone, this is the red cone --

17 (Slide.)

18 -- and these are the 1.1 million year old salts here.

19 (Slide.)

20 This is Bear Mountain with the Bear Mountain Fault

21 along the base of the range. And that's the one that they've

22 at least currently been using for seismic risk. It's about 15

23 kilometers from the site.

24 (Slide.)

25 This is looking to the north from a position on Yucca

1 Mountains. This is Solitario Canyon. The Solitario Canyon
2 Fault again forms the western boundary of the repository right
3 down through here.
4 (Slide.)
5 That's a look at the group.
6 (Slide.)
7 This is looking to the south again down the Solitario
8 Canyon Fault. It lies along the western boundary -- at the
9 Laker Falls Cone down here.
10 (Slide.)
11 And I've thrown in a closer view of the Laker Falls
12 Cone. Unfortunately it was snowing when we were out there the
13 last time. This just shows you. This is a cone that has been
14 dated as been partially of having an age of at least as young
15 as 20,000 years.
16 (Slide.)
17 This is the group. You remember Phil Dudley from the
18 USGA who made the presentation from on the mountain? And I put
19 this one in of the group because it is interesting that Jerzy
20 Szymanski from the DOE was using a rule of thumb in plate
21 tectonics.
22 (Slide.)
23 We're looking at the rocks. Here's Bill Dudley.
24 (Slide.)
25 And a closeup view of Rapido Canyon. Rapido Canyon,

1 running a camera up the volcanic sequence there. These are
2 probably collapsed pumice fragments here, indicative of
3 welding.
4 (Slide.)
5 This is looking out to the east, again at the UHAD
6 facilities, UHAD and RMAD, I guess. Also, I think, this is
7 Calico Hills to the northeast of the site and I think this is
8 Exile Hill where the surface facilities are. Or will be.
9 (Slide.)
10 This is just looking down.
11 (Slide.)
12 And then, as was mentioned we did get a briefing from
13 USGS And I think this person is from the Phoenix -- I'm not
14 sure, I think he is not with USGS on the Matrix 4 part of the
15 hydrology report.
16 (Slide.)
17 Well, we moved off the mountain and down to the Exile
18 Hill area, where we got under discussion with respect to the
19 veining here along the Bull Ridge Fault.
20 (Slide.)
21 This is Bill Dudley again explaining, I think, the
22 USGS's position. I think also that Jerzy Szymanski is
23 providing counterpoint to what Bill Dudley was saying about how
24 well they might be penetrating the hydrothermal updrafts as
25 well as spring-related.

1 I guess just as an editorial note, I felt that USGS
2 presentation kind of sided towards the purely photogenic
3 approach in the presentation they made to group people.
4 (Slide.)
5 Well, this was me down in Trench 14. I guess Dr.
6 Mark was commenting on the names.
7 (Slide.)
8 And then after the trench, a woman called Fresno, and
9 myself and went up to the exploratory shaft area and this was
10 in Coyote Wash. This is Coyote Wash looking back to the west
11 towards Yucca Mount. And we took some photographs of where the
12 few shafts would be in the exploratory cap project.
13 (Slide.)
14 And Owen is standing at one right here. A second on
15 is back behind him. And although it's distorted because I have
16 a wide-angle lens, you can see the distance between the two
17 shafts.
18 (Slide.)
19 And these had been moved. They were fired about six
20 months ago. They had been further up the wash and basically in
21 the center of the wash. And they moved them over to the side
22 of the hill. Because of concerns with respect to flooding.
23 (Slide.)
24 And this just jumps back down to the Exile Hill area
25 with the surface facilities -- this is looking east. The

1 surface facilities would be on the other side.

2 (Slide.)

3 And then one final slide showing Dr. Carter

4 contemplating particularate waste at Yucca Mountain.

5 DR. MOELLER: Any questions for Keith?

6 Well, thank you very much. That's an excellent

7 record of our trip.

8 DR. MACK: Could I ask? Yucca Mountain, the height

9 at the top is around, what, 5,200, something?

10 DR. McCONNELL: Something like that, yes.

11 DR. MACK: And then it drops off steeply on the west

12 and steeply on the east? Where are the exploratory shafts in

13 that broad outline? The picture doesn't tell me. I saw the

14 picture. Are they starting from about 4,000 feet, or 4,500, or

15 what?

16 DR. McCONNELL: You see, this is the top of the

17 mountain about 5,000 to right here. The exploratory shafts are

18 down here and this is the 4,200 contour right through here.

19 DR. MACK: But they're off the mountain?

20 DR. McCONNELL: They're off the mountain.

21 DR. MACK: And they're away from where the waste

22 depository will be because I thought that was under the top?

23 DR. McCONNELL: The outline of the repository is this

24 dashed line. So they're actually inside the repository.

25 DR. MACK: Oh, I had the wrong picture. They're

1 halfway down to the wash?

2 DR. McCONNELL: Yes.

3 DR. MACK: And they run to a level of about 1,400

4 feet below the top?

5 DR. McCONNELL: Yes, I think so, I'm not sure. They

6 go directly down.

7 DR. MACK: And they go below the water table?

8 DR. McCONNELL: No. They are only in unsaturates.

9 DR. MACK: They don't get to the water table? Okay,

10 thank you.

11 DR. MOELLER: Any other questions?

12 Well, thank you again, Keith.

13 We'll move along now. We're going to alter the

14 agenda again and pick up --

15 MR. LINEHAM: Excuse me, Dave, we have another

16 request.

17 DR. MOELLER: The individual that's filling in for

18 Farringer on the EPA extended lawsuit is Chip Cameron from OGC

19 and he needs to get back to the office. If we could go into

20 his presentation next? And then the ground water travel time?

21 And then finally the program as planned, if that's okay with

22 you?

23 DR. MOELLER: Fine. So this is on the EPA court

24 decision?

25 MR. CAMERON: Yes.

1 DR. MOELLER: All right, we'll go ahead with that.

2 MR. CAMERON: Sure.

3 DR. MOELLER: I think they've got a copy of the court

4 decision -- minus page 46.

5 MR. CAMERON: Page 46? Let me think, what was on

6 that page? Probably might be a good thing to get that.

7 Dan was going to do the presentation today and he had

8 a conflict with something else so they asked me to sit in and

9 just give you a summary of what happened in the recent court

10 decision. It was a decision by the United States Court of

11 Appeals for the First Circuit, which sits up in Boston, and the

12 name is Natural Resources Defense Council v. EPA.

13 DR. MOELLER: Are you a lawyer?

14 MR. CAMERON: Yes, I'm from the Office of General

15 Counsel.

16 The challenge to the EPA High-Level Waste Standards

17 was brought by the NRDC and some other environmental groups and

18 also the states of Maine, Vermont, Texas, and Minnesota. And

19 they challenged the EPA standards on a number of grounds. Now,

20 what the court did was they found two provisions of the EPA

21 standards objectionable and they remanded these to the EPA for

22 reconsideration.

23 These two aspects were the mutual protection

24 requirement and the ground water protection requirements.

25 Notably the court upheld a number of other provisions in the

1 EPA standard, and I'll talk a little bit more about that. But
2 in terms of the remedy that the court fashioned, they vacated
3 the entire EPA book, so that that means that there are no parts
4 of the EPA standard that are valid at this point. That's one
5 thing that the EPA is seeking -- or is considering, further
6 judicial relief on, is the vacating of the entire standard,
7 rather than only the two sections that the court had found
8 objectionable.
9 As you know, the EPA standards upset the generally
10 applicable environmental standards for the management and
11 disposal of high-level waste, spent fuel, and certain types of
12 TRU waste. The NRC regulations in Part 60 are supposed to
13 implement the EPA standards, and the NRC has had a proposed
14 rule out to -- that would conform our regulations to the EPA
15 standard and we were on the eve of sending a final rule up to
16 the Commission when this court decision came down.
17 At this point, we've put any action on that final
18 rule on hold until we see what the EPA is going to do in terms
19 of further judicial review of the First Circuit's decision.
20 Now, the EPA's standard is composed of two basic
21 parts: one is subpart (a) and this sets radiation exposure
22 standards for waste management and storage operations,
23 including pre-closure activities at the repository.
24 Now, subpart (b) of the EPA standard is comprised of
25 four different types of environmental standards: one is the

1 general containment requirement, which establishes limits for
2 the cumulative release of radiation to the accessible
3 environment 10,000 years after disposal.
4 The second type of requirement or standard, in the
5 subpart (b) are the so-called "assurance" requirements, which
6 are meant to back up or supplement the general containment
7 requirements. The third standard is an individual protection
8 requirement which establishes release limits for the annual
9 radiation exposure to any member of the public in the
10 accessible environment around the repository in the first 1,000
11 years after disposal, and the last type of standard is a ground
12 water protection standard, which establishes radiation
13 concentration limits for certain types of ground water.
14 Now, the courts upheld the general containment
15 requirements and they upheld the assurance requirements, and
16 they also upheld the requirements for the management and
17 disposal of waste that are in subpart (a) of the standard, and
18 I'll just basically talk about the areas that the court, the
19 areas of the EPA standard that the court upheld.
20 The containment requirements are primarily a
21 protection mechanism in the EPA High-Level Waste Standards and
22 basically the court said that the EPA approach was a rational
23 approach and they said the courts have to be deferential to
24 agency expertise when you're dealing with an area that, as they
25 put it, "is at the frontiers of science." In other words,

1 areas of great uncertainty.

2 The court also upheld the EPA's "reasonable

3 expectation" compliance standard. Minnesota, the State of

4 Minnesota, had said that the EPA has to demand absolute proof

5 of compliance with the standards, and the court, again,

6 deferring to agency expertise, said that, "in an area of great

7 uncertainty, it is not possible to demand absolute proof, so

8 that the agency was at their discretion to use a reasonable

9 expectation of compliance standard. Now, this is important

10 because essentially the "reasonable expectation of compliance"

11 standard is the same as our "reasonable assurance" standard

12 that we use in 10(c) of our Part 60 to make a licensing

13 decision.

14 The third area that the court upheld were the

15 assurance requirements. Minnesota objected to the fact that

16 the EPA assurance requirements did not apply to NRC licensed

17 facilities. And the reason that EPA chose that route was

18 because the Commission, in commenting on the EPA proposed rule,

19 stated that assurance requirements are a matter of compliance

20 which was within the NRC's jurisdiction and not within the

21 EPA's jurisdiction. EPA did not agree with that, but in order

22 to get a final EPA standard out, the Commission and the EPA

23 agreed that the NRC would incorporate the EPA assurance

24 requirements into its regulations. And the court bought that

25 approach. It said that was fine. But that if there was some

1 deficiency in terms of the NRC's incorporation of these
2 assurance requirements, the EPA could go back and change their
3 rule to ensure that the assurance requirements were applicable
4 to the repository.
5 The last area that the court upheld was the ALARA
6 concept. One of the states objected to the fact that EPA
7 deleted from the final an ALARA concept that was in the
8 proposed rule. In other words, EPA said that site selection
9 and design should be done so that releases are as low as
10 reasonably achievable. EPA took that out of the final rule on
11 the reasoning that the NRC's multiple barrier approach in 10
12 C.F.R. Part 60, and the DOE siting guideline that said that the
13 sites would be selected, one of the factors for site selection
14 would be a site that would have the lowest release of 100,000
15 years. The combination of the NRC and the DOE approach on that
16 according to the court, was a rational basis for the EPA to
17 delete the ALARA concept from the final rule.
18 So much of the standard has been upheld. The two
19 areas that the court found objectionable were the individual
20 protection requirements and the ground water protection
21 requirements. And it's interesting that these are the two
22 sections of the rule that were not in the EPA's rule as
23 proposed. They were added in response to public comment. Now,
24 the individual protection requirement is meant to assure that
25 any individuals that might be in the area of a repository do

1 not receive over a certain amount of radiation, and the court
2 invalidated the individual protection requirements on two
3 grounds. One is that the court felt that the Safe Drinking
4 Water Act, also applies to the repository. And EPA is also the
5 administrator of the Safe Drinking Water Act, which has a "no
6 endangerment of ground water" in it. And pursuant to this
7 endangerment, the EPA under its Safe Drinking Water tack,
8 promulgated a standard for the concentration of man-made
9 radionuclides in ground water. And that standard was 4
10 milirems.
11 In the EPA High-Level Waste Standard, the
12 concentration or the release limit was 25 milirems. The EPA
13 gave no explanation in the High-Level Waste Rule, of why there
14 was a deviation between the 4 milirems under the Safe Drinking
15 Water Act and the 25 milirems under the High Level Waste
16 Standard. EPA tried to argue that the safe drinking water act
17 doesn't apply to all of their activities across the board.
18 Now, the court did not go so far as to say that EPA cannot
19 deviate from the Safe Drinking Water Act standard. What they
20 did was they said that the individual protection requirements
21 were arbitrary and capricious because EPA gave no explanation
22 of why there was a deviation. The court hypothesized that
23 maybe it might be an adequate rationale to show that it would
24 be impossible for the repository to meet a 4 milirem standard.
25 But they didn't say that would be sufficient. Basically what

1 they did was they said, "EPA go back and re-evaluate and either
2 come up with an adequate rationale for this divergence between
3 4 milirem and 25 milirem, or change the High-Level Waste
4 Standard to be consistent with the Safe Drinking Water Act
5 standard.
6 The second deficiency in the individual protection
7 requirements was that the requirements were limited to the
8 first 1,000 years after the waste was disposed. And the states
9 argued that it should be applied to 10,000 years after the
10 waste was disposed. EPA gave no rationale for why it should be
11 1,000 rather than 10,000 years, and the court remanded that
12 particular provision back to the EPA for a reconsideration.
13 The ground water protection requirements were
14 remanded also. There were many substantive challenges to the
15 ground water protection requirements. But the court did not
16 get to those challenges because it found that the EPA had
17 issued the final rule, the Ground Water Protection
18 Requirements, without giving the public a noted time
19 opportunity for notice and comment under the Administrative
20 Procedure Act, and basically, what EPA has to do is to re-issue
21 the ground water protection standards for notice and comment.
22 In terms of what the EPA could do at this point is
23 that they could provide a rationale for the existing individual
24 protection requirements, in other words, keep it at 4 milirems
25 and keep it at 1,000 years and provide a rationale. Or they

1 could change one or both of those variables. In other words,
2 take the 25 milirems, cut it down to 4 milirems, take the 1,000
3 year application and then make it a 10,000 year application.
4 If they go changing the standard, then they're going to have to
5 issue that for notice and comment. In terms of the ground
6 water protection requirements, they could just reissue the same
7 standards for notice and comment. But keep in mind that there
8 still are the substantive challenges to those standards, ground
9 water protection standards that were not heard by the court.
10 If EPA reissues the same ground water protection standards,
11 then they will be back in court to defend the substantive
12 validity of those particular standards.
13 Now, NRC must conform to those particular changes
14 that EPA makes in either the individual protection or the
15 ground water protection requirements.
16 On two other points of the DOE's selection process,
17 many people wondered what the effect of the decision would be
18 on DOE's previous site selection decision, in other words,
19 nomination of five sites and a recommendation of three sites
20 for characterization. We do not believe that the DOE site
21 selection decisions will be, or should be invalidated as a
22 result of this particular decision. You have to keep in mind
23 that there are challenges directly to the DOE siting guidelines
24 and to the DOE site nomination and recommendation decisions.
25 And they could invalidate the DOE site selection decisions that

1 have been made up until this time.

2 But this decision itself will not, or should not,

3 invalidate the DOE's site selection decisions. Basically

4 because of the fact of how the guidelines, the DOE siting

5 guidelines, for site selection, how those guidelines are

6 structured and applied. Basically because of the lack of

7 definitive data on the sites at the early stages of site

8 selection, DOE has been applying a qualitative standard for the

9 selection of sites. And they do have provisions in the siting

10 guidelines that deal with ground water protection. And I think

11 that their qualitative application of the guidelines at the

12 site nomination and recommendation stage would mean that there

13 would be no fatal conflict between the First Circuit's decision

14 on these EPA standards regardless of what EPA does in revising

15 the standards, and the DOE site selection process.

16 And likewise there does not need to be any delay in

17 site characterization because enough containment requirements

18 were upheld and enough is known about the general direction of

19 the individual protection requirements and the ground water

20 protection requirements, to allow DOE to structure a site

21 characterization program to get the requisite information to

22 see if those standards would be met in the future.

23 And that's basically it. There's been as far as I

24 know, no decision by the EPA on what type of judicial relief,

25 if any, they are going to seek. Basically from the people that

1 I've talked to, they think it's a well-reasoned Opinion. The
2 only deficiency the people point to is the fact that the entire
3 standard was vacated rather than only the individual
4 protection, ground water protection requirements.
5 So I'll be glad to answer any questions you have.
6 DR. MOELLER: Did the court say why they vacated the
7 entire --
8 MR. CAMERON: No, they really didn't provide any
9 explanation for that, so its -- that's why EPA thinks that the
10 relief, the remedy of vacating the whole standard was fairly
11 radical.
12 DR. MOELLER: In reading the decision itself, on page
13 53 of the, you know, big thick thing, it said that the most
14 recent law prevails. Now, if the Safe Drinking Water Act
15 preceded the High-Level Waste Repository Standard, which I --
16 am I wrong?
17 MR. CAMERON: It did.
18 DR. MOELLER: Then why didn't the High-Level Waste
19 Repository Standard prevail?
20 MR. CAMERON: Because there was no explanation. And
21 that's a good question, because it points out a rather
22 important facet, I think, in the court's decision, is that they
23 looked at the later law, the NWPA, the Waste Policy Act, and
24 they said that while there was evidence of congressional intent
25 to alter the Safe Drinking Water Act, no endangerment policy

1 for the controlled area, because Congress discussed the fact
2 that the geologic setting would be used to control the use of
3 the waste and therefore there must be some contamination within
4 the control area. So therefore they could say that that most
5 recent Act -- so there's two aspects, not only that it's most
6 recent, but there is some indication of congressional intent to
7 change the prior statute. So the court found that evident for
8 the controlled area, but they didn't find a similar intent of
9 Congress for the area beyond the controlled area.
10 DR. MOELLER: Well, and they also were pointing out
11 that the Safe Drinking Water Act says that water must not, or
12 ground water must not be endangered by underground injection.
13 And then I gather that they decided that the repository was
14 equivalent to underground injection.
15 MR. CAMERON: Yes, that is the point that I think EPA
16 and the utility groups who were involved in the case thought
17 that they had the better legal argument on. In other words,
18 the Safe Drinking Water Act applies to underground injection of
19 waste, which when it started out was a pretty specific
20 application of inserting waste into ground water. It was never
21 thought that it would apply to the release of any type of waste
22 into the ground water. But I think the court came up with a
23 fairly good reading of the legislative history of the Act that
24 said that the disposal of waste underground in a repository is
25 going to constitute underground injection.

1 DR. MOELLER: As I recall, when the Safe Drinking
2 Water Act was passed and the 4 milirem was selected, the
3 thinking there was, and you know, I think my general comments
4 are correct, maybe the specifics are not, but the thinking was
5 that 25 milirem a year was the limit. And of that limit, it
6 seemed reasonable to assign or apportion 4 milirem of the 25 to
7 drinking water, because you drank water that's contaminated and
8 ate food that had a little bit in it and breathed air that had
9 a little bit, if you let the water contribute no more than 4
10 milirem, you'd still have a cap on the 25. Now, that of
11 course, doesn't solve the problem at all for the conflict
12 between the two, because you could say the person drinking the
13 water contaminated by the repository may breathe air and so
14 forth and therefore could get more than 25.
15 When did the people bringing the challenge -- what
16 was the suit first filed and how long has this been in the
17 works and so-forth?
18 MR. CAMERON: This has been fairly quick turn-around.
19 The suit was filed in probably December 1985. I think the
20 EPA's standard became effective in November 1985, and then they
21 filed suit right after that, but why I say "fairly rapid," is
22 because the guidelines, that challenge against the DOE siting
23 guidelines, were filed back in '83 or '84 and they still
24 haven't really argued the case on the merits yet, they're still
25 arguing about access to DOE documents.

1 DR. MOELLER: Well, I've found it interesting that
2 they discovered this conflict, and of course filed a suit, and
3 it's also of interest, if I understood you correctly, that you
4 said these very two items were added in response to public
5 comments on the original draft? Okay, that is interesting.
6 Any questions or comments?
7 DR. ORTH: May I make a guess as to how long it's
8 going to be before the issue is resolved?
9 MR. CAMERON: Before they --
10 DR. ORTH: Before there is a new standard and it'd
11 decided upon?
12 MR. CAMERON: Oh, boy. I think I'd hazard a guess if
13 we were to do it, but I'm not sure about the EPA's bureaucracy.
14 It took them a long while to get the original standard, but I
15 got no feel -- I didn't get any feel from the people over there
16 in terms of what direction they were going to go in terms of
17 revising the standard, but it has to go through, you know, a
18 notice and comment period once it -- there is a certain period
19 of time before they issue something for notice and comment and
20 then there's a 60 day comment period and there's a comment
21 resolution -- I think they could do the ground water protection
22 requirements fairly rapidly. I don't think that they'll -- I
23 don't know, but it's feasible that they would not change those
24 at all because the court shed no light of infirmity on those
25 particular provisions.

1 But I mean, that process could be a year.

2 DR. MOELLER: Other questions or comments? Okay,

3 well, thank you very much. That was a very lucid and clear

4 explanation of what, to me, had been a very complicated matter

5 until you made your presentation.

6 MR. CAMERON: Well, good. Thank's for letting me

7 talk now instead of waiting.

8 DR. MOELLER: Okay, Mr. Cameron, thank you.

9 I think if it's okay with the NRC staff, we'll go on

10 a break. Can we take fifteen minutes?

11 [Off the Record.]

12 [Back on the Record at 3:26 p.m.]

13 The meeting will come to order. And we'll move ahe

14 with the next item, which is the briefing on the pre-

15 emplacement ground water travel time needed, and that will be

16 presented by Fred Ross, of the NRC staff.

17 DR. ROSS: Last month from the 14th to the 16th, the

18 hydrolysis section of the Technical Review branch of the

19 Division of Waste Management met with the contractors and

20 technical assistance contractors of hydrology plants to develop

21 a regulatory position on ground water travel time. Also in

22 attendance at the meeting on the first day were members of the

23 research staff having interest in ground water travel time, and

24 an ACRS member, Dr. Parry, and various members of the

25 Department of Waste Management.

1 The reason for developing a proposed regulatory
2 position was to update the generic technical position on ground
3 travel time that the staff issued for public comment in June
4 1987. Included in our update we wanted to request the staff's
5 latest thinking on the ground water travel time issue. We
6 gained a great deal of experience, especially this past year,
7 particularly with our review of the final EA's where we had a
8 chance to actually do a ground water travel time review of
9 complicated analyses at three of the sites. We gained a great
10 deal of experience in that.
11 Also over the year we worked on a generic planning,
12 five year planning, and developed a ground water travel time
13 demonstration issue out of that effort. We also wanted to
14 update the GTP to reflect the comments that we received from
15 DOE, states and tribes. Although we didn't receive very many
16 comments -- we didn't receive any comments I know of from DOE
17 Headquarters, but we did receive some comments from DOE-Nevada.
18 And the State of Nevada and the State of Texas commented and
19 the Yokum Indians commented.
20 DR. MOELLER: Excuse me, when again was your meeting?
21 DR. ROSS: July, this past July.
22 DR. MOELLER: On what day? I'm trying to find out
23 was it before or after we toured?
24 DR. ROSS: It was the 14th, 15th and 16th. Three
25 days.

1 DR. MOELLER: That's several weeks before our tour.
2 I'm curious because you know, in our discussions in Las Vegas,
3 they explained about needing a clarification of what was meant
4 by "ground water travel time," and there was no indication to
5 us that this meeting had been held.
6 DR. ROSS: Did you say you went prior to our meeting
7 or afterward?
8 DR. MOELLER: We were at the end of the month.
9 DR. ROSS: Oh, well Dr. Parry was there at the first
10 day of our meeting.
11 DR. STEINDLER: This was just an internal NRC
12 meeting, wasn't it?
13 DR. ROSS: Yes.
14 DR. STEINDLER: DOE wouldn't have been advised.
15 DR. MOELLER: Oh, they weren't there? These comments
16 were -- how were they submitted, DOE's and the tribe's?
17 DR. ROSS: These were the written comments.
18 DR. MOELLER: Oh, okay, I'm sorry.
19 DR. ROSS: The GTP went out for a public notice and--
20 DR. MOELLER: Sure, they did not know about it?
21 DR. ROSS: Right, okay.
22 DR. MOELLER: But Prestholt must have known, and he
23 was the one that made -- brought up the issue, so I remain as
24 confused after your answer as before.
25 DR. ROSS: He didn't have enough travel money to come

1 back.

2 DR. STEINDLER: Because Prestholt is one of those

3 that raised.-- yes, he was the person --

4 DR. MARK: Yes, he was the guy the issue.

5 DR. STEINDLER: -- that raised the issue.

6 DR. MOELLER: Okay, I think all of us should hear

7 this message. It's very important and of course you can send

8 reports and then you have to get the people to read them.

9 DR. ROSS: Well, bear in mind that at this meeting we

10 didn't have a draft developed then.

11 DR. MARK: On that general subject Dave, in something

12 we write or say some time, we should call attention to this

13 travel money. People ought to move more than they do.

14 DR. MOELLER: It's in my report, which I didn't say,

15 but let me, now that I'm reminded, I certainly -- it's not the

16 official ACRS, or even the subcommittee position, but please, I

17 hope you'll send copies along to the people, you know,

18 Prestholt, et cetera, so they can see it. Oh, and we ought to

19 be assured a copy goes to DOE, maybe with your "thank you"

20 letter you could send that?

21 DR. MARK: A copy of your report? Yes, that's what I

22 was basically waiting for before sending letters.

23 DR. MOELLER: Thank you.

24 DR. ROSS: Okay, and another thing we wanted to do is

25 include the staff position on uncertainty, which we developed

1 through that five-year planning. That again stems from the
2 experience with the final EA's in which we were not satisfied
3 with the way DOE is expressing uncertainty, particularly in
4 conceptual models, low-pass and use of the data. We thought
5 that DOE is very inadequate in that area.
6 MR. STEINDLER: When you say, "staff position on
7 uncertainty," you're talking about just on water travel time?
8 DR. ROSS: Yes, uncertainty on ground water travel
9 time analysis.
10 In addition, over the year, a lot of people have been
11 working on the travel time problem, staff and the contractors,
12 and we wanted to make sure that all the opinions of the staff
13 that an eventual say in the final outcome of the guidance,
14 would be involved in developing the guidance.
15 And of course, the reason for doing any guidance
16 document is to provide some sort of guidance to DOE, and to
17 invite the public to participate in the development of the
18 guidance.
19 As I stated, the ground water and travel time meeting
20 was planned as the working meeting, and with the specific goal
21 of preparing a draft regulatory position on ground water travel
22 time, as a conclusion. Now, prior to the meeting, the staff
23 prepared a draft statement of position on ground water travel
24 time, which was sent out to the contractors. This was by way
25 of organizing the staff's thoughts on ground water travel time

1 and also in keeping the focus on the goal at hand. We found it
2 to be a very successful way of having a meeting because we
3 didn't degenerate into pointless discussion of things we
4 weren't interested in.
5 Now, to begin with, the draft statement on ground
6 water travel time provided some definition of discussion on the
7 various elements of ground water travel time issue we thought
8 were the most important. And those were a definition of pre-
9 waste emplacement conditions, a definition of likely path of
10 radionuclide travel, a definition of ground water travel time
11 with respect to velocity, and a statement of position on
12 uncertainty.
13 What we did was, because we had these four things we
14 were going to work with -- yes?
15 DR. SHEWMON: Just for my clarification, is it that
16 you have a particular interest in ground water travel time, or
17 are you interested in the transport of radionuclides? Do you
18 equate the two?
19 DR. ROSS: No, to address the question directly,
20 we're interested, at least most of us now on the staff, believe
21 that ground water travel time should be a water problem and not
22 a transport problem. It should be a ground water flow problem
23 and divorced from transport.
24 DR. SHEWMON: But the ground water doesn't hurt the
25 general health and public -- see, it's the radionuclide

1 residue.

2 DR. ROSS: Right, and we have EPA standard, release

3 standard, and ground water protection standard to deal with the

4 thing independent of transport problems, something that doesn't

5 have a lot of redundancy in it. Some of the same kinds of

6 things you'd have to do anyway to calculate the releases.

7 DR. SHEWMON: But what do I care about the ground

8 water travel time, admitted, if no water comes through then no

9 radionuclides will, but if the nuclides all sit still and the

10 ground water travels, then that can't hurt anybody, can it?

11 DR. ROSS: Under those conditions that's true, and in

12 fact, if the ground water travel time should be shown to be

13 very fast, in excess of the thousand years, or on the short

14 side of the thousand years, then the Commission does allow for

15 an alternative ground water travel time, should DOE make a case

16 that they meet the release standards and the ground water

17 protection standards. The point is --

18 DR. SHEWMON: In other words, "don't ask me about the

19 public health and safety. It's our policy to worry about

20 ground water travel time," is what you're telling me?

21 DR. ROSS: Well, with respect to this particular

22 performance objective, which is simply to provide some measure

23 of the goodness of the site in terms of performance. It's an

24 independent measure. That's the way we're viewing it, and

25 that's consistent with everything that our interpretation of

1 everything that the Commission has published on ground water
2 travel time. And that also eliminates a lot of the
3 uncertainties that would occur if you had an elaborate analysis
4 which included transport processes in it, and you have to get
5 into all those things, you know, including retardation and
6 other things related to transport.
7 So by divorcing it, you have something that's much
8 simpler to deal with. It's hard enough as it is, actually.
9 DR. MARK: I think -- I may not disagree that ground
10 water travel time is a simpler problem than the real problem.
11 You used the word, "redundancy." It isn't redundancy, the
12 transport is a complication, not a redundany, and it's the only
13 important thing, and unless you know something about it, you
14 know nothing worth knowing.
15 DR. ROSS: I agree with what you said. When I said
16 "redundancy," I mean if you're going to have an independent
17 measure of something, then why do the same analysis that you'd
18 have --
19 DR. MARK: But why measure something other than what
20 you're interested in? I mean the air might move quite quickly,
21 too.
22 DR. ROSS: What you're saying is, "why have ground
23 water travel time at all?"
24 DR. STEINDLER: Do I hear correctly from your comment
25 that when the original regulations are put together, the notion

1 of the ground water travel time was in fact equivalent or equ[illegible]
2 to, transport of nuclides, and it's only recently that the
3 staff believes otherwise?
4 DR. ROSS: No I don't believe so, because we went
5 back and we looked at all the background information that the
6 Commission had published. And granted there are people on the
7 staff that still believe it should be transport, and we're
8 going to try and work that out, and that's one of the things
9 we're going to do in the next month or so.
10 DR. STEINDLER: My impression was that the original
11 ground water travel time regulation was let down because what
12 you wanted was a well-characterized geology-hydrology of the
13 site -- full stop. Then the next sentence dealt with the
14 question of how fast do individual pertinent nuclides
15 transport? And that separation was what I thought was what was
16 originally present? Are you telling me that that's not the
17 case?
18 DR. ROSS: Maybe with the rule was first -- not even
19 the draft rule applied it. The draft rule said something about
20 a "transport," a "nuclide transport" time, but the rule was
21 rewritten and ground water travel time, which they intended to
22 look at the transport of radionuclides I would have thought
23 they would have written it as "radionuclide travel time," not
24 "ground water travel time."
25 Anyway, we provided the contractors and the rest of

1 the staff with what we thought were workable definitions, and
2 focused, as I said, our attention on the issues at hand and
3 gave this some impetus for the work groups that we divided
4 into. There were 12 of us roughly, so we divided into two
5 groups and one group handled the definition of pre-waste
6 emplacement, and the other, the statement of position on ground
7 water travel time uncertainty, and the other group worked on
8 pathway and velocity.
9 And at the end of that time, we did conclude with the
10 draft statement of position.
11 DR. MOELLER: You're hinting also that whatever your
12 final report may be, it's not really a guidance report.
13 DR. ROSS: At this point it's not.
14 DR. MOELLER: There would be some dissenting opinion?
15 DR. ROSS: Yes, we're proposing some changes. I
16 don't know what in the end what we'll know.
17 DR. MOELLER: Sure.
18 DR. SHEWMON: Would you help me with one other
19 definition? Can you define "ground water?" What I have in
20 mind is something like Yucca Flats, where if once a day you get
21 a torrential rain, indeed, some of it will race on through. A
22 lot of it will evaporate, and some of it may go into pores and
23 over centuries, may migrate on through. Which of those three is
24 ground water?
25 DR. ROSS: I think the regulation defines "ground

1 water" as anything occurring below the surface of the earth.
2 Any water occurring below the surface.
3 DR. SHEWMON: Yes, but there is three different
4 components that go, so how do I average it?
5 DR. ROSS: I'm not understanding what the three were?
6 DR. SHEWMON: I've got a crack. Much of the water
7 runs through the series of faults or cracks and disappears very
8 quickly. I have another group which stops and when the sun
9 comes out it evaporates. I've got yet something else which
10 goes into capillary pores and may well stay there for a good
11 while and migrate on down.
12 DR. ROSS: It's all ground water with the exception
13 of after the stuff has evaporated it's now in the atmosphere,
14 so it's --
15 DR. SHEWMON: But how do I average? What part of the
16 water that came through? Now do I take the stuff that raced
17 through? That has a ground water time of a day.
18 DR. ROSS: Well, you're interested, you know, for the
19 ground water travel time, it's from the disturbed zone to the
20 accessible environment, and you're interested in the velocity
21 of that travel time of that water.
22 DR. SHEWMON: But if it goes through the faults, it's
23 travel time is a day.
24 DR. ROSS: Well, I don't know if it's adjusted like
25 that, or we address that.

1 MR. POHLE: I can -- my name is Jess Pohle of the
2 Hydrology section. From what I've seen of the draft site
3 characterization plan for Nevada, they're going to deal with
4 that particular issue in their issue solution strategy, meaning
5 the various units in the unsaturated zone, and they discretize
6 those units. They've allocated a certain level of performance
7 to the Kevi Canyon welded unit, the Topapah Springs welded
8 unit, the Calico Hills non-welded unit -- all the way down to
9 the water tables. Then you've got the leg of the flow path
10 through the water in the saturated zone to the accessible
11 environment.
12 The way the system functions today, there is in the
13 way the USGS is presenting it, this is not, let's say, a
14 validated concept. The conceptualization now is that there may
15 well be fracture flow in Topapah Springs, and that may not be a
16 bad thing in our repository data.
17 DR. STEINDLER: Well, that may sound pretty good, but
18 it doesn't fit into this particular question.
19 MR. POHLE: Well, in the Calico Hills, they're saying
20 that it at this time acts more like a traditional porous
21 medium, and not fundamentally fracture flow. The velocities
22 are greatly reduced while transmitting the same amount of flux,
23 mass of water, and then into the saturated zone in that segment
24 of the flow path. There would be no intent in implementing
25 travel time to take rapid flow through one particular formation

1 and use that as the velocity from the disturbed zone all the
2 way to the accessible environment. That would be irrational.
3 There would be -- would have no --
4 DR. STEINDLER: Well, for me to worry about water
5 flow and not nuclides borders on the irrational, but then I'm
6 trying to learn. What about the part that just evaporates?
7 MR. POHLE: That would not be included in the
8 downward flux.
9 DR. STEINDLER: Anything that goes into the ground
10 and comes out as vapor doesn't count?
11 MR. POHLE: That's part of the water balance and
12 they can defend that information because whatever the flux,
13 that would be then flowing from the disturbed zone at some
14 depth would not include that mass of water.
15 DR. STEINDLER: Okay, just trying to learn your game,
16 thank you.
17 DR. MOELLER: Again, Paul, I guess the primary
18 rationalization I could give for it is that the nuclides
19 presumably can move faster than the water, so it's a
20 conservative ---
21 DR. STEINDLER: They can evaporate and run ahead.
22 DR. MOELLER: It's hopefully a conservative measure,
23 but I heard you.
24 DR. SHEWMON: But the field is littered with
25 conservative, convenient, easy assumptions that are irrelevant

1 to danger to the public. And then we end up decades later
2 trying to dig ourselves out of a hole.
3 MR. BALLARD: I'm Ron Ballard, Technical Review
4 Branch. I don't think that -- first of all, keep in mind that
5 there are many parts -- there are other parts of the rule that
6 require a look at radionuclides. The ground water travel time
7 is only one part of it, and it's considered at this stage to be
8 an independent, but not, of course, irrelevant -- it's just an
9 independent measure of a site's suitability. That's the staff
10 view and I would also like to have you keep in mind as you hear
11 the presentation that this is a first draft out of the staff as
12 a result of the comments and there are certainly parts in the
13 comments you're reading, under consideration by the rest of the
14 staff, too. It's just issues that we haven't quite resolved.
15 This was intended more to just present you with the status as
16 where we are now.
17 DR. ROSS: Well, anyway, as I said, we did develop a
18 proposed regulatory position at the conclusion of that meeting,
19 and everything up here I've coined in terms of the new position
20 and what the revised position does, definitely from the GTP of
21 last year, and I guess we've already kind of gotten into this,
22 since we consider it or would like to consider water travel
23 time a ground water flow problem and not a radionuclide
24 transport problem. We're advancing the concept of ground water
25 flow along somewhat of a ground water flow as a unit mass, a

1 unit mass of ground water along macroscopic flow paths. We're
2 not dealing with the microscopic things here, the microscopic
3 pathways. And that's consistent with at least a portion of the
4 GTP that dealt with seepage velocities.
5 We propose then, to eliminate the concepts of
6 diffusion and dispersion from the position because they're
7 primarily transport phenomena. And we propose limiting the
8 concept to tracer movement to validating pathways. In other
9 words, you can use tracers or natural tracer studies to help
10 define your pathways, or conceptual models, but not for the
11 velocity part of the analysis.
12 We expanded our position on uncertainty. We clearly
13 stated in our regulatory position the GTP had a lot of things
14 on uncertainty but it didn't have them in one place as a staff
15 position. We now would like not to advance the concept of the
16 use of a CDF cumulative distribution function as a method to
17 reduce uncertainty. Certainly it's possible you can use it to
18 express some of the overall uncertainties in the ground water
19 travel time analysis, but not to reduce uncertainty.
20 DR. STEINDLER: Was that ever seriously considered?
21 DR. ROSS: Well, the GTP had a section which
22 prescribed the use of a cumulative distribution function to
23 both treat and express uncertainty. It was an attempt to take
24 all the uncertainties and --
25 DR. STEINDLER: So far what you're saying is, "treat

1 and express." But what you just got done saying is "reduce
2 uncertainties."
3 DR. ROSS: I meant reduce.
4 DR. STEINDLER: You meant "reduce?"
5 DR. ROSS: In the information.
6 DR. STEINDLER: How could it possibly reduce
7 uncertainty?
8 DR. ROSS: Well, we didn't think it did. I mean now
9 we don't think it does.
10 MR. ROSS: The type of data available, the geologic
11 data, the geochemistry data as well as the hydrologic data in
12 developing conceptional models and flow paths.
13 We stress the need to identify sources and levels of
14 uncertainty. That's one thing, as I said before, that DOE
15 didn't do well in the EAs. And we stress the need for DOE to
16 identify methods used to reduce uncertainty and also methods to
17 express the level of uncertainty in their ground water travel
18 time.
19 We think that this position, this draft position
20 provides a framework to resolve the ground water travel time
21 issue. It minimizes the prescriptive guidance and allows more
22 flexibility on the part of DOE to calculate ground water travel
23 times. It does place a greater burden on DOE, though, to
24 develop the specific methods used to particularly deal with the
25 uncertainty problem.

1 Okay. What we think needs to be done: We have just
2 concluded a staff review of the draft position and within the
3 next few weeks, we will try to resolve whatever the internal
4 conflicts are amongst the various staff members and possibly
5 the contractor. And then we will write a new draft and we will
6 send it up for division level review, at which time, our upper
7 management will decide what type of format we are going to use,
8 whether it is going to be another GTP or maybe we'll go through
9 the rain guide process. I don't know.
10 We will transmit it to research for review from that
11 point. And we will issue a regulatory position, whatever it
12 may be, whatever format it may take for public comment.
13 DR. MOELLER: Any additional questions?
14 DR. MARK: When is that likely to come about?
15 MR. ROSS: Which?
16 DR. MARK: This public comment phase.
17 MR. ROSS: I don't think we have really scheduled
18 that yet.
19 DR. MARK: I mean 1990?
20 MR. ROSS: Well, I hope we can do it within a year.
21 DR. MARK: 'Cause at about that time, we should go
22 back to the drawing boards.
23 DR. MOELLER: Yes, Don Orth?
24 DR. ORTH: Can you give any examples of what you feel
25 this might make DOE do different. Let's take, for example,

1 specifically, out at BWIP where we are worried about flow zones
2 through the basalt, through fractured zones and one thing and
3 another, would DOE do anything different, given this, than what
4 they have been doing?
5 MR. ROSS: I don't know exactly what they have been
6 doing. I am not the lead reviewer for the BWIP site. I know
7 they did an analysis of travel time that we weren't happy with,
8 all that happy; but I don't know what some of the specific
9 problems at BWIP are.
10 MR. BALLARD: May I make a comment or response to
11 that question? This is our attempt to provide guidance of what
12 our interpretation of 10 CFR 60 is, which is pre-placement
13 ground water travel time is one of the requirements of our
14 technical rule in 10 CFR 60. It should not be mixed with the
15 requirements of the post-closure performance -- repository
16 performance.
17 And when we provided to DOE in form of a guidance to
18 them, what they -- they can take it and do the kind of things
19 we are talking about: identify sources of uncertainty in their
20 conception model, also identify the sources of concern in their
21 data. And then to show the calculations, how much the ground
22 water travel time there is.
23 Before, what they were doing without identifying any
24 sources of uncertainty, they were giving us numbers. That
25 ground water travel time could be in excess of 80,000 years or

1 50,000 years. So, we are hoping that when they receive this
2 guidance, they will not only give us the numbers, but will also
3 identify what are the sources of uncertainty are in their data
4 and how they have -- and how and what they have done to reduce
5 that uncertainty. And one of our main concerns is how they
6 have expressed it --
7 DR. MOELLER: Other questions or comments?
8 Well, thank you, Fred. We will look forward to the
9 product of your efforts.
10 The last formal item on our program for today is the
11 review of the Fiscal Year 1988 to 1992 High Level Waste Program
12 plans. And John Linehan -- join us at the table, John.
13 John will be reviewing that with us. And you have a
14 handout.
15 DR. LINEHAN: Yes. Just this one sheet.
16 When we were asked to give this presentation, we were
17 asked to go into two different things: First of all, the
18 activities of the products that we anticipated over the next
19 couple of years. In addition, what our FTE would be and what
20 our contract dollars would be. We are not far enough along in
21 the budget process to be able to give you any information on
22 the FTE of the contract dollars.
23 Where we are in 1987 is our FTE is approximately
24 about 95 full-time staff in the high level waste area. And our
25 contract dollar budget is approximately $6 million.

1 DR. STEINDLER: You say your contract budget?

2 DR. LINEHAN: Our technical assistance contract, TA.

3 DR. MOELLER: And so your technical assistance

4 contracts, the potentiality is not that much different, say,

5 from the State of Nevada. I mean if they have -- pick a

6 number. Say, they had 2 or 3 million. Are you about like a

7 good solid Indian tribe?

8 DR. LINEHAN: Probably. Some of the states and

9 tribes are going to have more dollars than we do, looking at a

10 number of typical areas.

11 DR. MOELLER: Yes.

12 DR. LINEHAN: It is going to be a very different

13 situation.

14 The other item of uncertainty -- I've got this

15 stamped, "draft." There is a lot of uncertainty in the program

16 with respect to the DOE schedules, when the SCPs are coming in,

17 the recent draft -- not the draft, but the final mission plan

18 amendment that we discussed early this morning has taken

19 outdates for the SCPs. There is uncertainty with respect to

20 them. And, in addition, there are questions as to what is

21 going to happen on the Hill, if any of the proposed legislation

22 is going to go through, and what the impact of that on the

23 program would be, especially, if we try to look out over a two

24 or three year period.

25 What we have attempted to do, therefore, in this

1 chart, is to lay out what we see as the major activities by
2 year that we anticipate. Going down on the left-hand column,
3 here, they are broken down into six different categories which
4 I will go into in a minute. It is really a convenient way that
5 we break down our budget. And then going out to the right,
6 horizontally, the activities in each category per year is
7 spelled out.
8 Now, one of the important assumptions that was made
9 in developing this chart, and it is really just an assumption
10 to get things down on paper, is that we will only get one SCP
11 per year from the Department of Energy. I would ask you not to
12 read anything into that. We're not -- guessing. We have no
13 information from the Department. It is really for budgeting
14 purposes. We had to make some assumptions.
15 What will happen, depending on when the SCPs come in,
16 we will need to reallocate and adjust resources appropriately
17 if it differs from one per year. The important thing, though,
18 is we feel we have enough resources within the division to
19 respond to whatever DOE hits us with, even if it is two next
20 year or two within the next 12 months.
21 And the office director, you know, would reallocate
22 whatever resources are necessary if the division needed
23 additional assistance.
24 Probably the easiest thing is just to briefly go
25 through the different budget categories. The first one we have

1 is mainly development of regulatory requirements in providing
2 technical support for rulemaking.
3 The activities we have listed there are the high
4 level waste definition that we have briefed you on before and
5 we expect to get a proposed rule out on that sometime in Fiscal
6 Year 1988.
7 DR. MOELLER: Where do I see that high level?
8 DR. LINEHAN: It's defined in categorized waste.
9 DR. MOELLER: Okay. Defined -- fine, sure.
10 DR. LINEHAN: I am changing the terminology, again.
11 DR. MOELLER: That's all right.
12 DR. LINEHAN: And I think we have pretty well briefed
13 you on that so you understand what our thinking is there.
14 The next item, the "conform to the NWPA
15 requirements," is a proposed revision to Part 51 that would
16 occur in Fiscal Year 1988. The purpose of this is to conform
17 Part 51, portions of Part 60 to NWPA with respect to
18 environmental areas of concerns. And it would also lay out in
19 Part 51 what the criteria would be that we would use for
20 adopting DOE's environmental impact statement.
21 The final rulemaking that we have listed there is a
22 review of the waste confidence proceedings. When the
23 Commission issued its finding or decision with respect to waste
24 confidence, they made a commitment to re-look at it, revisit
25 it. I believe it was every five years. It was a fixed number

1 of years. We are scheduled to begin that re-look sometime in
2 Fiscal Year 1988 and we would be issuing a policy statement on
3 what our conclusions were sometime in Fiscal Year 1990. And at
4 the present time, that is all we have planned for rulemaking.
5 And, as Chip Cameron indicated, just previous to me,
6 the rulemaking to conform to the EPA standard, it appears it's
7 going to be up in the air until there is some action on the
8 part of EPA and the courts to resolve that situation.
9 The other item there, "Implement NWPA Actions," deals
10 with the various responsibilities the division has for
11 monitoring what the NRC is doing, what DOE is doing with
12 respect to the Nuclear Waste Policy Act. It includes a number
13 of different things that we've got listed there: review and
14 comment on various DOE documents that our requirement is
15 required by the Waste Policy Act.
16 Probably the most important thing there is the
17 establishment of the FFRDC and the decision on awarding that
18 contract is expected sometime the end of this fiscal year or
19 the very beginning of the next fiscal year. And as we have
20 indicated previously, once we get to that point and award the
21 contract, we would be in a position to talk to you about what
22 our plans are.
23 And the final thing there is just the quarterly
24 progress report that we discussed earlier this morning.
25 The second budget line item is development of

1 technical guidance in the pre-licensing consultation we have
2 with DOE, the states and the Indian tribes.
3 There is a number of activities listed there in the
4 left-hand column and probably it is better just to focus on the
5 products. The important things in the area of reg guides, we
6 are going to be working on a standard and format content guide
7 for the license application. That is a guide that would give
8 guidance to DOE on what they would have to submit to us. And,
9 at the same time, hand in hand with that effort, we will be
10 working on review plans, standard review plans that will
11 provide guidance to the staff on what they have to do in their
12 review of the license application: what they need to do to get
13 prepared for that.
14 DR. STEINDLER: Before you go on, let me go back to
15 the upper box. Sometime back, the staff indicated that they
16 were going to try and set aside to the extent possible as many
17 of the potentially contentious items that might come up through
18 individual small rulemaking exercises. Has that dropped off as
19 the active policy of the staff?
20 DR. LINEHAN: No. It is still there. It comes down
21 under the fourth category there.
22 DR. STEINDLER: Okay.
23 DR. LINEHAN: And I will get to that in just a
24 minute.
25 Going on, on that second category, we have the site

1 characterization review plan that we briefed you on this
2 morning. It is a general review plan, a generic review plan,
3 but there are going to be some portions of it, such as the
4 technical review criteria that are going to be very site
5 specific. So, what we anticipate is once we issue that,
6 assuming we do get SCPs coming in on the Hanford site and
7 basalt site is to be making modifications to that review plan
8 for those two different sites.
9 DR. MOELLER: What do you work into your plans, if
10 anything, in anticipation of any Congressional action? You
11 know, these various bills to limit it to one site and so forth.
12 Maybe you have been here long enough to where you, you know,
13 wait and see.
14 DR. LINEHAN: Yes. Long enough to know I don't think
15 we really can. If you look at the legislation on the Hill
16 right now that is being considered, it varies considerably.
17 Anything from -- I don't know if it is an 18-month moratorium.
18 There is no way to plan for something like that.
19 DR. MOELLER: Okay.
20 DR. LINEHAN: The one thing, though, that has
21 happened over the past several years, ever since I've been with
22 the program, which is about three and a half years, now --
23 going down to the third category just for a minute where we
24 have the technical assessment capability. That is really
25 developing our own capability to independently review the

1 license application. That has always been cut in the budget
2 previously. So, even if we were faced with something like a
3 moratorium, there is a lot of activity that needs to be carried
4 out there.
5 The, you know, more reactive type of thing -- excuse
6 me. Proactive --
7 DR. MOELLER: Sure.
8 DR. LINEHAN: That we need to do on our own.
9 Going back to the second category there. I have
10 mentioned the review plans. In the area of generic technical
11 positions, you are familiar with a number of these. I wouldn't
12 pay much attention to the numbers. This is a draft. And it is
13 really going to depend on what our final budget figures are:
14 how many technical positions we issue. And, again, it is also
15 going to depend on when the SCPs come in. These could go up or
16 down. Or there could be a period of time when we do
17 essentially none of that work and just focus on SCPs if we
18 happen to get two during the same time period.
19 DR. MOELLER: Where it says you are going to do 1.8
20 final TPs or 1.6.
21 DR. LINEHAN: Well, I don't know where we're going to
22 cut that line, but, again, these are just budget numbers.
23 DR. MOELLER: Sure. Okay.
24 DR. STEINDLER: We just got a lecture on
25 uncertainties.

1 DR. MOELLER: You will do one and get pretty far
2 along with another.
3 DR. LINEHAN: I don't dare come down with .6
4 technical position. But that is all going to be worked out,
5 you know, well in advance.
6 DR. STEINDLER: How does the staff view the technical
7 position in terms of the customer? Who is it addressed to?
8 DR. LINEHAN: The technical position is addressed to
9 the Department of Energy. It is to provide guidance to them.
10 DR. STEINDLER: Under those conditions, would you not
11 expect that the planning for the issuance of technical
12 positions in the 1990 and beyond category may be a tardy
13 exercise. In other words, you don't seem to demonstrate or
14 show any sense of urgency in getting your technical positions
15 completed in order to provide advance guidance to the
16 Department so that, in fact, the product that the Department
17 turns out will be more akin to what you are interested in.
18 If that is a correct assessment, then my question is:
19 Why? And, if it is not a correct assessment, can you clarify
20 it for me?
21 DR. LINEHAN: The numbers that are down there are in
22 terms of where we stand in a budget exercise, number (1). That
23 isn't fun.
24 In general, we feel that it will take a number of
25 years, a couple of years to get out all of the technical

1 positions that are needed. You had mentioned before this
2 effort we had to identify and resolve issues. I have been
3 talking about that, I think, with you folks for two years, now.
4 And we have been trying to get the Department of Energy to work
5 with us, to lay out what are the key areas where they need
6 guidance so that we can proceed with this.
7 We just got a response from them. I think it is the
8 first formal response on this item we have ever got within the
9 past month or so where they lay out areas where they feel there
10 are rulemakings needed to resolve issues, where they would like
11 guidance. And the thing is just starting to roll right now.
12 I think the way the schedules have been going in the
13 past, I think 1990, I don't think it's too late to provide
14 guidance. That's all I'm going to say, but there is a lot to
15 be done there and it is going to take a couple of years.
16 The final item there is just part of the budget
17 chart. It is not a specific product, but it is an important
18 activity, this interaction with the states and the tribes and
19 just recognizing that as we develop guidance, as we discuss any
20 technical issues, that there is the need for the ongoing
21 interaction with all the bodies.
22 The next item, this technical assessment capability,
23 as I mentioned before, is to develop our own capability in
24 house to independently review DOE's license application. It is
25 an area that has routinely been cut in the past from the budget

1 or whittled down considerably because folks knew that the
2 license application was a way off and there was time to do this
3 work.
4 The first item there, the development of the overall
5 assessment methodologies, mainly focuses on the work that the
6 staff is doing with Sandia, that we briefed you on a few
7 different times. It deals with a lot of the work to try to
8 come to grips with this issue of uncertainties.
9 There are activities going on there where we are
10 trying to come up with technical positions, to develop
11 methodologies for identifying -- scenarios. We have the study
12 at Sandia going on for determining scenario probabilities. And
13 these activities, the schedules for them, when we may be able
14 to review them with you will be developed once we get a better
15 fix on the budget. There are a number of activities going on
16 at Sandia, a number of reports coming out. Probably at least 8
17 or 10 that I am aware of right now. And, as we get into the
18 next fiscal year, and we have these meetings, Dade, to discuss
19 what's on the platter, what would be appropriate to review with
20 you, we will be able to give you a better rack out -- updates
21 on those.
22 The next items, the models and codes, is really the
23 work in each one of the technical areas, technical disciplines.
24 Some of it has been going on for a period of time where models
25 and codes have been developed for us by contractors. The main

1 effort here is to decide where we stand on the models and
2 codes, whether we need to do further work and to make sure
3 there is a technology transfer where the codes that have been
4 developed, the models by contractors, the ability to run them
5 is transferred to the staff or to the consultants we have with
6 the FFRDC.
7 The next budget line item we have, this develope
8 processes to meet the NWPA mandated schedules, is typically
9 referred to as streamlining activities. Things which
10 streamline the licensing process. The first item, development
11 of the licensing support system, we have briefed you on. As of
12 right now, there is an interim system that is up and
13 operational. The work on that is going to be transferred, if
14 it hasn't already been, in the near future to the Office of
15 Resource Management within the Commission who has this
16 responsibility for the Commission overall, systems of this
17 nature.
18 DR. STEINDLER: Excuse me. Do they have any obvious
19 talents for this job?
20 DR. LINEHAN: As I understand it, Waste Management's
21 staff that has been working on it will continue to work on it.
22 DR. MOELLER: What does "ARM lead" mean?
23 DR. LINEHAN: I believe it -- is it Administration
24 and Resource Management? I think the office --
25 DR. MOELLER: Oh, they will take the lead.

1 DR. LINEHAN: Yes, they will have the lead on it.
2 DR. MOELLER: All right.
3 DR. LINEHAN: The next item that we discussed this
4 morning is the negotiated rulemaking which is the modification
5 of Part 2 to require that all parties submit information in a
6 specific format so that it can be put in this licensing support
7 system and would provide for terminals with all parties so they
8 would have access to the information. And the schedule right
9 now on that is to come up with a proposed rule in Fiscal Year
10 1988.
11 The next item, there, that Dr. Steindler mentioned a
12 while back, this early closure of licensing open items. We
13 have given you a few presentations on efforts we have taken to
14 go through the rule Part 60 to identify what the key issues
15 are, what some of the more contentious issues are, also,
16 looking at some of the issues we have at the sites. And we
17 have been geared towards trying to develop technical positions
18 on these, possibly reg guides, but some mechanism where we can
19 develop a technical position, possibly an acceptable
20 methodology, get public comment on it, comment from the
21 technical community and try to reach some consensus so there is
22 some agreement on how the issue ought to be handled.
23 We talked on some of them about taking them to
24 rulemaking to get total resolutions so they wouldn't be
25 something that would be brought up in the hearing again. What

1 we need to do to make that successful is to work with the
2 Department of Energy, though, on that. And that is something
3 that we haven't been too successful in over the past few years,
4 but, as I indicated, we have got a positive response from the
5 Department within the past month or so. And that is an
6 activity we will be pursuing.
7 DR. MOELLER: Well, now, if you will recall -- and I
8 am sure you do -- this subcommittee has been told for three
9 years, say, that you were going to use the rulemaking as a way
10 to bring these issues to closure so that they could not be
11 brought up again. And, yet, I guess -- have we seen the first
12 example?
13 DR. LINEHAN: No, you haven't. What I was trying to
14 explain is that it is an effort that really hasn't got beyond
15 the thinking stage.
16 DR. MOELLER: But you are now talking to DOE. They
17 are indicating favorable --
18 DR. LINEHAN: Yes. When we originally made the
19 presentations, two of the examples I used that we would
20 consider taking to rulemaking was the methodology for dealing
21 with certain portions of the EPA standard and also the
22 methodology that would be used to show compliance with the
23 ground water travel time criterion.
24 I believe -- correct me, Seth, if I am wrong, but DOE
25 identified both of those as items they felt we needed to go to

1 rulemaking on. They developed -- they mentioned other topics
2 for potential rulemaking or where potential guidance was
3 needed. And in general, overall, it pretty much lines up with
4 the thing we were thinking of.
5 The reason we didn't move ahead is if we are going to
6 resolve any of these things, and especially if we are going to
7 go to rulemaking, we have got to have the cooperation of the
8 Department because there is quite a bit of work on their part.
9 DR. MOELLER: Yes.
10 DR. LINEHAN: That they are going to have to do with
11 commitments of resources.
12 DR. STEINDLER: Let me just make an idle comment.
13 Maybe not so idle. I think it would be useful to pick a
14 suitable topic agreed to by DOE and yourselves and in a sense
15 push the first of its kind through the system to see what kind
16 of problems you are going to run into. While everybody has got
17 -- especially if you go through the hearing stage, everybody
18 has got a notion of what it could be and the horror story of RM
19 50-1 on the EDCS which lasted what? Three years?
20 DR. MOELLER: Yes.
21 DR. STEINDLER: And 20,000 pages of transcripts,
22 still is not totally dimmed out, even though they don't have to
23 go that way, RM-2 was two days of hearings.
24 I think it is worthwhile to see if the system can be
25 made to work. And the earlier you can do that, the earlier you

1 DR. LINEHAN: No. On that one we are going -- I am
2 sorry. We are going to try to issue it by the end of this
3 fiscal year. The other two GTPs we issued.
4 DR. MOELLER: Yes.
5 DR. LINEHAN: On the Q list, that is what we are
6 trying to do. We had trouble getting it scheduled for this
7 particular meeting. We weren't ready to report on it.
8 DR. MOELLER: Okay. That was it.
9 DR. LINEHAN: We do have a public meeting in the next
10 week or so on the Q list GTP to discuss with parties, any
11 interested individuals, how we responded to the comments on the
12 draft Q list GTP. And that would be open to any of the staff
13 members that would want to attend. We would be glad to tell
14 you, sort of after the fact, in the next meeting, how we
15 handled the GTP and what's in it; but the timing was just off
16 for this meeting.
17 DR. MOELLER: Well, I --
18 DR. STEINDLER: You have seen it?
19 DR. MOELLER: I have seen the draft.
20 DR. STEINDLER: I'm not sure I've seen it.
21 DR. MOELLER: And it is very important.
22 DR. LINEHAN: That's right.
23 DR. MOELLER: Because the Q list is the same as
24 setting up DOE's hierarchial issues.
25 DR. LINEHAN: Exactly.

1 can get a feeling for what kind of grief you are going to have.
2 So, I would urge the Department, to the extent that you have
3 any push with them, to focus in on something, to agree to it,
4 move it.
5 DR. LINEHAN: Yes, I agree. Definitely. We will get
6 an early indication from the other parties how they are going
7 to respond to this type of thing.
8 The next item we have there is the -- is quality
9 assurance. Within the -- it is not past fiscal year. We're
10 still in Fiscal Year 1987, we have issued three generic
11 technical positions. We have actually issued two of them in
12 final form and we are about to issue the third one. Those are
13 the Q list GTP, the GTP on peer review and the GTP on
14 qualification on existing data.
15 We are also in the process and hope to complete this
16 fiscal year a revision to the quality assurance review plan.
17 And, if you remember, the review plan was that document that
18 interpreted the QA elements or criteria that have been written
19 down for reactors in terms of a repository.
20 DR. STEINDLER: Wasn't a Q list GTP, Dade, on our
21 agenda at one time?
22 DR. MOELLER: It was and we were given the draft, you
23 know, a month or two months ago. And we have not reviewed it,
24 to my knowledge. But then you are saying to me now that it has
25 been issued.

1 DR. MOELLER: The Q list is the list of critical
2 items and I would have hoped we could have seen it or could
3 have discussed it.
4 DR. LINEHAN: Well, as I understand, we've had it
5 down to you: a draft of the final.
6 DR. MOELLER: Correct.
7 DR. LINEHAN: For your comments and, you know, any
8 comments that we could get outside of the meeting.
9 DR. STEINDLER: I think it may be worthwhile seeing
10 whether we can resurrect some copies and pass them out.
11 DR. LINEHAN: Well, we can get them down to you
12 tomorrow.
13 MR. MERRILL: I've got a copy I can distribute. Can
14 I make a comment?
15 DR. MOELLER: Yes.
16 MR. MERRILL: Since you are not able to get it ready
17 for this meeting and we knew that you were having a public
18 meeting, the question still persisted as to whether or not it
19 would be reasonable to consider it in our October 14, 15, and
20 16th meeting if it can be held off until after that time to get
21 the ACRS -- of course, that would mean it would be the November
22 meeting before they would get the ACRS comments.
23 DR. LINEHAN: If you people can -- if you have the
24 time to review it, you know, we can definitely consider -- we
25 will definitely consider the comments; but the other

1 opportunity would be if someone wanted to sit in on the public
2 meeting we're having. You know, whether it would be an
3 explanation of what was in the GTP and how we responded to the
4 comments on the draft GTP.
5 DR. MOELLER: But that would mainly be for our
6 information. It wouldn't be a representative of any comments
7 from us. I realize, too, we don't meet every month. We are
8 not really complaining. We are, though, sharing with you the
9 fact that it is a key item and we had been looking forward to
10 jumping on it, you know, whenever it came out. And I would be
11 sorry if we don't have that opportunity to chat.
12 DR. PARRY: I think both Owen and I are planning to
13 attend, at least I am. And I thought Owen was, too.
14 MR. MERRILL: I haven't firmly decided if I can go
15 yet. But what we can report, if I may continue, would not
16 represent the opinion of the Waste Management Subcommittee
17 members and I am wondering if it might not be advisable to send
18 this out to every Waste Management Subcommittee member and
19 solicit comments on this document to be returned in time for,
20 say, Jack to present them, if that is agreeable, at the public
21 meeting.
22 DR. MOELLER: It is next week. And that just doesn't
23 work. Although I must say, having said that, the letters that
24 we receive, like on the basis of the trip, I find very
25 valuable. But that is a little different.

1 We have, in a few cases, where -- well, take
2 Castenberg and take Mike here, where we have total faith in the
3 individual, we have depended upon him to review certain
4 procedures being followed by the NRC staff and his comments are
5 our comments. But this is a little different.
6 Well, we will talk about it and try to figure
7 something out. We can make copies available right away, as you
8 say and I don't know how we could ever get any response to you
9 in time for anything.
10 MR. MERRILL: Would you want to have comments from
11 the individual members submitted to yourself and you combine
12 them and then perhaps we can schedule for discussion by the
13 full ACRS at the October -- what is it? The 7th, 8th, and 9th
14 meeting?
15 DR. MOELLER: The full committee is not going to be
16 interested in this Q list.
17 DR. LINEHAN: The latest schedule, as I understand
18 it, is to issue the guide sometime the end of September.
19 DR. MOELLER: And that is issued for public --
20 DR. LINEHAN: No, that would be a final guide.
21 DR. MOELLER: That's final.
22 DR. LINEHAN: There has already been public comment.
23 We had already presented it to you once.
24 DR. MOELLER: Okay.
25 DR. LINEHAN: I know there is not much time left, but

1 any points you would want to give to us verbally or whatever,
2 we would be happy to consider. But we do have that time
3 constraint. And that particular guide is one that the
4 Commission is tracking and we have got a date there to get it
5 out. I really don't have flexibility.
6 DR. MOELLER: Okay. Well, we will talk about it,
7 maybe in the executive session. I don't really have an answer.
8 I think it is just going to go by us.
9 Go ahead, John.
10 DR. LINEHAN: Okay. The final item on the chart is
11 pre-licensing reviews. The thing you are familiar with is the
12 reviews that we have done on the final liase.
13 The next item there is the reviews of the SCPs and
14 the preparation of the SCAs. And as I mentioned before, this
15 one SCP per year is just for illustrative purposes to get
16 everything down on the paper. And we really don't know what
17 the schedule is going to be at this point in time.
18 Following the SCP -- following each one of the SCPs
19 there will be bi-annual updates that we will be commenting on.
20 And at the present time, as was indicted this morning, DOE's
21 official date that they are giving verbally is September 28th
22 for Nevada; but, as I pointed out at the beginning of the
23 presentation, they have dropped dates from the mission plan.
24 And there is really nothing in writing we can see right now
25 showing any dates for the SCPs.

1 The next item we have in there is the topical reports
2 that we discussed this morning, again, that DOE proposed using
3 in their mission plan amendment. They made the proposal
4 without any explanation. We went back to them and in this
5 letter I mentioned earlier, where they came back with areas
6 where they needed guidance, where they felt rulemakings were
7 appropriate to resolve issues, they further discussed this
8 concept of topical reports, although very briefly. And it is
9 just down here to recognize that it is something we are going
10 to have to get with DOE on. They have really just proposed
11 this concept and there is no indication of when they would want
12 to start submitting these or how many they would want to
13 submit.
14 DR. STEINDLER: I suggest to you that topical reports
15 of that kind may represent a non-legal rulemaking attempt. The
16 consequence of that conclusion is that the criteria that you
17 develop for their review and acceptance has to be very
18 carefully hammered out so that you don't get yourself in a trap
19 having accepted something three years ago without careful
20 thought and review and then, in a sense, be stuck with living
21 with it further down the line.
22 That means to me, at least, that the front end of
23 that exercise that starts in Fiscal 1988 with scope and volume
24 not yet defined ought to have a little section in it saying
25 definition of criteria and review process. And that, I think,

1 would be very critical.

2 DR. LINEHAN: I definitely agree and the review

3 process is the first thing we need to focus on. And, again, as

4 I mentioned this morning, the first thing we have to do is talk

5 with folks in NRR who have experience with them, you know, to

6 find out how they handled them.

7 DR. STEINDLER: Do you anticipate that they would be

8 used in the sense the same way as NRR has?

9 DR. LINEHAN: I really don't know how they were used

10 in NRR. I just know that they used them. But it was to try to

11 close out particular subjects, topics. Yes, that would be the

12 intent.

13 The final two items there, the on-site licensing rep

14 I think you are familiar with, based on the presentations that

15 Prestolt gave, with what their role is and how they interact

16 with DOE and the Headquarters staff.

17 And the final item there, the review of the second

18 repository, we have no significant resources budgeted for the

19 second repository and there is no active efforts, to speak of,

20 underway right now. DOE isn't doing any site specific work and

21 is just doing some more generic research type activities they

22 are conducting in that area.

23 DR. MOELLER: Jack?

24 DR. PARRY: John, isn't DOE planning now to

25 reinitiate their second repository work in October 1? Unless

1 they hear differently from Congress.

2 DR. LINEHAN: That is what they have stated, yes.

3 DR. PARRY: Do you plan then to have some low level

4 effort staying aware of what they are doing?

5 DR. LINEHAN: There would be a very, very low level

6 of effort, just to remain aware of what they are doing. What

7 we would be concerned about would be getting involved early in,

8 you know, when they started to get to the site level of

9 focusing in on sites. Just as we did on the first nine sites

10 that were being considered. But right now that whole program is

11 too indefinite to even guess.

12 DR. MOELLER: Other comments or questions?

13 There being none, well, thank you, John, for so much

14 information in a small space. It was very helpful to have this

15 to go along with it.

16 Let me say, then, that this brings us to the close of

17 our formal interactions for the day with the Division of High

18 Level Waste Management staff. Let me thank all of the people

19 who came down to appear with us and for the manipulations in

20 the schedule and so forth, being accommodating there to assist

21 us.

22 We will now go into executive session and the main

23 thing that we will be doing in the executive session is to try

24 to summarize what we concluded on the basis of yesterday's

25 meeting and to identify any particular issues on which we might

1 want to prepare written comments in terms of today's meeting.

2 We will be adjourned until 8:30 a.m. tomorrow

3 morning.

4 (Whereupon, at 4:34 p.m., the subcommittee went into

5 executive session.)

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1 CERTIFICATE

2

3 This is to certify that the attached proceedings before the

4 United States Nuclear Regulatory Commission in the matter of:

5 Name: ACRS Subcommittee on Waste Management
General Meeting

6

7 Docket Number:

8 Place: Washington, D.C.

9 Date: August 18, 1987

10 were held as herein appears, and that this is the original

11 transcript thereof for the file of the United States Nuclear

12 Regulatory Commission taken stenographically by me and,

13 thereafter reduced to typewriting by me or under the direction

14 of the court reporting company, and that the transcript is a

15 true and accurate record of the foregoing proceedings.

16 /S/ Irwin L. Coffenberry

17 (Signature typed): Irwin L. Coffenberry

18 Official Reporter

19 Heritage Reporting Corporation

20

21

22

23

24

25

First Set of Handouts Owen Merril
8-18-87 - will try to note where these documents referred to when transcribing

REVISED 7/28/87

NTS ITINERARY

WMPO (ACRS) PROGRAMMATIC

JULY 29-30, 1987

JULY 29

8:15 a.m.	Meet at front door of Alexis Park Hotel. Transport via DOE/WMPO vans to SAIC offices.
8:30 a.m.	Arrive at SAIC offices at Valley Bank Building on Convention Center Drive. Meet in Room 450.
8:45 a.m.	Presentation by Paul Prestholt, NRC On-Site Representative.
9:30 a.m.	Presentation by Carl Johnson, State of Nevada.
11:00 a.m.	Break for Lunch.
12:30 p.m.	DOE/NNWSI Presentation.
4:30 p.m.	Close/Question & Answer Period.
5:00 p.m.	Transport via DOE/WMPO vans to Alexis Park Hotel.

JULY 30

6:45 a.m.	Escorts and visitors meet at front door of Alexis Park Hotel. Depart for Mercury via DOE/WMPO vans.
8:15 a.m.	Arrive at Mercury Badge Office for badging.
8:45 a.m.	Depart for Area 1 Drill Yard.
9:30 a.m.	Arrive at Area 1 Drill Yard. Walk-through briefing by Patrick Rowe, REECo.
10:00 a.m.	Depart for G-Tunnel.
10:30 a.m.	Arrive at G-Tunnel. Briefing by Roger Zimmerman, SNL.
11:45 a.m.	Depart for Area 12 Cafeteria.
12:00 noon	Lunch (no host).

12:45 p.m.	Depart for Spent Fuel Test-Climax (SFT-C).
1:15 p.m.	Arrive at SFT-C. Underground briefing by escort.
2:00 p.m.	Depart for SEDAN Crater.
2:10 p.m.	Arrive at SEDAN Crater. View crater.
2:20 p.m.	Depart for Yucca Mountain.
3:45 p.m.	Arrive at top of Yucca Mountain. Yucca Mountain Geology/Hydrology briefing by USGS representatives.
6:45 p.m.	Depart for Mercury Steak House.
7:45 p.m.	Arrive at Mercury Steak House, reserved table (no host).
8:45 p.m.	Depart for Las Vegas, Alexis Park Hotel.
10:15 p.m.	Arrive at Alexis Park Hotel, Las Vegas.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

August 18, 1987

MEMORANDUM FOR: ACRS Members

FROM: O. S. Merrill, Senior Staff Engineer

SUBJECT: NEWSPAPER CLIPPINGS

Attached are several news clips regarding "nuclear waste dumps" from two of the Nevada papers that were printed while we were there. Also, attached is an article from the Washington Post that is relevant to the above.

Attachments:
As stated

cc: ACRS Technical Staff
ACRS Fellows

Thursday, July 30, 1987
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Street Edition
Vol. 83, No. 124 102 pages 25 cents

Nuke bill OK'd by panel

By David Koenig
Review-Journal Washington Bureau

WASHINGTON — A bill that may target Yucca Mountain in Nevada as the most likely site of a high-level nuclear waste dump was approved overwhelmingly Wednesday by the Senate Energy Committee.

The bill would speed the process of finding a permanent storage site for nuclear waste, authorize an interim storage facility and pay bounties to states that volunteer to accept these facilities.

■ Bryan, Hecht trade nuclear jabs/4A

The committee approved a compromise plan drafted by panel Chairman Bennett Johnston, D-La., and ranking Republican James McClure of Idaho. It was cleared for floor action on a 17-1 vote, with Sen. Chic Hecht, R-Nev., dissenting.

Hecht strongly defended his handling of the nuclear waste issue in Congress on Wednesday, and declared he is "absolutely opposed" to building an underground dump in Nevada.

In a blast at Gov. Richard Bryan and other critics, Hecht said he has shown "real leadership, real service to Nevada" by working on a bill which revives the foundering search for a dump site. Hecht, who attached 12 amendments to the bill, suggested his critics have ducked responsibility by instead demanding the site-selection process be halted.

Hecht said if the bill becomes law, "all of the opposition in the state of Nevada won't do a thing to

Please see NUCLEAR/4A

Nuclear

From 1A

help. But by participating in the process ... Nevada comes out ahead no matter what happens to the bill. That's what real leadership, real service to Nevada, is all about.

"Some people in my state are asking, 'Why don't you just throw up your hands and flatly oppose the entire process, refusing to participate at all?'" Hecht said. "That's the approach the political opposition in my state has chosen, and it would be much easier, and probably politically smarter for me to fall into line.

"Doing that might help Chic Hecht, but it would do nothing for the people of my state or the country," he said.

But environmentalists and Nevada's lobbyist on nuclear waste issues have charged that Hecht has done little while the Energy Committee produced a bill they say makes Yucca Mountain the obvious first choice for the dump.

On Tuesday, the state's nuclear waste lobbyist said he was "baffled" that Hecht had not objected to the bill on grounds it will revive the dump-selection process — a process state officials say has been conducted illegally by the U.S. Department of Energy.

The lobbyist, Wright Andrews, said the bill ignores the energy department's mistakes, and amounts to "sticking it to Nevada."

The issue now goes to the Senate floor and the House, where it may be opposed by some lawmakers favoring a shutdown of the selection process. However, the so-called "moratorium coalition," which included Sen. Harry Reid, D-Nev., may be broken.

Johnston said lawmakers from the East now support his bill because it would kill the selection of a second dump in the East for at least 20 years. Most of the senators from the Northwest now support the bill, and even the leader of the coaltion, Sen. James Sasser, D-Tenn., is wavering because Johnston's bill may let Tennessee off the hook for an interim storage facility.

Johnston, however, insisted his bill does not target Nevada.

"Nevada is no closer to being chosen than they were before," he said. "There is nothing in this bill that is anti-Nevada and a lot that is in their interest."

However, sources have said Johnston has told Eastern lawmakers they should support the bill because it would result in Nevada being selected. Johnston himself acknowledged he has said that articles and testimony by some scientists indicate Yucca Mountain is the preferred choice.

Even environmentalists who oppose the resumption of the search process credited Johnston with a textbook example of bargaining for votes.

"He passed around enough bottles," said Brooks Yeager, a lobbyist for the Sierra Club. "He even bought off Hecht, even though (Hecht) opposed it, because (Hecht) really didn't fight it."

Yeager complained the measure "will force the Department of Energy to make a decision they're not ready to make" — to pick the best available dump site in two years. "They don't have sufficient information and their selection process has been illegal so far."

Hecht seeks changes to nuclear waste bill

By David Koenig
Review-Journal Washington Bureau

WASHINGTON — Sen. Chic Hecht, R-Nev., said Tuesday he is "bargaining for my state" on the nuclear waste issue, but he came under attack by Gov. Richard Bryan.

The incident could be a precursor to next year's U.S. Senate race, when Bryan may challenge Hecht and nuclear waste will probably be a major campaign issue.

Under an amendment proposed by Hecht, and approved Tuesday by a Senate committee, the state that gets the high-level nuclear waste dump would also get "special consideration" for government research projects.

The amendment carries no guarantee, but Hecht suggested it would lessen the sting if Yucca Mountain in Nevada is chosen for the dump. The state has usually been ignored when research projects are handed out, he said.

"What I'm doing is bargaining for my state," Hecht said.

But Hecht's handling of the nuclear waste issue was attacked by Bryan and by a lobbyist for Nevada, who complained that Hecht has not argued directly against Yucca Mountain's selection.

"I am extremely disappointed that our senior senator ... has apparently chosen not to keep the dump out of Nevada," Bryan said in a statement issued by his office.

At issue is a bill by Sen. J. Bennett Johnston, D-La., to move ahead in 1989 with detailed study of one of the three leading dump sites in the West, instead of studying all three. The state chosen would receive $100 million a year in compensation. The bill would all but kill a planned Eastern dump.

"If this is passed, it is extremely negative for Nevada," said Wright Andrews, the Washington lawyer hired by Bryan to represent the state on nuclear waste issues.

"This legislation is saying, 'OK, so what about all the unfairness. We will pick from one of the three,'" Andrews said. "And all they are doing is sticking it to Nevada."

Nevada officials say Yucca Mountain has been unfairly targeted by the U.S. Department of Energy. Texas and Washington state officials say the same thing about their sites. But Andrews said concerns about polluting the Columbia River in Washington, combined with Texas' political clout, will push the dump into Nevada.

Instead, Hecht has pursued a strategy of shaping the Johnston bill with a dozen amendments, most of which have been approved by the committee. Andrews called

Please see NUCLEAR/8B

Nuclear

From 1B

and his attorneys contended that Huffaker's personal views on drinking made him unqualified to preside over the drunken driving case. However, another District Court judge refused to disqualify Huffaker.

Rosborough's attempt to remove Huffaker — a move dubbed "judge shopping" in legal circles — was based on the judge's comments during the February sentencing in another drunken driving case.

them "minor softening amendments," while adding that "the clear tone of this entire (committee debate) has been: 'It's going to Nevada.'"

Bryan, who was traveling back to Nevada from a governors' conference in Michigan, said Nevada is the Energy Committee's "primary target" for the waste dump and suggested Hecht will not fight on the state's behalf.

Hecht, however, has dismissed the suggestion that Johnston's bill targets Nevada. He said the final decision where to put the dump will be based on technical factor not political ones.

But, Hecht argues, the state th is chosen should be taken care by the federal government. In th spirit, he offered the amendmer Tuesday to favor the dump-sit state in competing for federal r search projects.

"I think it is time our stat should be given some of the advan tages of the nuclear age," Hech said.

Nuclear sparks fly between Hecht, Bryan

By Dorothy Kosich
Review-Journal Capital Bureau

CARSON CITY — The wrangling between Sen. Chic Hecht and Gov. Richard Bryan over a high-level nuclear waste repository took on a sharper tone Wednesday as Bryan accused Hecht of selling out Nevada.

Hecht, R-Nev., responded that Bryan's criticism is actually directed at getting a head start on the 1988 election campaign. The Democratic governor has been frequently mentioned as a challenger for Hecht's Senate seat.

Hecht is a member of the Senate Energy and Natural Resources Committee, headed by Sen. Bennett Johnston, D-La. The committee voted Wednesday in favor of a Johnson proposal that may make Yucca Mountain the first choice for a high-level nuke dump, while excluding detailed study of two other sites in Washington and Texas. Hecht voted against the proposal.

Bryan said Wednesday that "by not fighting the bill all the way, Senator Hecht appeased the (Department of Energy) and the administration, and gave the impression Nevada is willing to trade for the nuclear garbage in the country."

Bryan said Hecht "should have stood up for the Nevadans who have said they are opposed to a dump in our state. Instead, he wrote off Nevada's interests in exchange for a few crumbs from his friend, Senator Johnston. He failed miserably to fight for Nevada."

Bryan said the crumbs included an assurance that the government would favor a request that a repository state also be given research projects such as the proposed superconducting super collider project.

In a telephone interview, Hecht argued his amendments to the Johnston proposal strengthens Nevada's position because it is based on a resolution approved by the 1987 Legislature and signed by Bryan.

Senate Joint Resolution 5 urges the federal government to mitigate adverse impacts of a facility for disposal of high-level radioactive wastes in 14 areas, such as fire protection and medical care.

"I've asked in each session in the Legislature for bipartisan opposition to the site," Bryan responded in a telephone interview late Wednesday from a governors' conference in Michigan.

He called Hecht's amendments "trifling at best." He said Hecht should have been talking about his opposition to Johnston's bill and why it violates the provisions of the Nuclear Waste Policy Act.

Bryan said, "Hecht also failed to speak up for Nevada in committee discussion of judicial review. As a result, Nevada's protection from some DOE decisions will now lie with a temporary emergency court in Washington, D.C..

Hecht responded that "the 1988 political season has begun. I hope as we get down to the next election if Gov. Bryan decides to run against me that he will heed the advice of Mark Twain, 'first you get the facts, then you can distort them any way you want.' "

Bryan said his statement is not political rhetoric and that he has consistently voiced his opposition to the repository since 1983.

The senator said there is "nothing in any legislation that said Yucca Mountain was to be selected."

But, he added, opposition to Johston's current legislative efforts will be an "exercise in futility" because the repository selection process is part of the federal budget reconcillation act which "the president has already said he is going to veto."

Reid tells Congress to take dump 'elsewhere'

By Mary Manning
SUN Staff Writer

WASHINGTON — Sen. Harry Reid, D-Nev., introduced legislation of his own Thursday in an effort to derail Senate Energy Committee efforts to put the nation's first nuclear dump in Nevada.

Reid referred to Nevada as the "sacrificial lamb" in "an agreement that has been privately reached" to make Nevada the home of the nation's first high-level nuclear waste repository.

Reid introduced the High Level Waste Repository Water Pollution Control and Guarantee Act Thursday as "just one step I plan to take to STOP the siting of the nuclear waste repository in Nevada."

He added, "I won't give up the fight to save Nevada from this scourge."

The bill does two things, Reid said. First, it guarantees that if water in any state or group of states is polluted by a high-level nuclear waste repository leak, every other state in the country must share its water resources to replace those lost. Second, the federal government will pay for building whatever physical facilities are needed to transfer water to the affected states.

See REID, Page 4A

Reid won't give up fight

Continued from Page 1A

The bill also guarantees unusable residential, commercial or agricultural land due to high-level nuclear waste leakage will be replaced and compensated by individual states through equivalent property or eminent domain. Individual property and buildings would be compensated by the federal government.

Earlier this week, the Senate Energy Committee approved amendments that narrow the nuclear repository search to one site. The Department of Energy picked Nevada, Texas and Washington last year for intensive scientific studies.

However, Sen. Bennett Johnston, D-La., introduced the approved amendment to spend only $1 billion — instead of $3 billion — to study only one site instead of all three.

Reid said the earlier legislation was an effort to "have this poison forced down the throats of our citizens, with no thought of fairness or of Nevada's wishes."

"Many of my colleagues in this body look on my state as a convenient dumping ground for the trash their citizens generate in pursuit of ever more affluent lifestyles," Reid said.

"Many in Congress think that because we have accepted the necessity of nuclear testing in Nevada's central ranges, the people of my state will permit our beautiful land to be despoiled for any purpose, and at any price," the senator said.

"To those who believe that of Nevada, I have a simple message: go elsewhere!" he added.

Reid referred to a high probability that central and southern Nevada are joined by deep aquifers. Any plutonium leaked into those underground waters could spread with "stunning rapidity," he said.

Home Edition

2A LAS VEGAS SUN Thursday, July 30, 1987 25¢

Senate panel 'dumps' Nevada

Bryan: Hecht sold state for nuke garbage

By Chris Chrystal
United Press International

WASHINGTON — The Senate Energy Committee approved a high-level nuclear waste disposal bill Wednesday that provides for detailed study of a single dump site and gives neighboring states an equal right of veto.

Approval was 17-1 on a roll call vote, with Sen. Chic Hecht, R-Nev., opposed.

"I am convinced it is the wrong approach for this country to be taking," Hecht said. "We have other options and we should be looking at those first."

However, Gov. Richard Bryan said Hecht "sold out" Nevada during the committee's consideration of several amendments, and the senator's vote Wednesday was "a charade."

"Most of Hecht's amendments don't do anything substantial that was not already contemplated under the Nuclear Waste Policy Act of 1982," Bryan said. "They certainly do nothing to support his contention he opposes a

See BRYAN, Page 6A

Bryan: Hecht sold out state to be nuke garbage disposal

Continued from Page 1A

deep geologic repository in Nevada or elsewhere.

"By not fighting the bill all the way, Sen. Hecht appeased the Department of Energy and the administration and gave the impression Nevada is willing to trade for the nuclear garbage of the country."

Energy Committee Chairman Bennett Johnston, D-La., who sponsored the bill with Sen. James McClure, R-Idaho, said the strength of the vote "shows there's a consensus to get it passed" and predicted favorable action in the Senate.

But Bryan said Johnston used a budget tactic to skirt the Nuclear Waste Policy Act. "It appears that Hecht has been dumped by the DOE and the administration and Nevada is the loser," the governor said.

The measure, which saves money by having only one dump site studied, was approved both as a single piece of legislation and as part of the committee's budget reconciliation procedure aimed at meeting spending guidelines.

The Senate is expected to take up budget reconciliation after the August recess.

Bryan added, "To that prospect, he should have said, 'Over my dead body.' He should have stood up for the Nevadans who have said they are opposed to a dump in our state."

Nevada's other senator, Harry Reid, D-Nev., who does not sit on the Energy Committee, was also upset by the committee action.

"I have always opposed and will continue to oppose the location of a high-level nuclear waste repository in Nevada," Reid said. "The passage Wednesday of legislation that virtually singles out Nevada for that site does not change my position."

Reid said he will "offer language in the full Senate to stop siting for 18 months" and "to set up an independent study commission." He said his plan would save $45 million more than the Johnston proposal for the next fiscal year.

The panel approved an amendment by Sen. Mark Hatfield, R-Ore., giving states such as Oregon that border a nuclear dump site state or share a common river or waterway the same voice in the selection process as the proposed host.

The amendment applies only to the proposed deep-earth repository, not above-ground "temporary" storage of high-level waste.

The Hanford Nuclear Reservation in Washington state, one of three proposed sites for the nation's first high-level nuclear waste dump, shares the Columbia River with Oregon along most of its southern border.

The other proposed sites are Yucca Mountain in Southern Nevada and Deaf Smith County in the Texas panhandle.

All three were going to be studied at a cost of $1 billion apiece, but under the Johnston-McClure bill, only one would be studied, unless it were found unsuitable.

Sen. Wyche Fowler, D-Ga., who with Sen. Bill Bradley, D-N.J., opposed Hatfield's amendment, said giving neighboring states and those sharing waterways equal veto rights boosts the chances of defeating a proposed dump site.

"We all want to get the thing built and this is not the way," Fowler said.

Sen. Timothy Wirth, D-Colo., tried to get an amendment approved to make surface or groundwater vulnerability a big issue in dump site selection, but the panel agreed only to include it in the report, rather than the bill itself, to avoid the appearance of steering the dump to the driest state — Nevada.

Hecht cast the lone vote against the Wirth proposal. He also complained that singling out one site for detailed study is unfair.

"I remain adamantly, unalterably, absolutely opposed to a permanent, deep-geologic repository for high-level nuclear waste in Nevada or anywhere else," he said.

Opinion

Nuclear repository is not a dump?

Every once in a while, we get one of those letters — some harping, some cute, some indignant — contending that the newspaper has misued some word or phrase.

Probably every editor remembers the time his newspaper carried a photo caption about kids "playing frisbee in the park." And every editor probably remembers the inevitable letter from the company that makes Frisbees informing him, in no uncertain terms, that Frisbee (upper case "F") is a registered trademark, not to be confused with other plastic disk toys. Fair enough.

Caesars Palace used to have a cute little rhyming letter it would send out to publications that inadvertently put an apostrophe in the name: "We send 'dis message without no malice. Der ain't no apostrophe in Caesars Palace."

The list goes on and on. Usually, these "get it right" letters have to do with misused brand names. But on occasion, you get letters from people who dislike other terms — those who say the term "illegal aliens" is pejorative, casting these immigrants as beings from out space (use "undocumented workers," they say); those who say the Contras should be labeled "freedom fighters;" Those who object to the term "mentally retarded," which they see as pejorative, insisting that the phrase "developmentally disabled" be used instead.

At any rate, it was probably only a matter of time before someone came forward to challenge our use of the term "dump" to characterize that high-level underground nuclear waste site the federal government wants to build at Yucca Mountain.

Sure enough, a group called the Atomic Industrial Forum, has come forth to register a complaint. The Atomic Industrial Forum is a pro-nuclear advocacy organization based in Bethesda, Maryland.

In a missive to news organizations this week, the Atomic Industrial Forum lodged the following complaints and offered these suggestions:

"Dump is a four-letter word that fits neatly into headlines. But it is not an accurate word when you are writing about high level nuclear waste. Please use the correct term: repository.

"After all, what is a dump? A dump is commonly thought of as a place where trash or garbage or drums of toxic waste are dropped in a disorderly manner....

"A nuclear waste repository is planned to be something entirely different: a carefully engineered facility within a carefully selected site....

"Those who oppose the peaceful applications of nuclear energy love to use the pejorative word 'dump.' Please don't join their camp. . . ."

We think the Atomic Industrial Forum folks are a little oversensitive. We do not count ourselves among those who oppose nuclear power in general. Nor do we suggest that an underground, um, repository would be inherently unsafe.

What we have objected to in terms of the waste site is the politicized siting process and the effort by bureaucrats and Eastern elected officials to "dump" the repository on politically feeble Nevada. We also object to the unfairness of a deal which gives Nevada not only the nation's atomic weapons testing program but also its high-level atomic waste, all of it generated elsewhere.

Besides that, the term "dump" also carries these definitions: "An accumulation of refuse or other discarded materials; a place where such materials are dumped; a quantity of reserve materials accumulated at one place."

So, the term "dump" in news stories or in headlines is accurate. We plan to continue using it. In editorials, where "pejorative" is not a no-no, we'll call it a dump or tomb or a shaft full of gunk or anything else that comes to mind.

But, tell you what. If you folks in Bethesda manage to convince the feds to put the dump in your backyard instead of ours, we'll call it anything you want.

Chic Hecht courts disaster with nuke waste stance

The Neville Chamberlain of nuclear waste in Nevada. That's the unenviable metaphor ascribed to Republican Sen. Chic Hecht, as his critics gear up to defeat him in next year's big election.

Like the pusillanimous British prime minister who conceded the Sudetenland of Czechoslovakia to Hitler in 1938, setting the stage for a German invasion of Poland and World War II, Hecht is being characterized these days as too faint-hearted to defend Nevada from the hob-nailed boot of Washington's nuclear oppression.

It has to do with Hecht's status as a member of the Senate's Energy Committee, which currently is setting a budgetary framework that targets Nevada as home for the nation's nuclear waste.

In recent days, Senate Energy Committee Chairman Bennett Johnston of Louisiana has been ramrodding a bill that would (in the alleged interests of budgetary restraint) require the Department of Energy to study only one possible site for the nuke dump.

Ned Day

Previously, sites in Washington and Texas had been proposed along with Nevada as possible waste repositories.

Under Bennett Johnston's measure, the Yucca Mountain site in Nevada would become the focus of all DOE attention, making the eventual determination a foregone conclusion.

And the blame, according to his critics, belongs directly to Chic Hecht.

Hecht simply is too malleable, too willing to appease the Department of Energy, too ineffective to represent Nevada's interests in this crucial public policy decision, they say.

For his part, Hecht points to eight amendments that he has managed to attach to the bill, most of them dealing with safety standards for the transportation of waste.

But the critics contend that these amendments are only a smokescreen to camouflage his legislative appeasement.

"All the little amendments that Hecht has offered don't change the bill," said Brooks Yeager, a Sierra Club lobbyist.

"The thrust of the bill is that there is a very good chance that Nevada will be picked and there won't be much that Nevada can do about it."

For Nevada, it's a devastating setback. For Chic Hecht's political career, the same is true.

As it stands now, Hecht will face Democratic Gov. Richard Bryan in the 1988 Senate election.

Bryan, one of the most popular governors in Nevada history — and fresh from an impressive eyeball-to-eyeball legislative confrontation with the for-profit hospital industry, in which he won major reform in the delivery of health care — has staked out a position virulently opposed to nuclear waste dumping in Nevada.

This while Hecht openly vacillated, first opposing the dump site, then seeming to favor it (under considerable pressure from the Reagan administration) and now, somewhere in-between.

But in the wake of events in the Energy Committee during the past two weeks, Hecht is seen as, at best, ineffective, or, at worst, too timid and ill-informed to protect the interests of his constituents.

Even before this catastrophe, Hecht trailed Bryan by some 30 points in the public opinion surveys conducted to test the hypothetical race between himself and Bryan.

Now, on top of his lead, Bryan has been handed a potent political issue, tailor-made for his campaign theme, which will emphasize his competence and a willingness to stand up against powerful special interests.

Fully 75 percent of all Nevadans polled on the issue last year said that they oppose Southern Nevada as the site for a nuclear waste repository.

Equally important, leaders of the resort industry (who provide many of the millions to fund election campaigns in Nevada) also are adamantly opposed to the dump.

They worry that an accident, even a minor one, would create a public relations nightmare that could permanently curtail their casino profits.

Sitting back in Washington, Chic Hecht may not recognize the full political implications of what has transpired in the Energy Committee this July.

He may think that Nevadans can be "educated" on the nuclear waste issue, persuaded to the point that the dump is inevitable and that he has cut the best possible deal for Nevada.

If so, in the parlance of his home state's casino industry, Sen. Hecht is living in a whore's dream.

The Neville Chamberlain of nuclear waste in Nevada.

Ned Day's column appears on the Commentary page every Wednesday, Friday and Sunday.

WHERE I STAND

By Hank Greenspun

Life is just a series of perils and threats.

Yesterday's headlines discussed another change in the Department of Energy's policy, when the Senate Energy Committee approved a high-level nuke waste disposal bill providing for a single dump site instead of the three chosen a few years ago.

The site to be selected is Nevada, of course, because congressional representatives from Texas, Oregon and the other two sites in the original plan — which was about the fifth revision of original plans — have expressed vehement opposition to locating the dumps in their states.

The vote in the Senate panel for approval of the one-site proposal was 17-1, with only Sen. Chic Hecht of Nevada against the bill.

Because Hecht did not fight the bill all the way and gave the impression he was willing to trade off something beneficial — like the super collider facility, if we were forced to take the high-level repository — Gov. Bryan accused the senator of selling out the state.

One could possibly interpret the governor's criticism as having political implications, because of an almost foregone conclusion that he will oppose Hecht in 1988 for the Senate seat.

Whether political or sincere, one cannot fault Bryan, because he has always opposed the siting of Nevada for a nuke dump. It goes back to his days as attorney general, when he threatened lawsuits and held hearings with eminent scientists as witnesses in opposition to the low-level waste site in Beatty.

Permitting Sen. Chic the benefit of some wavering and procrastination on the issue, it now appears he is sincere in his efforts, but perhaps his methods aren't very productive.

The only genuine interpretation we can place on the issue is that the DOE cannot be trusted in any findings or investigations since the department came into being. For that matter, we cannot trust the objectivity of the entire Congress when the fate of one

Continued from Page 1A

small state is placed on the scales with two large states that have plentiful electoral votes which count heavily in national elections.

Every Las Vegan who is interested in learning what is about to happen to his state should view a program that will be aired next week and will continue to be telecast on succeeding weeks on Prime Cable's Channel 30.

It is called "Acceptable Risk," a documentary detailing the poisoning of citizens by the nuclear industry.

The program highlights the plight of many cities on the East Coast that relied on information furnished by the industry and the DOE on the safety of factories emitting wastes and gases into soil and ponds

By Hank Greenspun

and sometimes bulldozed into the ground. It tells of small towns with high indices of cancer and other related diseases.

It focuses on the long-term effects of nuclear testing for non-military purposes and the millions of dollars it has cost the government to clean up after poisonings without acknowledging responsibility to the victims.

"Acceptable Risk" is laced with information and knowledge that the Las Vegas SUN has been discussing with its readers for many years, ever since the siting of the low-level nuke waste dump at Beatty.

We attempted to stop it with a federal court action and even threatened the recall of some of our state legislators for not opposing it with legislation.

Gov. Bryan as well as our county commissioners and city councilmen have been strong voices in opposition, but it takes an aroused citizenry to raise so much Cain that will make someone in government finally stand up and call a halt to the poisoning of our waters, soil and populace.

Remember, Channel 30 on Prime Cable. Watch this newspaper for dates and times.

"Acceptable Risk" is must viewing for Nevadans who have a desire to stay healthy and who want their children to live.

WHERE I STAND

By Mike O'Callaghan

All Nevada news directors and editors received a red-hot tip from the Nevada Nuclear Waste Study Committee this month. The NNWSC is made up of a group of people wanting Nevada to become the nation's nuke garbage dump. Oops, there I did it again! Shame on me for calling it a dump. That's exactly what the NNWSC doesn't want me to do.

The NNWSC wants Nevada editors and news directors to call the nuke garbage dump a nuke garbage repository. Now doesn't that sound better? Not really.

Then how about nuke garbage dump repository? Not any better? Nope.

Well, I guess it just all boils down to the fact that a dump is a dump. Even if you want to call it a rose garden, it's still a dump.

So if the Nevada Nuclear Waste Study Committee wants the Silver State to become a nuke waste dump, then let them live with the name. It may be a good idea to call them the Nevada Nuclear Waste Dump Study Committee.

Now that's what is known as calling a dump a dump. Sure sounds more accurate than respository. Doesn't it? Yep!

• • •

Colorado State Sen. Martha Ezzard is my kind of public servant.

Because she left the Republican Party and became a Democrat? No, because she resigned her seat in the state senate when she switched political parties. That is exactly what most other politicians have failed to do in recent years. In fact, I can't recall a Nevada political party-switcher who has resigned his or her elected office when jumping the traces.

In most cases, the voters rectified that lack of

See WHERE I STAND, page 2A

WHERE I STAND

Continued from Page 1A

concern by failing to vote them back into office the next time around.

Sen. Ezzard said it would be "unfair to the GOP voters of Arapahoe County who elected her "if she were to continue to serve as a Democrat." She is a class lady who did exactly what law should demand others do.

Such a law was proposed by Assemblyman Eileen Brookman this year. Assembly Bill No. 647 simply stated that "a public officer shall not change the designation of his affiliation with a political party on an affidavit of registration during his term in office."

Like a ton of other good bills, AB647 died in committee. This particular bill died in the Committee on Elections chaired by Democrat Assemblyman Courtenay Swain of Reno.

It's too bad there aren't more elected public servants like Colorado's Martha Ezzard. It's also too bad that AB647 died in a Nevada Assembly Committee.

• • •

Roy Nickson of the Nevada Taxpayers Association did a great job covering the 1987 Nevada Legislature. You don't have to agree with him on every issue to respect his opinions and ability to identify tax problems.

In a recent issue of "Tax Topics," Nickson suggested that once Bullfrog County is blessed with a load of nuke waste the area could "perhaps get Chernobyl, USSR, to be a 'sister' city."

In a more serious vein he described Bullfrog County to his readers with some disturbing facts. Nickson wrote, "Bullfrog County, with no population, landlocked within Nye County, having one dirt road and with its non-contiguous county seat 270 miles distant, is now Nevada's newest political subdivision. All of the usual county offices are up for grabs — three commissioners, clerk-treasurer, recorder-auditor, sheriff, district attorney and assessor — 'course, the pay isn't all that great, only one dollar a year. County should be well off financially. They will receive a monthly distribution of the 1.25 cent statewide gasoline tax collection, distributed on a formula basis that includes total area (144 square miles out of roughly 110,000 in the state) and that dirt road's total mileage as a proportion of all road mileage in the state (NRS 365.550). Also, it appears it is eligible for one-eighteenth of the total 'table tax' imposed by NRS 463.380 and that's estimated at about $130,000 a year."

Oh yes, and don't forget the school district, a must for every Nevada county!

So now what do our smiling legislators have to say about the highly publicized bastard governmental unit they fathered in the closing days of our longest and most expensive legislative session in history?

• • •

You have to believe the Santa Fe Restaurant in the new Thunderbird Hotel and Casino has great food. The Las Vegas Stars who dine there tell me that the restaurant, under the ownership and guidance of CHRIS KARAMANOS, is excellent. ... The addition of AL LUCIANI to the Nevada Golden Nugget team is another sharp move by STEVE WYNN. The former New Jersey deputy attorney general has done a great job for the Atlantic City Golden Nugget. ... Gaming Control Board Chairman MIKE RUMBOLZ was a good board member and gaming experts now tell me is an even better chairman. ... Clark High School graduate NICK BELL is viewed as Iowa Coach HAYDI FRY's secret weapon at fullback this fall, according to the Des Moines Sunday Register. ... U.S. District Judge ROGER FOLEY keeps calling 'em according to the U.S. Constitution. ... MIKE SOSKIN of the King 8 Hotel and Gambling Hall is still probably the best river fisherman in Southern Nevada. ... Former GOP chief MARILYN GUBLER broke another political barrier when acting as maid of honor for Demo honcho SHELLEY BERKLEY's repetition of vows at a ceremony honoring her 10th year of marriage to attorney husband FRED.

$7 billion accident limit

House ups liability of nuclear industry

By John Hanrahan
United Press International

WASHINGTON — The House overwhelmingly approved legislation Thursday that would increase from $700 million to $7 billion the maximum amount the nuclear industry must pay accident victims.

The 396-17 vote came after the House, during two days of debate, rejected amendments that would have made the industry bear much more of the potential costs of an accident. Most members favoring unlimited industry liability ended up voting for the final bill.

The vote was on legislation to extend the 30-year-old Price-Anderson Act, which expires Saturday. The Senate has yet to consider the measure.

The current law limits nuclear utilities' liability for off-site health and property damage costs caused by a plant accident to $700 million.

The legislation passed by the House would increase the industry's liability for damages to the public to $7 billion, a figure several House members argued would likely be inadequate to cover damages from a major nuclear plant accident in a large metropolitan area.

Under the House-passed legislation, the damages would be paid from utilities' insurance and from a victims' compensation fund to which utilities operating the nation's 109 licensed commercial nuclear reactors would contribute $10 million a year, up to a maximum of $63 million, after an accident.

If damages exceeded the $7 billion ceiling, it would be up to Congress to determine a method of additional compensation.

The House-passed measure would also continue a full exemption from liability for private contractors operating Energy Department nuclear weapons and research facilities, and for designers and builders of nuclear plants. The bill would make the government liable for off-site damages caused by accidents at its contractor-operated facilities up to a ceiling of $7 billion.

In action prior to the final vote, the House rejected Thursday several amendments, including one that would have prohibited industry attorneys from being paid out of the victims' compensation fund until victims were fully compensated.

The amendment's sponsor, Rep. Gerry Sikorski, D-Minn., said that without his proposal "pinstriped dandies" would be paid before victims if the $7 billion ceiling were reached.

Sikorski said opponents' contention that the amendment would hurt victims was "a Mother Teresa argument" that did not ring true, coming as it did from those supporting the nuclear and insurance industry position on the amendment.

DRAFT

HLW PROGRAM PRODUCTS FY89 BUDGET

HLW DISPOSAL PROGRAM	FISCAL YEAR 1987	FISCAL YEAR 1988	FISCAL YEAR 1989	FISCAL YEAR 1990
DEV NWPA PROGRAMMATIC & REG REQMTS				
TECHNICAL SUPPORT FOR RULES AND AMENDMENTS				
DEFINE AND CATEGORIZE WASTES		PROPOSED RULE - PART 60	FINAL RULE-PART 60	
CONFORM TO NWPA REQUIREMENTS		PROPOSED RULE - PART 51	FINAL RULE-PART 51	
CONFORM TO EPA STANDARDS	FINAL RULE - PART 60			
REVIEW WASTE CONFIDENCE PROCEEDINGS AND OTHER RULEMAKING				POLICY STATEMENT
IMPLEMENT NWPA ACTIONS	ESTABLISH FEDERALLY FUNDED R&D CENTER	ANNUAL REVIEW AND COMMENT TO DOE ON MISSION PLAN AND PROJECT DECISION SCHEDULE AND OTHER PROGRAMMATIC DOCUMENTS		
		QUARTERLY PROGRESS REPORT TO COMMISSION ON DOE REPOSITORY PROGRAM		
DEV TECH GUIDANCE & CONSULT WITH DOE, STATES AND TRIBES				
PROVIDE TECH SPT FOR FORMAT & CONTENT REGULATORY GUIDES LICENSE APPL (PSAR)	DEVELOPMENT OF DRAFT AND FINAL STD F&C GUIDES AND REVIEW PLANS			FINAL GUIDE TO BE COMPLETED IN FY92
PREPARE REVIEW PLANS	SCP REVIEW PLAN		EA REVIEW PLAN (FINAL TO BE COMPLETED IN FY92)	
PREPARE GENERIC TECHNICAL POSITIONS		3 FINAL TPS	1.8 FINAL TPS	1.6 FINAL TPS
INTERACTIONS WITH DOE, STATES AND TRIBES	CONTINUING IDENTIFICATION AND RESOLUTION OF LICENSING ISSUES			
		MEETINGS WITH STATES AND TRIBES		
DEV TECH ASSMNT CAPABILITY FOR LIC. REV.				
DEVELOP LIC. ASSMNT METHODOLOGY	DEVELOPMENT OF OVERALL PERFORMANCE ASSESSMENT METHODOLOGIES (UNCERTAINTIES)			
DEVELOP LIC. ASSMNT MODELS AND CODES	DEVELOP MODELS AND CODES TO IMPLEMENT REVIEW OF DOE SITE CHAR. ACTIVITIES AND LICENSE APPLICATION			
DEV PROCESS TO MEET NWPA MANDATED SCHDL				
DEVELOP A LIC SUPPORT SYSTEM	ILSS OPERATIONAL	SUPPORT DEVELOPMENT OF THE LICENSING SUPPORT SYSTEM (ARM LEAD) (ARM LEAD)		
DEVELOP NEGOTIATED RULE PROCESS		PROPOSED RULE - PART 2	FINAL RULE - PART 2	
EARLY CLOSURE OF LIC. OPEN ITEMS		STRATEGY		
DEV & IMPLEMENT QA & INSP. PGMS.				
DEVELOP QA CAPABILITY (IE)	3 GENERIC TPS			
CONDUCT AUDITS OF REPOS. PROGRAM	QA REV PLAN AND AUDITS	5 AUDITS	12 AUDITS	12 AUDITS
CONDUCT PRE-LICENSING REVIEWS				
REVIEW AND COMMENT ON FINAL ENVIRONMENTAL ASSESSMENTS	REVIEWED AND COMMENTED ON DOE FINAL EAS			
REVIEW SCPS AND PREPARE SCAS		REVIEW SCP AND PREPARE SCA	REVIEW SCP AND PREPARE SCA	REVIEW SCP AND PREPARE SCA
REVIEW UPDATES OF SCPS		REVIEW 1 SCP UPDATES	REVIEW 3 SCP UPDATES	REVIEW 5 SCP UPDATES PER YEAR
REVIEW TOPICAL REPORTS, TEST PLANS	SCOPE AND VOLUME NOT YET DEFINED		WORKLOAD INCREASE FROM FY88 THROUGH FY90	
-SITE LICENSING REPRESENTATION /IEW DOE SECOND REPOSITORY	CONTINUING TION, SEMI-ANNUAL BA		TO NRSS DIRECTOR OR	UNIT MONTHLY REPORTS

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS
Sandia National Laboratories
NNWSI Geotechnical Projects Division 6313

WHY

- Perform field experiments in previously unresearched hard rocks to document geomechanical behavior for geological based nuclear waste storage considerations

  - Important phenomena being evaluated
    - In Situ Stress
    - Thermal (heat flow characteristics)
    - Mechanical (stress-strain responses, excavation effects)
    - Thermomechanical (volumetric expansion)
    - Hydrothermal (heat induced water migration)
    - Strength (jointed rock, joint)
    - Hydrologic (fracture permeabilities)

- Develop measurement and modeling technology related to above phenomena to prepare for in situ site characterizations in the exploratory shaft at Yucca Mountain

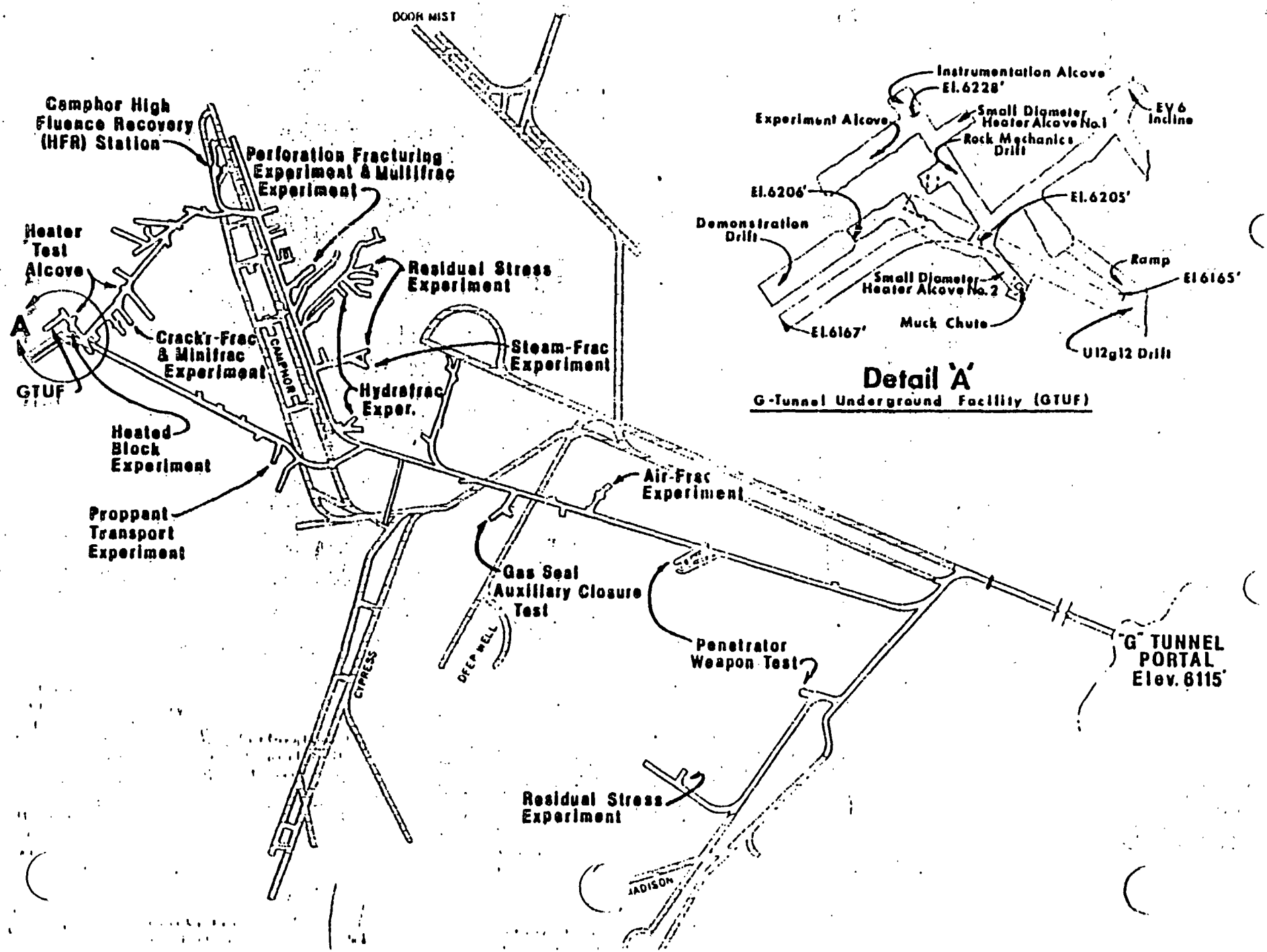
SNL EXPERIMENTS UNDERWAY

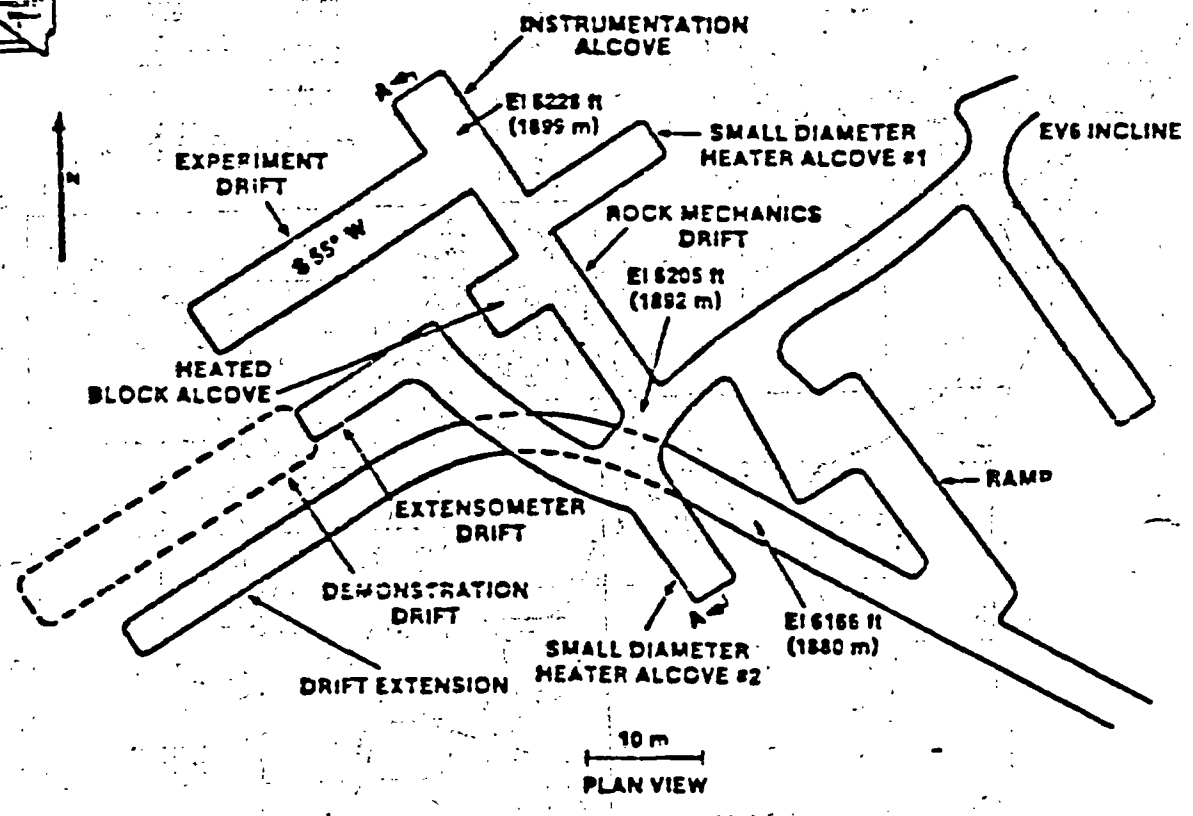
Experiment	Phenomena	Status
Geotechnical Field Measurements	In Situ Stress, Mechanical, Hydrologic	Completed
Small Diameter Heater (Canister Simulation)	Thermal, Hydrothermal	3 Exp. Completed
Heated Block (Establish Lab Field Scale Relationships)	Thermal, Mechanical, Thermomechanical, Strength (Joint)	Exp. Completed
Pressurized Slot (Document Joint Influence)	Mechanical	Tech. Feasibility Estab.
Mining Evaluation (Document Construction Effects)	Mechanical	Exp. Completed
Horizontal Boring Machine (Demonstration of Feasibility of Horizontal Emplacement Concept)	Mechanical	Preparation Stage

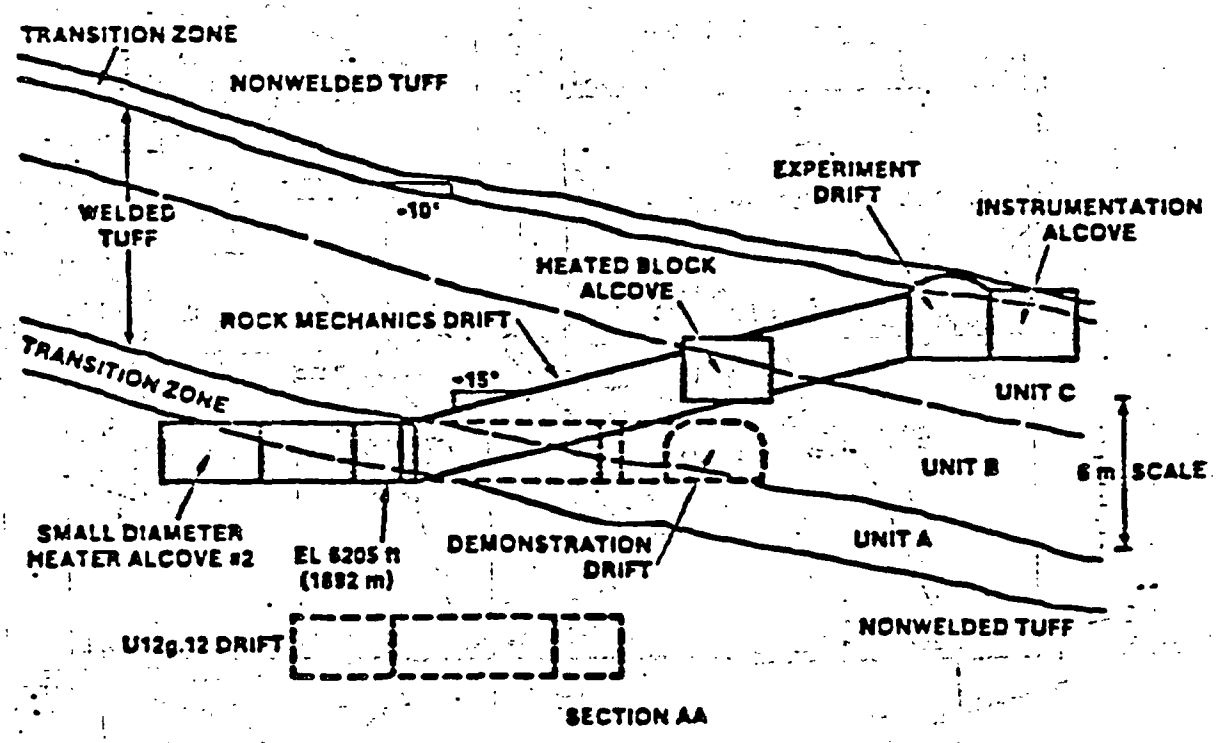
SNL EXPERIMENTS PLANNED

Experiment	Phenomena	Planned
Borehole Stability Investigations (Facilitate Retrieveability Considerations)	Mechanical	FY87-88
Mechanical Strength (In Situ Mechanical Strength Evaluation)	Strength	FY87-88
Prototype Thermal Stress (Demonstrate Response of Welded Tuff to High Thermal Stresses)	Thermomechanical	FY87-88

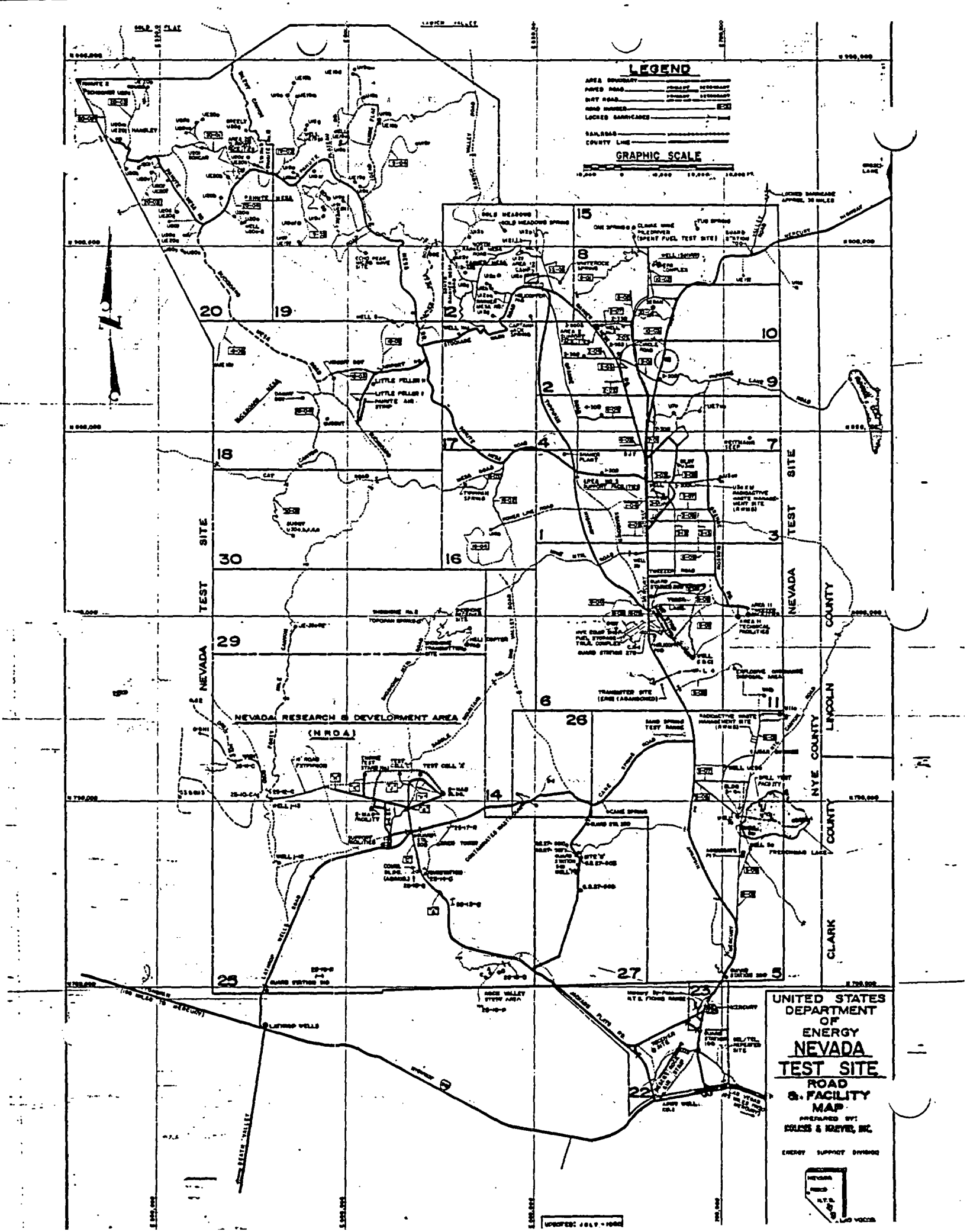
G TUNNEL COMPLEX







Plan and Section Views of G-Tunnel Underground Facility


LEGEND
GRAPHIC SCALE
NEVADA TEST SITE
NEVADA RESEARCH & DEVELOPMENT AREA
(NRDA)
NEVADA TEST SITE
NYE COUNTY
LINCOLN COUNTY
CLARK COUNTY
UNITED STATES DEPARTMENT OF ENERGY
NEVADA TEST SITE
ROAD & FACILITY MAP
PREPARED BY:
REYNOLDS & KREVER, INC.
ENERGY SUPPORT DIVISION

Tape 5 used Ring 5

GENERAL SCP REVIEW PLAN

The activities planned for the time of site characterization are intended to collect the information necessary to support a license application for a geologic repository. The purpose of the SCP is to describe the program by which the DOE plans to obtain that information. The NRC is required by the National Waste Policy Act (NWPA) to review and comment upon the aspects of the SCP that fall within its regulatory purview. The SCP Review Plan lays out the mechanism by which the NRC intends to fulfill its responsibilities relative to review of the SCP.

PURPOSE OF THE SCP REVIEW

The NRC staff review of the SCP is to be a focused review with a three-fold purpose: (1) to determine whether the SCP contains the information required by 10 CFR Part 60 (hereafter Part 60) and other relevant documents; (2) to identify the extent to which DOE's program as presented in the SCP, SCP references, and selected study plans for conducting activities during the site characterization phase will enable them to obtain the information needed to support a license application for a geologic repository; and (3) to assess whether the DOE program as presented in the SCP, SCP references, and selected study plans will have significant adverse effects on the waste isolation capabilities of the site.

In keeping with this statement of purpose, the emphasis of the review will be on certain portions of the SCP to achieve specific objectives, and especially to assure that the major issues of relevance to the site are addressed. The SCP review is only the first step in a sequence of reviews throughout site characterization and not the only mechanism available for staff comment upon DOE's site characterization activities.

SCOPE (RANGE OF ACTIONS TO ACCOMPLISH PURPOSE)

(1) Ensure that DOE's SCP satisfies the basic regulatory requirements and the DOE-NRC agreements concerning the information to be contained in an SCP.

(2) Analyze DOE's site characterization program relative to Subpart E of 10 CFR 60 (Technical Criteria).

(3) Analyze the QA aspects of DOE's site characterization program relative to Subpart G of Part 60.

Tape 7 & 8

August 15, 1987

MEMORANDUM

TO: Mr. Owen Merrill
Senior Staff Engineer, ACRS

SUBJECT: Revised Trip Report

Enclosed for your information and use is a revised (and corrected) copy of my report of the visit by the Waste Management Subcommittee to the University of Arizona and the DOE Nevada HLW Repository Facilities last month.

Sincerely,

Dade W. Moeller,
ACRS Member

encl.

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D. W. Moeller
LET57 - Draft #2
August 11, 1987

SUMMARY REPORT OF ACRS WASTE MANAGEMENT FIELD TRIP TO UNIVERSITY OF ARIZONA AND THE NEVADA TEST SITE - July 28-30, 1987

I. Introduction

The field trip consisted of three parts:

1. A visit to the NRC supported HLW Management research program at the University of Arizona in Tucson. This included a visit to their field investigations at the Oracle Ridge Mine near Superior, AZ.

2. A visit to the DOE supported HLW Management research program in Las Vegas, Nevada. This visit included discussions with the NRC Onsite Representative (Paul Prestholt), the leader (Carl Johnson) of the State of Nevada review program organization, and USGS and DOE personnel (including personnel from the Lawrence Livermore Laboratory and the Los Alamos and Sandia National Laboratories).

3. A tour of HLW Management research activities and demonstration projects at the Nevada Test Site. This included a visit to Yucca Mountain and discussions with personnel of the U. S. Geologic Survey who are conducting onsite investigations there.

ACRS Committee members who participated in the tour included Carson Mark, Dade Moeller, Forest Remick, Paul Shewmon and Martin Steindler. Consultants taking part in the field trip included Melvin Carter, Konrad Krauskopf, Frank Parker, George Pinder, and Mihailo Trifunac. Also taking part in the trip were S. J. S. Parry, Senior ACRS Fellow, and Owen Merrill, Senior Staff Engineer, ACRS; Stephen Kale and James Knight of the DOE Staff Headquarters Office of Geologic Repositories; and Keith McConnell, Division of High Level Waste, and Thomas Nicholson, Office of Nuclear Regulatory Research, NRC Headquarters.

II. Visit to the University of Arizona (July 28, 1987)

Presentations to the Subcommittee included coverage of laboratory and field studies on borehole plugging, including the use of cement and bentonite plugs in basalt, granite and welded tuff, as well as the sealing of salt with cement, bentonite and crushed salt.

The visit to the Oracle Ridge Mine included examination of welded tuff in the field and a review of data obtained through the drilling of a series of nine boreholes in a tuff formation.

The laboratory studies have shown that cement borehole seals, which were initially tight, will with time (7 to 9 months) become loose. A critical factor in the success of the seal appears to be the manner (and care) with which the hole is drilled. If the walls of the borehole are damaged, this can lead to a poor seal. The field studies have shown that the tuff formation "breathes." Sometimes the air flow is into the formation; other times it is out.

One interesting item reported was the development by Lawrence Livermore Laboratory personnel of a technique for electromagnetic geotomography which yields data that closely correlate with those from hydraulic tests (of permeability). Support of further development of this technique at LLL has, however, been terminated.

The major observation noted in the University of Arizona studies is that fractures within a geologic formation will dominate the flow of water through the formation. Therefore the primary need is to understand fracture flow, as well as matrix flow.

Questions raised and comments made by the Subcommittee included the following:

1. All the studies reported appear to be exploratory; there does not seem to be a focus or delineation of clear goals for the work. For example, a number of experiments have been conducted in which a variety of materials have been tested as possible seals for a range of geologic media. If these studies had been arranged on the basis of a factorial experimental design, much more information could have been extracted from the data.

2. The possible influences of chemistry on the behavior of the seals (and their bonding to the geologic medium) do not appear to have been investigated. Although both laboratory and field tests are underway, the integration of the two appears to be absent. There is no clear indication of how either set of tests complements the other. Although they are attempting to obtain a water balance in the flow tests (outlet versus inlet), this does not appear to have been successful. The outlet flow, for example, continues for some time after the inlet flow has been terminated.

3. There were also questions as to how data based on small borehole plugging experiments can be applied to the sealing of large shafts. Plastic (flexible) seals might also be considered. Finally, little attention appears to have been given to the development of methods for testing the adequacy of borehole and shaft seals in the field. This would appear to be crucial to the confirmation of the integrity of a completed repository.

4. Other questions raised included: The adequacy of their QA program; uncertainties and limitations in the data they are obtaining; and who it is that performs independent reviews of the work they are doing. In this regard, it might be noted that the headquarters NRC Project manager appears to have had a major impact on the nature of the research they are conducting.

5. Lastly, there were questions as to how successful the University of Arizona staff has been in keeping up with related research being conducted elsewhere, and the transfer of the results of their work to others. The NRC Onsite Representative (in Las Vegas), for example, had essentially no familiarity with the work being done at the University of Arizona, even though the work was supposedly being conducted primarily in support of the proposed HLW repository being considered for location in Yucca Mountain.

III. DOE Presentations in Las Vegas (July 29, 1987)

A. Presentation by NRC Onsite Representative

The opening technical presentation was made by Paul Prestholt, the NRC Onsite Representative for the proposed Yucca Mountain repository. Mr. Prestholt has a background in geology and quality assurance and appeared to have a solid grasp of the project. He accompanied the Subcommittee throughout the meetings in Las Vegas and the tours at the Nevada Test Site. Mr. Prestholt appeared to have good working relationships with the headquarters NRC Staff, the DOE Staff and the State of Nevada personnel.

Comments and observations made as a result of contacts with Mr. Prestholt included the following:

1. Both the DOE Staff and Mr. Prestholt indicated that the NRC needs to give more attention to the guidance being provided to the DOE Staff. At present, such guidance appears to be less than effective -- certain terms are not clear or need to be better defined; in some cases the DOE Staff simply does not understand what the NRC desires be done. A clear example was the fact that the NRC regulations (which are based on EPA standards) specify limitations on groundwater travel time. What is important is the travel times of the radionuclides being transported by the water. This should be indicated and/or clarified.

2. Mr. Prestholt is hampered by a lack of funds for support of travel by NRC headquarters personnel. For example, during a recent QA review of the DOE HLW research work, he requested the assistance of a QA expert from NRC headquarters. Such help was not provided due to limitations on travel funds. Mr. Prestholt also believes the project is frequently hampered by the high turnover rate of NRC personnel. New people must receive orientation both from Mr. Prestholt and the DOE Staff, with resultant delays. There also appears to be little Commissioner interaction with NRC HLW operations in the field. Except for a trip by Chairman Zech to the BWIP site, the interaction of the Commissioners with NRC and DOE personnel at the several proposed repository sites appears to have been minimal.

3. There are also questions about the availability of written reports pertaining to the HLW repository investigations and related

work. Neither Mr. Prestholt nor any of the DOE personnel had seen any of the recent ACRS reports on the HLW repository program. This includes the recent report (letter) expressing our concerns about the associated QA program. In a similar manner, none of the ACRS Subcommittee members or consultants have seen any of the quarterly reports being submitted to NRC headquarters by Mr. Prestholt. Efforts may need to be taken to make such reports more widely available.

4. Finally, the question was raised as to whether the three sites currently proposed as possible locations for a HLW repository are receiving comparable attention in terms of laboratory and field investigations, evaluations and reviews. According the the NWPA, all three should be evaluated on a comparable basis.

B. Presentation by State of Nevada Representative

The next presentation was made by Mr. Carl Johnson, Director of the Nevada Office of Technical Programs, who is responsible for reviewing the proposed repository in Yucca Mountain. Mr. Johnson's office includes 4 to 5 technical staff members, and is supported by a seven member Citizens Advisory Committee. Also interacting with his group is a seven member committee from the State legislature. Mr. Johnson indicated that, on the basis of his work, there were six critical issues related to the proposed repository in Yucca Mountain.

1. Characterization of moisture movement through the unsaturated zone.

2. Relation of the groundwater beneath Yucca Mountain to the regional aquifer system in that area. This was considered significant because such a system may be a potential future source of drinking water for the city of Las Vegas.

3. Effects of long term climatic changes. Here Mr. Johnson stated that predictions (based on historical records) are that the climate will become wetter and cooler.

4. Future faulting and other tectonic events.

5. Future volcanism.

6. Possible human interference -- natural resource exploration.

Of these issues, Mr. Johnson stated that the last three were most critical and that any one of them could (in his opinion) represent grounds for disqualification of the Yucca Mountain site from further consideration for a HLW repository.

Mr. Johnson also indicated that he was concerned about potential impacts on the site of future underground nuclear weapons

testing at the Nevada Test Site. In response, the DOE staff indicated that limitations on the ground shaking in the city of Las Vegas should assure protection of the Yucca Mountain region. Mr. Johnson also indicated that there was some potential for hydrothermal activity within the region and this was a concern to him. Overall, he stated that he is not satisfied with the DOE research program or the directions in which it is heading.

With respect to the review activities being conducted by the State of Nevada, the Subcommittee made the following observations:

1. The Staff program is funded by the DOE. Over the past six years, it was indicated that the funds provided had totalled about $100 million, a portion of which is used to provide contracts to State organizations (for example, the University of Nevada in Las Vegas and related units in Reno)* Such contracts range on an annual basis from $150 thousand to well over $1 million. In spite of this, Mr. Johnson indicated that the funding level needed to be increased.

2. The Governor of Nevada has indicated that he is opposed to the siting of a HLW repository in his State. It is his opinion that the State of Nevada has, through the nuclear weapons testing program, contributed more than its share to the Nation's nuclear programs. Since Mr. Johnson is a political appointee and must be responsive to the Governor, the objectivity of his review may be in question.

3. Although the State of Nevada and the NRC would appear to share identical objectives -- to assure that any repository located within Nevada can be constructed and operated with full protection of the health and safety of the public and the environment, and also comply with all applicable regulations -- these two organizations do not conduct any research activities on a cooperative basis, nor do they appear to share thoughts and concerns in terms of their reviews and evaluations of the Yucca Mountain project. Since their interests and roles would appear to be identical, such cooperation might be explored.

C. Presentations by DOE Staff and Contractors

Opening remarks in this portion of the program were made by Donald Vieth, former director of DOE HLW operations in Nevada. He indicated that DOE's major goals were to determine whether the geology would support a repository and to gather sufficient scientific data either to support or deny that indication, while also striving for intellectual honesty in the pursuit of these goals. To assist in these activities, they have established an "issues hierarchy" and a system for resolving each of the issues identified.

Although in a "typical" respository, access would be through a vertical shaft drilled from the surface, the Yucca Mountain site would permit access by drilling through the side of the Mountain, as

* According to DOE's "Annual Report to Congress" (DOE/RW-0144, dated April, 1987) the funds granted to the State of Nevada for FY 1983-86 totalled $7.3 M.

well as from the top. Current thoughts are that the primary entrance will be through the side.

Individual presentations were then made by DOE representatives on each of the following subject areas:

1. Site Characterization -- the objective was to provide information on what the program was designed to accomplish. Subcommittee questions pertained primarily to the performance allocations for the various site parameters -- how the individual goals or limitations were set and the basis for the specific numbers chosen.

2. Groundwater Travel Time -- the studies are designed to determine flow through the matrix and the fractures. Dr. Steindler noted that they had observed a 300 foot hydraulic discontinuity in the water table; this is similar to observations made at the BWIP site.

3. Geologic Faults -- several have been observed in the region of Yucca Mountain. Trenches have been dug to examine them in more detail.

4. Volcanism -- recent studies indicate that a nearby calandra may have been located that has an age less than 20,000 years. However, the releases appear to have declined substantially in recent history, and calculations indicate that the population doses accompanying a volanic release of material within the repository would be minimal (millirems, at most). Nonetheless, because of the interest of the State of Nevada in these matters, the DOE Staff is continuing these studies.

5. Hydrothermal Activity -- this is being investigated. Recent data indicate some potential for such activity in the area. Accompanying releases could affect the waste containers.

Following these presentations, the Subcommittee members formulated a list of questions they thought should be addressed. These were provided to the DOE Staff who offered to provide written responses, including a list of appropriate references, on each topic. The questions included the following:

1. How will the integrity of the completed repository be determined? That is, how will the integrity of the sealed shafts be assured?

2. Which is important -- the travel time of the groundwater or the radionuclides that it contains? The DOE staff is to clarify its questions regarding this issue and the Subcommittee will seek a response from the NRC Staff.

3. How were the retardation coefficients determined? In fact, could more information be provided on all the geochemistry work from the standpoint of how it was assured that collected

samples were representative, that their analyses were accurate, and that the interpretation of the resulting data were properly conducted.

4. The same information is needed regarding measurements of stress fields in the area. Where did the numbers come from? Details of the calculations should be provided.

5. Indications are that the underground nuclear weapons tests have altered (temporarily and/or long range) the water tables in the area. Data on these changes should be provided.

6. As previously indicated, the procedures for determining the performance allocations for various parameters within the HLW repository should be carefully documented and provided to the Subcommittee.

7. Finally, the Subcommittee encouraged the DOE Staff not only to seek to meet the NRC regulations in the design, construction and operation of a HLW repository, but also to assure protection of the health and safety of the public, as well as the environment.

D. Site Tours (July 30, 1987)

The third day of the field trip was devoted to a tour of relevant work and research activities within the Nevada Test Site and at Yucca Mountain. Specific items covered included the following:

1. Drilling Rigs -- included a description and tour of rigs for constructing holes up to 12 feet or more in diameter (in a single cut). Current plans call for increasing the size up to perhaps 20 feet. Newer techniques permit more rapid drilling at far reduced cost.

2. G-Tunnel -- this includes tunnels one mile or more into the side of a mountain, including excavations within welded tuff some 1400 feet beneath the surface. The tuff (which was in a thin layer that cooled rapidly) was highly fractured and cracked. Within Yucca Mountain where the welded tuff layer is thicker and cooled more slowly, it is anticipated that far less fracturing will be present.

3. Spent Fuel Test -- Climax -- this consisted of a vertical shaft down some thousand feet or more into a granite formation. Spent fuel elements from the Turkey Point (PWR) Plant were encapsulated and remotely transported and stored here for some three years, during which extensive analyses and testing were conducted. Later the fuel elements were retrieved and the tests were subsequently terminated. This was a positive demonstration of the capability to emplace spent fuel in a granite repository at depth and later to retrieve it.

4. Sedan Crater -- the Subcommittee observed the Sedan Crater that was formed by an underground 100 KT explosion in 1962 as part of the Plowshare Program. The crater is in excess of 1200 feet in diameter and 300 feet deep.

5. Yucca Mountain -- here the Subcommittee observed the site, the local geology, and interacted with the USGS Staff who are conducting field studies in the area. The studies include measurements of the porosity of the overlying soil and welded tuff, and downward migration of surface rainfall. Nearby activities include the digging of exploratory trenches to explore faults in the area. The site is in a very remote and desolate area.

Summary Comment: The Subcommittee members and consultants were unanimous in their conclusion that the field trip had been a major success. Being provided the opportunity to observe the DOE laboratory and field facilities engaged in HLW research enhanced our understanding of the work and the associated problems.

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August 10, 1987

Dr. Dade Moeller
27 Wildwood Drive
Bedford, MA 01730

Dear Dade:

Though I was unable to attend the morning meeting at the University of Arizona due to the delay of the plane because of an intense electrical storm in Nashville, I have read all of the material sent to me and did participate in the visit to the geohydrology test site. In addition, I did participate in the discussions in Las Vegas, though I did not make the field visit. I have, however, previously toured most, if not all, of the sites.

Because of the lack of time on both occasions for full detailed discussions with the researchers involved, and without access to the voluminous documentation already available on the site, I shall restrict my comments to general impressions based upon the information that I have, recognizing that we did not have complete briefings, particularly on performance assessment that would indicate how they intend to meet the requirements of both 40 CFR 191 and 10 CFR 60.

Perhaps it would also be best to recall that the Environmental Assessments specifically do not address the system guidelines except in a preliminary and conservative way. It would be useful then to compare the technical guidelines for selection of sites for characterization and note that they must be met. They will be discussed in a manner corresponding to that outlined in the Guidelines and the EA Overview Document whose pages will be cited.

In the section on Geohydrology on page 22, it states that there are four major considerations:

1. ground water travel time and flux
2. effect of climatic changes
3. ease of characterizing and modeling the geo-hydrological system
4. local ground water used for consumption and irrigation

Since ease of characterization impacts all the others, I shall address this first, despite the fact that DOE says that "Since it is not an intrinsic physical characteristic of the geohydrological setting, this consideration is not as important as the first two considerations." This statement is true if one had infinite time and dollars and were willing to destroy the site in order to understand it. However, under the circumstances of tight money and time schedules, the logic of this escapes me because if the site cannot be

characterized and modelled in real time without endless scientific dispute, then one cannot get reasonable scientists to agree on the first two topics. Looking at all of the literature and even more importantly at what we learned on our field trip, such as that when rain water flows into the unsaturated zone, the impact is felt 5000 feet in the limestone aquifer below the tuff within one month. Visual observation of the tuff outcrops indicates it is highly fractured. Two of the topics in geohydrology about which there is not agreement even on the fundamentals is fracture flow and vadose zone flow. Yet this is precisely what one has at the Yucca Mountain site. Both are extraordinarily difficult problems. One cannot tell from the surface nor by geophysical means what are the number, orientation, size, connectiveness and chemical characteristics of the fractures. In the vadose zone, the hydraulic conductivity is a function of the head and the moisture content. Determining the moisture content in detail is difficult, and in addition, the conductivity varies depending upon whether the matrix is wetting or drying. Taking meaningful samples is also very difficult. Finally, the recharge is obtained by indirect means based upon the precipitation and the calculation of evapotranspiration. Evapotranspiration remains a black box with the empirical calculation of Thornthwaite in the 30's still the standard methodology, if any. The recharge is determined by the difference between precipitation and losses by runoff and evapotranspiration. Therefore, a small error in any of the input data can make a major difference in the output. The accuracy of the Thornthwaite formulation is low. Consequently, one can expect large differences in the source term. Taking all of these considerations into account, it is difficult to understand how one can fashion a credible model in the time available to do so.

Since the region around Yucca Mountain is a closed basin and the water in the vadose zone appears to move primarily in the fractures and joints, which one is not sure to intersect, it is difficult to measure flow times and be sure that the total flux is accounted for and that the fastest flow times have been included. As discussed above, a credible model is difficult to obtain, therefore determination of flow times and water flux with acceptable accuracy will be difficult to obtain. The effects of climatic changes can be calculated only if there is a credible model. As discussed above, that is difficult. Consequently, the effects of climatic change can be calculated only with a high degree of uncertainty.

This is not to imply that the work is not of high scientific caliber. Though we did not have time to make such determinations, the researchers are scientists with fine reputations. Rather the problem is one of approach. The problem cannot be solved scientifically with the time, manpower and funds available. Consequently, much higher reliance must be placed on the engineered barriers and an optimized combination of the engineered barriers with the natural barriers. The proper approach would be to determine precisely what can be said now with existing theory plus the advances that can reasonably be expected in the time available and the data already in hand and that which can reasonably be expected for use in license application, and design the engineering system to fulfill the system requirements with some degree of

safety. I am quite confident that this would indicate that the system's requirements could easily be met. It is less clear to me that all of the individual technical requirements can so easily be met. These determinations require a symbiotic relationship with the performance assessment group so that the most important parameters can be determined so that the investigations will focus on reducing the degree of uncertainty in the most critical items. While all of this may be happening, it was not clear to me that this was in fact the case.

In summary, to reach the goals of acceptance of waste at the repository in a timely fashion, an engineering approach to the problem is mandatory. We need as much as possible of the underlying theory, but will have to accept increased factors of safety to offset our uncertainty in theory and data.

Detailed comments on the individual presentations would require far more detailed information than we have available to us at this time.

Sincerely yours,

Frank L. Parker

FLP:bl

cc: Owen Merrill

Georgia Institute of Technology
A UNIT OF THE UNIVERSITY SYSTEM OF GEORGIA
NUCLEAR ENGINEERING AND HEALTH PHYSICS PROGRAMS
SCHOOL OF MECHANICAL ENGINEERING

August 6, 1987

Please reply to:

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Dr. Dade Moeller, Chairman
ACRS Subcommittee on Waste Management
Harvard University
Kresge Center for Environmental Health
Environmental Health Sciences
665 Huntington Avenue
Boston, Massachusetts 02115

Dear Dade:

As requested, following our recent visit to the University of Arizona and certain of its research facilities, I want to provide several comments. These are based on the discussions we had with the researchers as well as the pertinent briefings.

The closure techniques they have developed are being tested on a very small scale and with a limited number of variables. I'm concerned about scaling these up to practical size and to possible effects produced over time by radiation levels, elevated temperatures, etc.

In addition, they seem to be producing more or less ideal conditions in the way that plugs are emplaced and tested. This does not appear to simulate a repository environment.

These lead to major concerns in the sealing program and its application to a repository. Can we model large opening closures and sealings on a practical basis and effectively evaluate their performance? Also, can we develop a system which will allow testing of the repository or major portions of it before use?

In Nevada, I'm concerned about the movement of radionuclides in various media and the retardation coefficients. Besides mobility and transport of radionuclides, other factors which

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must be considered are the inventories, half lives, and relative hazards. These latter factors, in fact, are what reduce tritium to a non-problem in spite of its rapid mobilization and transport.

Hopefully these brief comments and questions will be useful to you.

Sincerely,

Mel

Melvin W. Carter
Consultant

MWC/bc
cc: Mr. Owen Merrill

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31 July 1987

Mr. Owen Merrill
Senior Staff Engineer
ACRS
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Owen:

Here are some random thoughts about the presentations we heard during the past three days in Tucson and Las Vegas. If you think they would be of any interest to Dade, I hope you will send them along to him.

University of Arizona. Seems to me some good research is being done, and just for the sake of scientific knowledge I'm glad to see such work supported, but I wonder if all of it is relevant to NRC's problem of judging the licensability of DOE's disposal efforts. For example, Jaak Daemen gave a good presentation of his work on seals in repositories in granite and basalt, but a major worry seemed to be the effect of wetting and drying. Such repositories, as far as I know, will be well below the water table, so I wonder if this worry is relevant? Once a repository is closed, only in extraordinary circumstances would it ever dry out. Also I doubt that finding an exact relation between flow rate and pressure is important for an actual repository situation. Shlomo Neuman's talk was an impressive analysis of the difficulties of predicting flow thru fractured rocks and of his efforts to surmount the difficulties, but I was left with the feeling (as I have been after many other discussions of this forbidding subject) that I still didn't understand how his equations and experimental results would help much in judging a real-life repository. Much the same criticism can be leveled at the work of Dan Evans and his colleagues: they have developed methods for obtaining much useful scientific information, but are they asking the right questions to get information quickly and efficiently that will apply directly to licensing problems? One other objection I had to the presentations in Tucson was the repetition in the talks of materials that we had already seen in the pre-meeting handouts.

Talk by Carl Johnson of the Nevada Agency for Nuclear Projects. It is hard to comment objectively about this talk, because the speaker took a negative attitude toward every question regarding the Yucca Mountain site.-- which I expect he was required to do by his political position. At least it is encouraging that the State and DOE are looking at the same set of questions, and I expect it is salutary for DOE to be continually reminded of the possible negative answers.

DOE - USGS presentations in Las Vegas. These talks were well organized and well presented. Seems to me the right questions are being asked, the methods of attack are reasonable, and appropriate attention is being paid to estimates of uncertainty. There is some overkill in the planned research, but much less than at Tucson. The only talk that disappointed me was the one on radionuclide retardation by K. Eggert. We were shown tables of retardation factors, and told about plans for getting additional numbers, but we heard very little about how the numbers were obtained. Retardation factors have no meaning unless the conditions of the experiments are specified very precisely -- the nature of the solid material used, the pH and Eh and chemical composition of the solution, the assurance that steady-state conditions were reached, and so on. To me, one of the major unknowns about the unsaturated zone is the oxidation potential and acidity of solutions that move thru it, and I wish more had been said about how these will be

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determined. They are essential not only in limiting retardation, but also in limiting solubility of radionuclides and in influencing the formation of colloids. Very probably the people doing the research are aware of all this, but I wish Mr. Eggert had made it clear in his talk.

John Stuckless in his talk on hydrothermal activity made it pretty clear that there is little evidence for warm solutions or mineralization at the site. Much of his talk concerned the exposures in trenches across a fault that we saw at the end of our field trip, and from the very superficial examination we could make I would certainly agree with him that the calcite-opal mixtures look like the work of pretty cold water. As I remember it, the only evidence he cited for elevated temperatures was from work on fluid inclusions in quartz from the matrix of the Tiva breccia. Just to be on the safe side, I suggest that samples of this matrix be assayed for gold and silver; if the solutions from which the matrix formed were warm, traces of the metals might be present. If the metals are completely absent (as I expect they will be), this would help to confirm that the site lacks mineral resources of any consequence. Assaying is a simple and inexpensive procedure, so it might be well to include also samples of the calcite-opal material from the fault zone and any similar material from fault- or vein-fillings elsewhere at the site.

G-tunnel. Seems to me that Roger Zimmerman is getting valuable information about the behavior of welded tuff from his in-situ experiments. The heating experiments, however, give somewhat ambiguous results because they are done with short holes drilled into a rock face that is exposed to a well-ventilated tunnel. I would like to see an experiment on a larger scale, of this general sort: seal a section of the tunnel a few tens of meters long, or drive a branch tunnel that can be sealed; put heaters in the tunnel so that its temperature can be raised to the point expected in a repository; and equip the tunnel with instruments to see what happens to water in the adjacent rock. My guess is that water moving down thru the unsaturated zone toward a heated repository would never reach the repository, but would be deflected around it by multiple vaporization-and-condensation. G-tunnel would be a fine place to see if the guess is correct.

I hope this will be of some use. You arranged a fine trip for us to Tucson and Las Vegas, and I do thank you for taking care of all the details.

Sincerely,

Konnie

Konrad B. Krauskopf

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July 31, 1987

Dr. D. Moeller
Chairman, Subcommittee on Waste Management
U. S. Nuclear Regulatory Commission
Advisory Committee on Reactor Safeguards
Washington, D. C. 20555

Dear Dr. Moeller:

This letter report on our trip to Arizona is provided at the request of O. S. Merrill. It briefly summarizes my perceptions of the ongoing NRC research program at this location.

Mission, Goals and Objectives: Because of my brief exposure to the NRC program, I have virtually no perspective on the management structure, breadth or depth of the program. My comments are therefore limited to the specific objectives documented in our pre-trip documentation and the presentations.

Overall research planning direction and structure are extremely important. I strongly recommend that a subcommittee of the newly proposed NRC committee be charged with the responsibility of working with NRC in defining the most cost-effective and technologically rewarding research objectives possible. I believe it is essential that critical problem areas, that is those that must be solved for the mission of NRC to be realized (such as the determination of site permeability), be identified and that research be focused on these areas. Certainly the activities we reviewed addressed important questions, but I am concerned that outstanding critical problems remain that require additional consideration. An interdisciplinary, highly competent oversight committee would be able to examine the overall research activity and provide guidance regarding not only areas of importance but also activities that may be either redundant or unlikely to contribute substantially to the Commission's goals.

Quality and Relevance of Research: Given my brief exposure to the Arizona activities, I believe they by and large constitute careful and relevant research. While one can criticize in retrospect some details of the various programs, they appear to be on a par with ongoing activities elsewhere in the United States and abroad. I am, however, concerned that certain high-risk,

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TAPE 7

high-return research activities, such as those associated with the now inactive field site, may have been prematurely terminated. I believe that carefully designed field programs of this kind are needed, and should be supported.

Quality of Principal Investigators: Of the principal investigators we met, I know only Dr. Neuman by scholarly reputation. He is unquestionably an outstanding researcher in the field of groundwater hydrology. His published papers document carefully executed and insightful research. I believe the NRC if fortunate to have him as a contractor.

Quality of Facilities: Regrettably, we were unable to visit the inside laboratories, but the unsaturated flow experiment was interesting. I think this is a unique facility and I believe that with careful planning and support, additional useful and important information could be obtained. It is evident that some of the results from both field studies were perhaps unanticipated, for example, the heterogeneity of the fractures in the tuff, and revealed new areas of concern for the waste repository program.

I hope these comments are helpful. I have enjoyed my participation on the subcommittee and regret I cannot devote the time needed to continue as a member.

Sincerely yours,

George F. Pinder
Professor and Chairman

GFP:dh

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SCHOOL OF ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING

July 20, 1987

Mr. Owen Merrill
Senior Staff Engineer
ACRS
USNRC
Washington, D.C. 20555

Dear Mr. Merrill:

On July 16, 1987, I met with the members of the NRC staff, in Silver Spring, to hear their presentation on the Yucca Mountain site and to ask questions. They were very helpful. They supplied all the important references I requested and outlined for me what they know so far about the site. During our discussion it became clear that they lack much the same technical information which I was hoping to get from them and that it is the material which is presented to them that does not have sufficient detail for further evaluation and verification. In this respect it is clear that there should be more formal communication between the NRC staff and their technical counterpart.

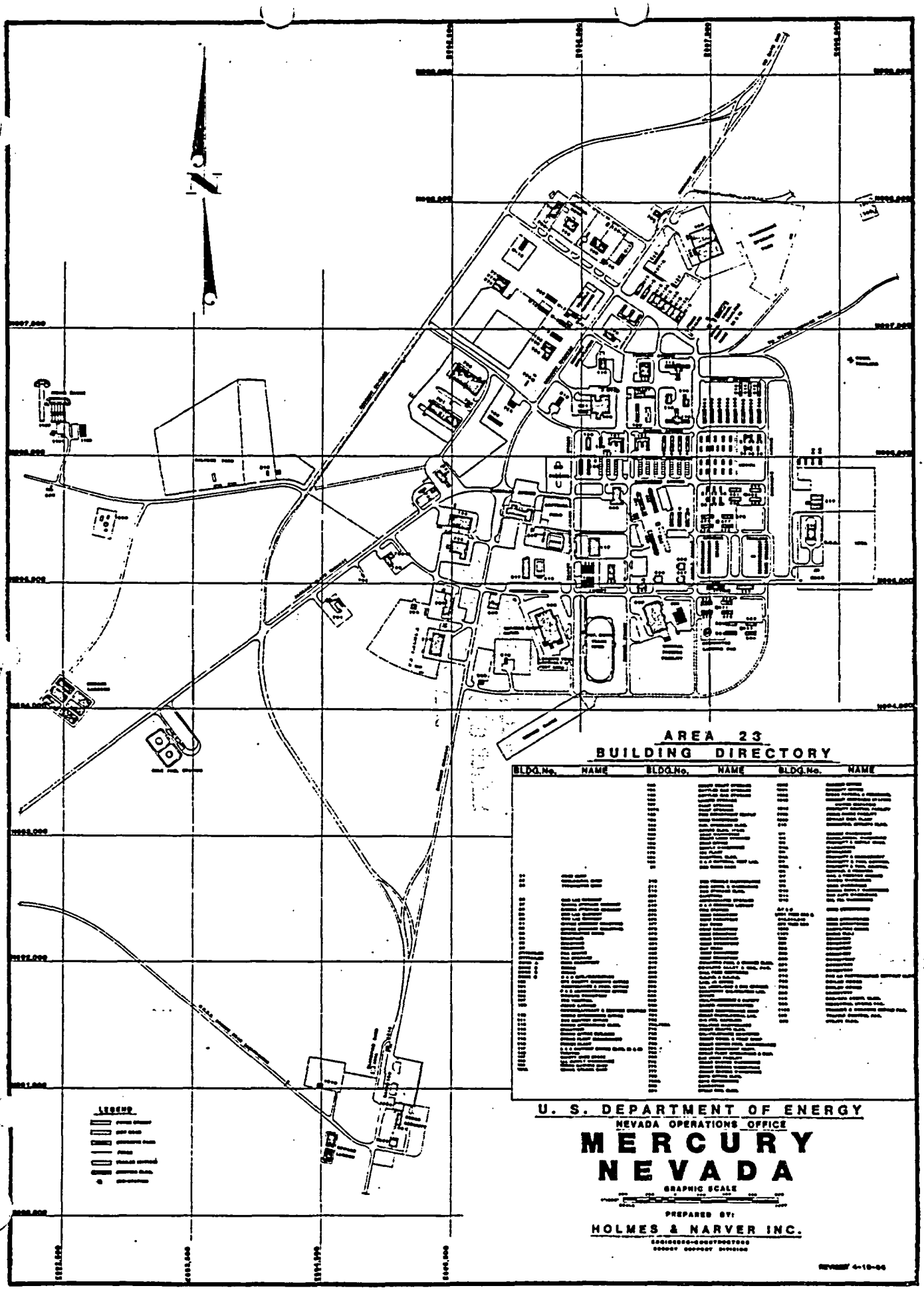
The NRC staff presented to me their current understanding of the proposed techtonic models for the Yucca Mountain site: right lateral slip faulting not expressed on the surface, bending of the top plate, and the variations of the extension model. We also discussed the local seismicity and how the design levels for vibratory ground motion are developed.

Again, as I indicated in my previous letter to you, I find that the NRC staff questions do appear to cover the right topics, but it is also clear that we do not have the adequate and more specific coverage of the technical material to evaluate the calculations and conclusions in the reports on this site.

Yours sincerely,

M. D. Trifunac

MDT:jch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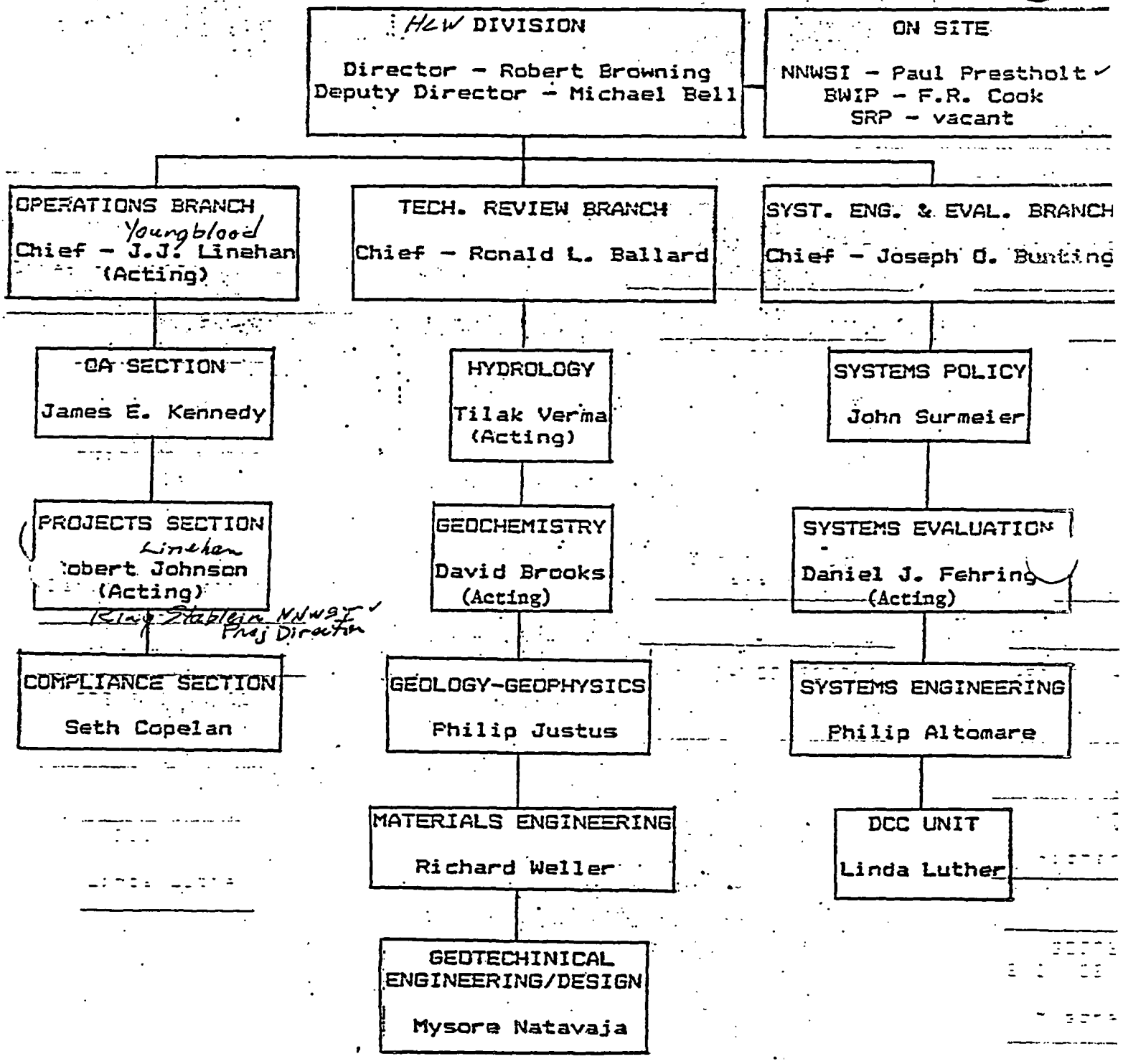
PAUL T. PRESTHOLT
SENIOR ON-SITE LICENSING REP.
JULY 28, 1987

FUNCTIONAL STATEMENT

As the Director of the Division of High-Level Waste Management's representative, serves at one of the selected candidate high-level waste repository sites as the principal NRC liaison with DOE staff and other parties involved with the onsite repository project in order to facilitate an effective pre-licensing interface with NRC.

DIVISION OF WASTE MANAGEMENT

✓ = Principal Points of Contact for P²



REGULAR DUTIES

- Represents the Director of the Division of High-Level Waste Management at the site for all high-level waste repository site activities relating to the most difficult projects for the potential disposal of large quantities of highly radioactive waste at the site.

- Proposes research programs, studies, safety reviews, and environmental impact assessments related to the future high-level waste repository licensing review.

- Acts as on-site liaison between the NRC and DOE Project Manager related to the HLW repository licensing review.

- Assists in the development of regulatory waste management policies, recommending improvements in procedures designed to accelerate the licensing process.

- Develops and participates in liaison mechanisms with other agencies in waste management activities, including EPA, DOE, state and local government specifically to maintain cognizance of on-going research and to assure the adequacy and appropriateness of program direction.

REGULAR DUTIES
(Continued)

- Maintains awareness and proficiency in current and developing techniques and theories of systems analysis by frequent contact with researchers in the field through site visits and professional meetings.

- Arranges meetings with senior DOE Field Office (FO) executives to discuss areas of mutual interest that may need clarification by the Division Director HLWM.

- Recommends to the Division Director HLWM improvements to NRC/DOE interaction relating to site characterization.

- Provides quality assurance (QA) reviews, as deemed necessary, in all areas of the DOE site characterization program to understand DOE's on going QA program and provide comments and recommendations to the Director HLWM as appropriate.

- Expedites the flow of facts, information and plans regarding site characterization activities between DOE's Field Office and/or contractors and the Division of High-Level Waste Management.

REGULAR DUTIES
(Continued)

- As the representative Judges to be appropriate or at the specific request of the Director, observes, reviews and evaluates onsite actions undertaken or sponsored by the DOE related to site characterization.

- Arranges and/or coordinates site visits by NRC technical staff.

- Prepares policy analysis papers and technical reports pertaining to the waste management program for use by the Division Director in developing waste management policy. As the representative Judges to be appropriate or at the specific request of the Director, reviews documents related to the characterization of the candidate repository site, including environmental assessments and site characterization plans.

- Makes specific recommendations concerning site characterization plans and activities to Division Director and/or NRC technical and project management staff.

- Develops recommendations for the Division Director concerning NRC policy and technical positions on repository licensing issues.

- Identifies and communicates pertinent information/data related to site characterization to responsible NRC technical and project management staff.

- Provides supervision for one onsite licensing staff and a part time clerical assistant.

CONTACTS

- As the Director of HLWM's representative, continuous contact with Director, Deputy Director, Branch Chiefs, and technical staff within HLWM and senior staff within the Commission.

- Continuous contact with senior DOE Field Office (FO) executives and other federal government agency representatives relating to site characterization activities.

- Frequent contact with senior State and local Government officials, and representatives of "affected Indian tribes" in coordinating the exchange of technical and policy information regarding the candidate repository site as required under NWPA (Section 117) and 10CFR60 Subpart C.

- Frequent contact with DOE and DOE contractor technical and administrative personnel to keep abreast of developments in the plans and activities involving the candidate HLW repository site.

- Occasional contact with Office Director NMSS relating to onsite licensing activities.

INDEPENDENT ACTION

- Manages and directs the efforts of the onsite licensing representatives office.

- Independently assesses effectiveness of DOE's on-site activities and based on his judgments, brings issues or potential issues which may affect NRC's licensing actions to the attention of the NRC Division Director and appropriate NRC Branch Chief.

- Independently assesses the effectiveness of NRC regulations and guidance on DOE's site characterization activities and, based on his judgment, brings issues or potential issues involving NRC regulatory actions and guidance to the NRC Division Director and appropriate NRC Branch Chief.

- Represents Division Director in meetings with DOE, State or Tribal officials relating to site project activities. Based on knowledge of Division technical, and regulatory policy positions, uses judgment to articulate NRC positions and provide clarification.

- Explores need for and establishes working liaison with multiple Federal agencies and acts as a liaison with other agencies involved in waste management activities including EPA, DOE, state and local government, especially as they deal with the Federal repository.

NNA.870729.0016

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Nevada
Nuclear Waste
Storage Investigations Project

NNWSI PROJECT BRIEFING FOR THE ACRS SUBCOMMITTEE ON WASTE MANAGEMENT

JULY 29, 1987

United States Department of Energy
Nevada Operations Office/Waste Management Project Office

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NNWSI PROJECT
BRIEFING FOR THE
ACRS SUBCOMMITTEE
ON WASTE MANAGEMENT

JULY 29, 1987

United States Department of Energy
Nevada Operations Office/Waste Management Project Office

INTRODUCTION

M. BLANCHARD

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Nevada Nuclear Waste Storage Investigations PROJECT
YUCCA MOUNTAIN

INTRODUCTION

- ENCLOSURE 3, SECY-87-137
- OBJECTIVES FOR BRIEFINGS
- SCHEDULE-PROGRAM SCP
- AGENDA
- SITE DESCRIPTION

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"TECHNICAL CONCERNS" (ENCLOSURE 3, SECY-87-137)

- PRESENCE OF POTENTIALLY ACTIVE FAULTS IN THE VICINITY OF YUCCA MOUNTAIN
- POTENTIAL FOR HYDROTHERMAL ACTIVITY IN THE VICINITY OF YUCCA MOUNTAIN
- GROUNDWATER FLOW
- EFFECTIVENESS OF THE POTENTIAL RADIONUCLIDE RETARDATION MECHANISMS AVAILABLE AT YUCCA MOUNTAIN
- POTENTIAL FOR VOLCANISM IN THE VICINITY OF YUCCA MOUNTAIN

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PERSPECTIVE ON "TECHNICAL CONCERNS"

1. THE ENVIRONMENTAL ASSESSEMENTS (ESs) WERE BASED ON DATA BASES THAT PRECEEDED SITE CHARACTERIZATION

2. THE ENVIRONMENTAL ASSESSMENTS CONTAINED PRELIMINARY FINDINGS ABOUT THE SUITABILITY OF THE SITE

3. THE "AREAS OF THE TECHNICAL CONCERN" IDENTIFIED IN SECY-87-137 CORRESPOND TO THE NRC STAFF COMMENTS ON THE YUCCA MOUNTAIN EA

4. THE NRC-EA COMMENTS IDENTIFY CONCERNS "PRINCIPALLY RELATED TO:

   (A) NOT IDENTIFYING THE RANGE OF UNCERTAINTIES ASSOCIATED WITH THE EXISTING LIMITED DATA BASE,

   (B) NOT IDENTIFYING THE RANGE OF ALTERNATIVE INTERPRETATIONS AND ASSUMPTIONS THAT CAN BE REASONABLY SUPPORTED BY EXISTING DATA, AND

   (C) NOT INCORPORATING A REASONABLE RANGE OF UNCERTAINITES AND ALTERNATIVE INTERPRETATIONS INTO EVALUATIONS AND CONCLUSIONS"

5. THE COMMENTS WERE OFFERED TO "ASSIST DOE IN PREPARING HIGH QUALITY SCPs"

6. "AREAS OF TECHNICAL CONCERN" DO NOT INCLUDE NRC STAFF REACTIONS TO ISSUE RESOLUTION STRATEGIES CONTAINED IN THE SCP

OBJECTIVE FOR BRIEFING

A COMMON THEME FOR THESE FIVE TOPICS:

PROJECT WILL TRY TO SHOW YOU THE LINKAGE OF PERFORMANCE AND DESIGN REQUIREMENTS TO THE SITE CHARACTERIZATION ACTIVITIES

EACH SPEAKER WILL INCLUDE SOME ASPECTS OF:

- RELEVANCE OF CHARACTERIZATION TO DESIGN/PERFORMANCE
- SUMMARY OF CURRENT UNDERSTANDING AND UNCERTAINTY

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AGENDA

1:00	WELCOME	D. VIETH
1:05	INTRODUCTION	M. BLANCHARD
1:20	ORGANIZATING PRINCIPLES FOR SITE CHARACTERIZATION	F. BINGHAM J. TILLERSON
1:50	GROUND-WATER FLOW	S. SINNOCK W. WILSON
2:45	RADIONUCLIDE RETARDATION	K. EGGERT
3:25	TECTONICS	T. GRANT J. FRAZIER
4:10	VOLCANISM	B. CROWE
4:35	POTENTIAL FOR HYDROTHERMAL ACTIVITY	J. STUCKLESS S. MATTSON
5:00	CLOSING COMMENTS	M. BLANCHARD

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PROGRAM SCHEDULE: CURRENT STATUS

- DOE HAS ISSUED GUIDELINES REQUIRED BY NWPA, SECTION 112(A)
- DOE HAS ISSUED MISSION PLAN REQUIRED BY NWPA, SECTION 114(C)
- DOE HAS ISSUED ENVIRONMENTAL ASSESSMENTS (EAs) REQUIRED BY NWPA, SECTION 112(B)(1)(E)
- NRC HAS COMMENTED ON DRAFT AND FINAL EAs
- DOE IS PREPARING SITE CHARACTERIZATION PLANS (SCPs) REQUIRED BY NWPA, SECTION 113(B)

LICENSING A REPOSITORY WILL BE DIFFERENT THAN LICENSING A NUCLEAR POWER PLANT IN AT LEAST ONE VERY FUNDAMENTAL WAY. ALTHOUGH, WE EXPECT TO ACHIEVE CONTAINMENT BY A CAREFULLY ENGINEERED REPOSITORY AND WASTE PACKAGES LONG-TERM ISOLATION WILL RELY UPON THE CHARACTERISTICS OF THE SITE ITSELF (e.i., GEOLOGY, HYDROLOGY, GEOCHEMISTRY, ROCK THERMAL/MECHANICAL PROPERTIES)

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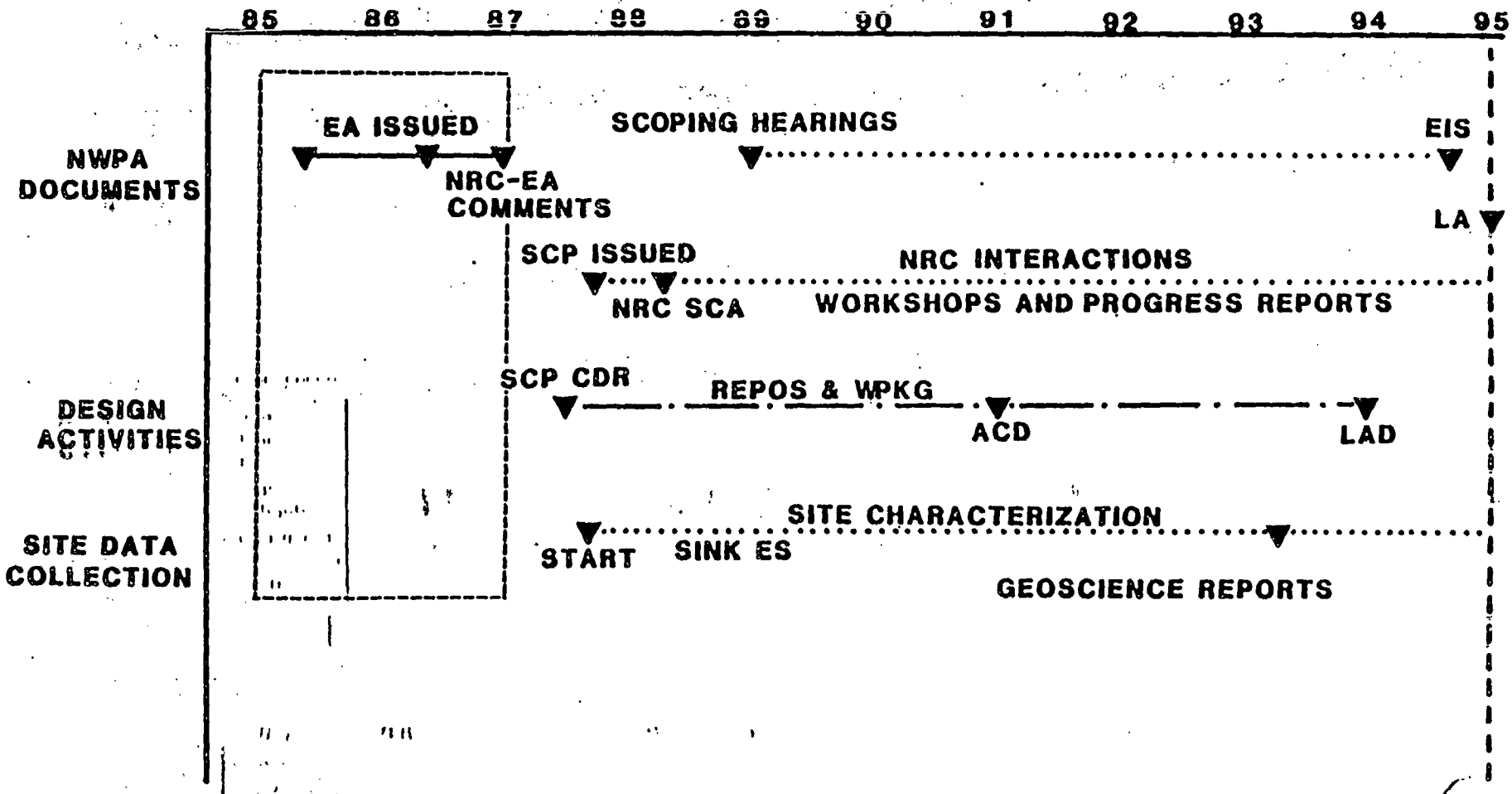
NNWSI PROJECT SCHEDULE



MDV 7/87

ORGANIZING PRINCIPLES FOR SITE CHARACTERIZATION

F. BINGHAM

J. TILLERSON

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ORGANIZING PRINCIPLE

To make the site-characterization program provide the information that will be needed for demonstrating compliance with regulations

THE ORGANIZING PROCESS

("Performance allocation")

("Establishment of repository design parameters")

1. Select system elements to be relied on.

2. For each element, select features on which reliance will be made. ("Performance measures," "goals," "indications of confidence").

3. Define the "parameters" to be measured or derived from measurements. Explain how well and over what ranges they must be measured.

IMPORTANT FEATURES OF THE PROCESS

- All the steps use available information
- The allocations may (probably will) change as more information becomes available
- Because uncertainties exist in the available data, the allocations are made conservatively; the performance of elements is underestimated
- NNWSI has used multidisciplinary teams to make the allocations

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ASSESSING POSTCLOSURE PERFORMANCE OF THE TOTAL SYSTEM

(releases to accessible environment)

- CCDF will show compliance
- Making CCDF requires modeling of future performance
- Future events and processes are grouped into
  - "Nominal-case scenario"
  - "Exceptional-case scenario classes"
- Performance is allocated for each class of scenario

NNWSI PROJECT

HYDROLOGIC SECTION
YUCCA MOUNTAIN SITE

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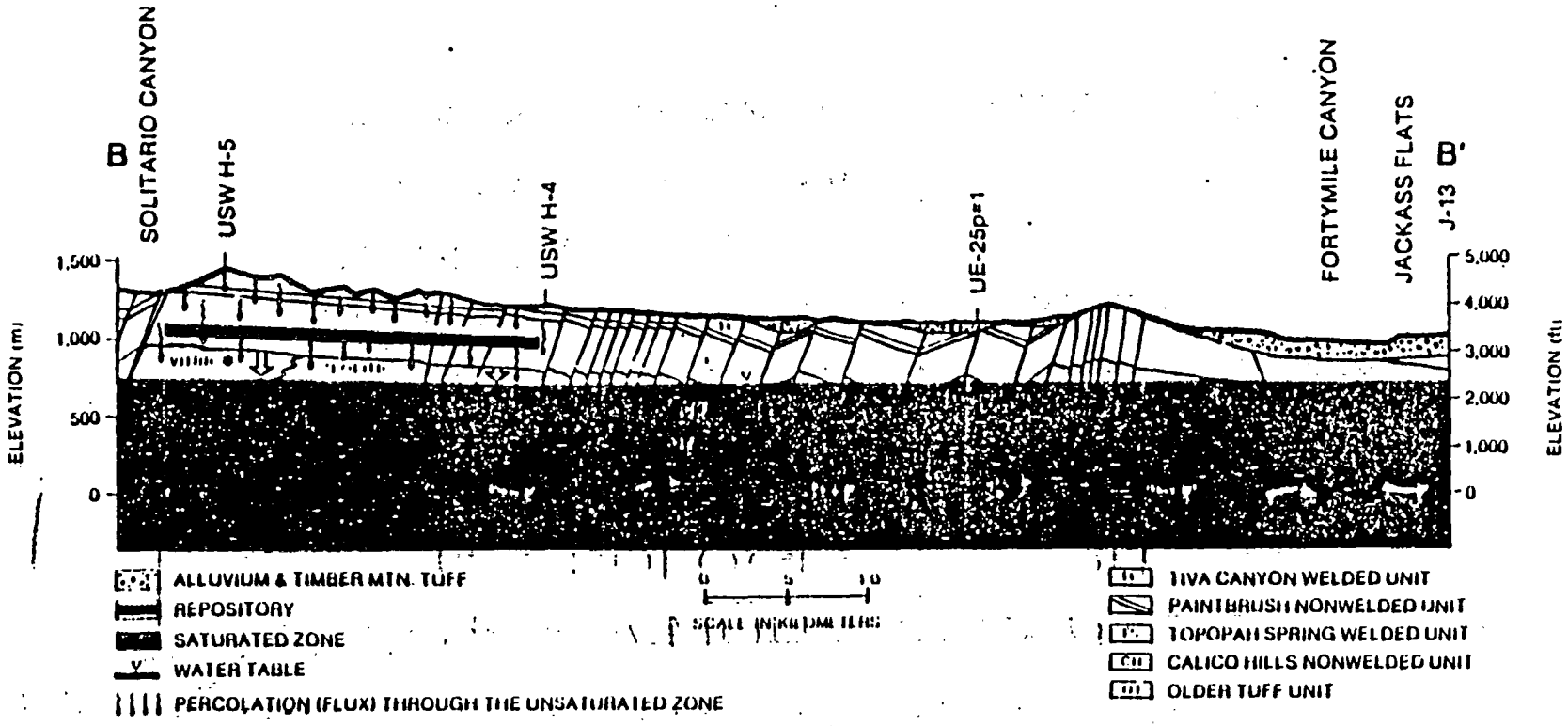
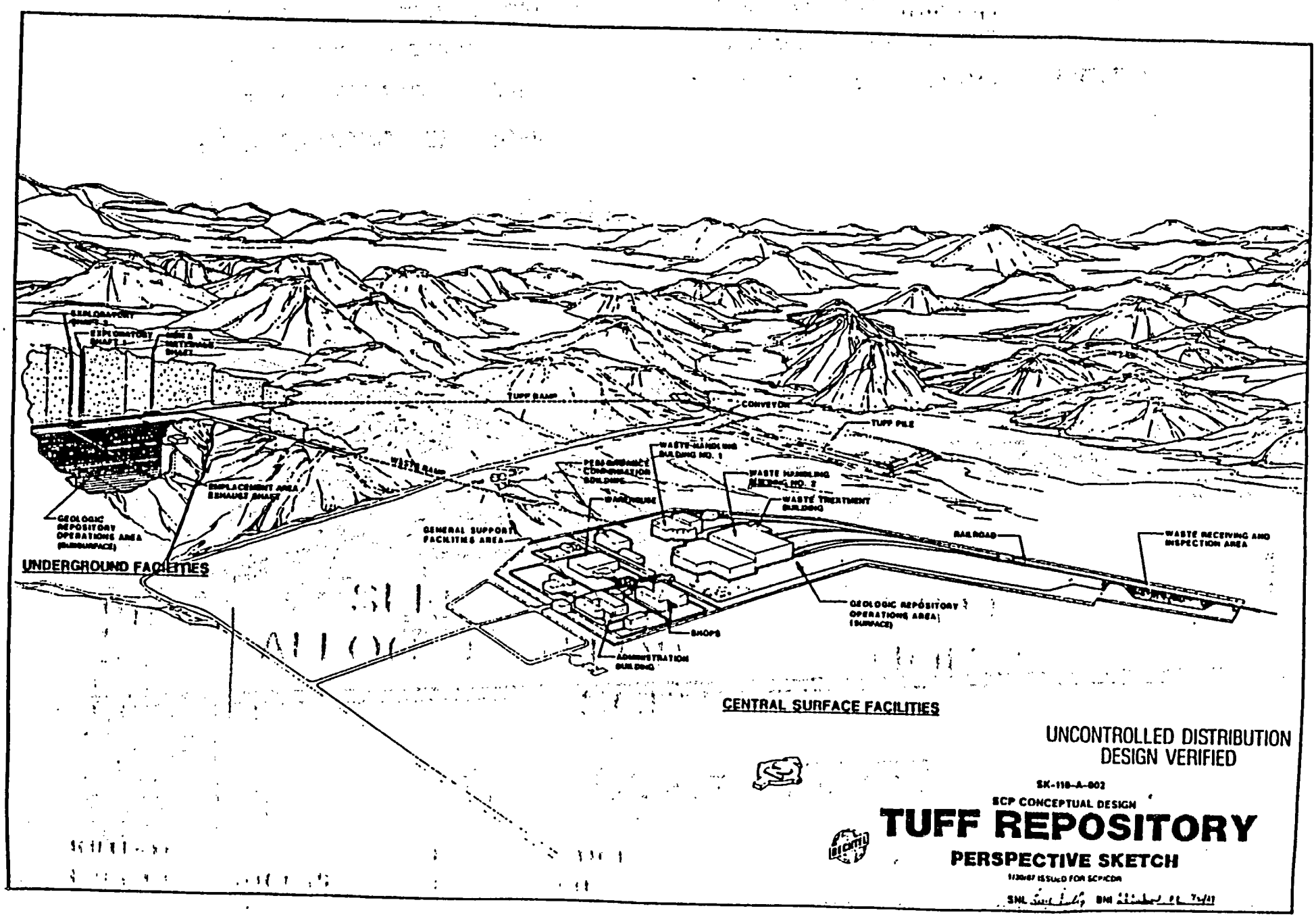


SELECTED PARAMETERS FROM ALLOCATION FOR NOMINAL-CASE SCENARIO

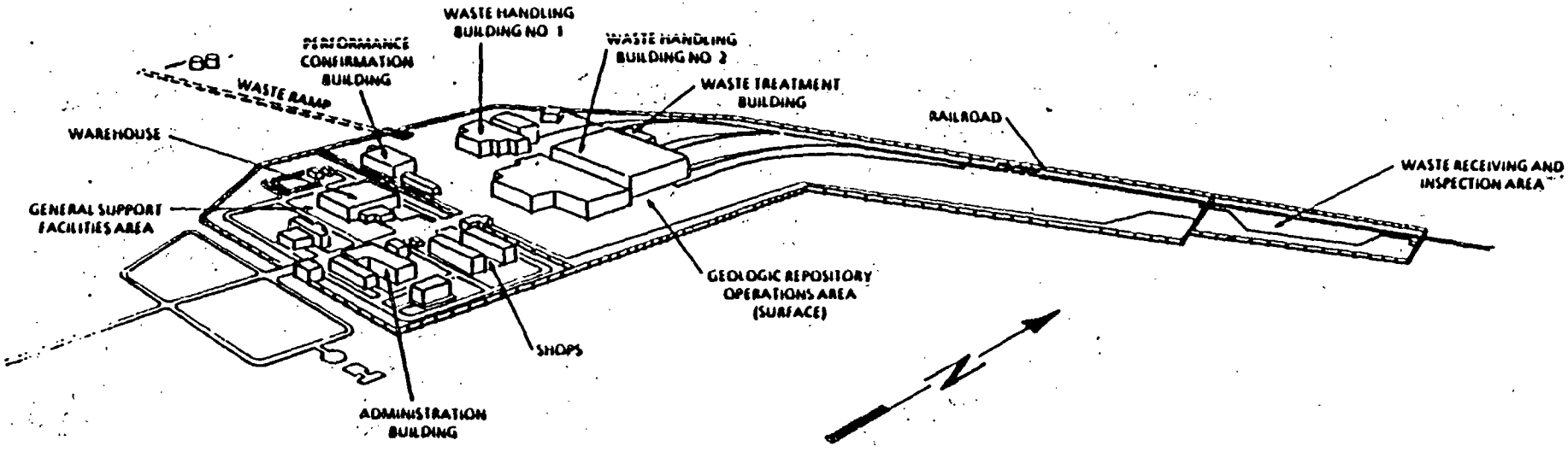
SYSTEM ELEMENT	PERFORMANCE PARAMETER	TENTATIVE PERFORMANCE GOAL	
UNSATURATED ZONE (UZ) (PRIMARY BARRIER)	AVERAGE FLUX	< 0.5 mm/yr	NUMEROUS MORE-DETAILED PARAMETERS
	AVERAGE EFFECTIVE MATRIX POROSITY	> 0.1	
	AVERAGE CHEMICAL RETARDATION FACTOR FOR I^{th} SPECIES	≥ 1	
	AVERAGE THICKNESS BETWEEN REPOSITORY AND WATER TABLE	> 100 m	
SATURATED ZONE (SZ) (BACKUP BARRIER)	AVERAGE FLUX	< 32 mm/yr	
	⋮	⋮	
	AVERAGE LENGTH OF FLOW PATH	> 5000 m	
ENGINEERED-BARRIER SYSTEM (BACKUP BARRIER)	FRACTIONAL MASS RELEASE RATE FOR EACH SPECIES	$< 10^{-4}$/yr	

SELECTED PARAMETERS FROM ALLOCATION FOR EXCEPTIONAL-CASE SCENARIOS

INITIATING EVENT OR PROCESS	PERFORMANCE PARAMETER	TENTATIVE PERFORMANCE GOAL	
IGNEOUS INTRUSION OR OFFSET ON FAULT CAUSES WATER-TABLE RISE	PROBABILITY OF INTRUSION WITHIN AREA	$< 10^{-5}$/yr	NUMEROUS MORE-DETAILED PARAMETERS
	PROBABILITY OF OFFSET > 1 m WITHIN AREA	$< 10^{-1}$ IN 10,000 yr	
	⋮	⋮	
VOLCANIC ERUPTION PENETRATES REPOSITORY	PROBABILITY FOR SUCH ERUPTION	$< 10^{-6}$/yr	
	DISRUPTED AREA	< 0.1% OF REPOSITORY AT CONDITIONAL PROBABILITY	
		< 0.1 IN 10,000 yr	
⋮	⋮	⋮	


TUFF RAMP
CONVEYOR
TUFF PILE
WASTE RAMP
EMPLACEMENT AREA EXHAUST SHAFT
GEOLOGIC REPOSITORY OPERATIONS AREA (SUBSURFACE)
UNDERGROUND FACILITIES
GENERAL SUPPORT FACILITIES AREA
WASTE HANDLING BUILDING NO. 1
WASTE HANDLING BUILDING NO. 2
WASTE TREATMENT BUILDING
RAILROAD
WASTE RECEIVING AND INSPECTION AREA
GEOLOGIC REPOSITORY OPERATIONS AREA (SURFACE)
SHOPS
ADMINISTRATION BUILDING
CENTRAL SURFACE FACILITIES
UNCONTROLLED DISTRIBUTION
DESIGN VERIFIED
SK-118-A-002
SCP CONCEPTUAL DESIGN
TUFF REPOSITORY
PERSPECTIVE SKETCH
SNL
BNI

SURFACE FACILITIES

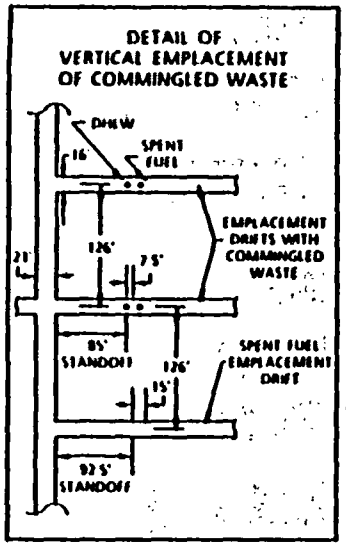


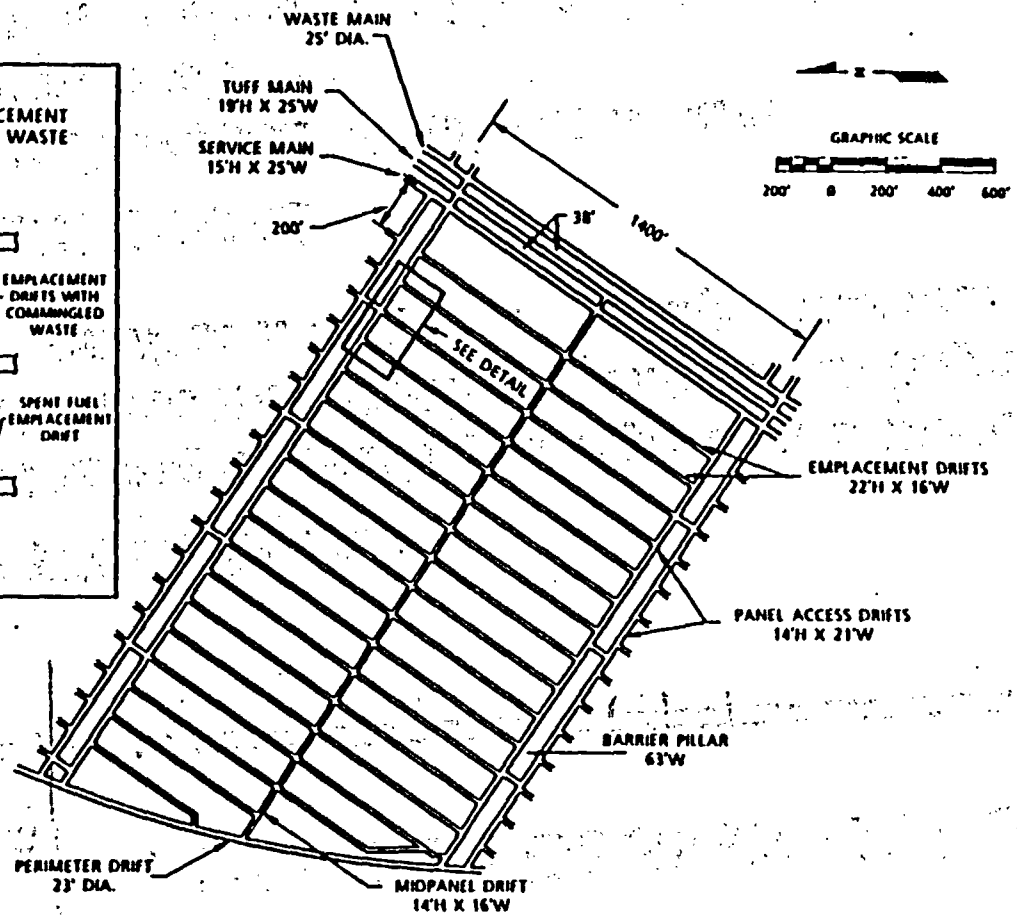
CENTRAL SURFACE FACILITIES

SELECTED CONSIDERATIONS:

- SPENT FUEL, DHLW & WVHLW
- RAIL & TRUCK ACCESS
- AVOID FAULTS WITH SIGNIFICANT DISPLACEMENT POTENTIAL
- COMPARTMENTALIZATION OF FACILITIES
- ZONED VENTILATION SYSTEMS
- LOW-PROFILE BUILDINGS
- NEGATIVE PRESSURE HOT CELLS

UNDERGROUND LAYOUT





PANEL LAYOUT - VERTICAL EMPLACEMENT

SELECTED CONSIDERATIONS:

- VERTICAL (REF. CASE) AND HORIZONTAL EMPLACEMENT DESIGNS
- THERMAL LOAD - 57 kW/acre
- PANEL EXTRACTION RATIO -
  - 16% - VERTICAL
  - 5% - HORIZONTAL
- RAMP FOR WASTE DELIVERY
- SEPARATE EMPLACEMENT & DEVELOPMENT VENTILATION
- SLOPE FROM DRIFTS TO EMPLACEMENT EXHAUST SHAFT
- DESIGN LIFETIME ~ 100 yrs.
- ACCESS DRIFT TEMPERATURE - <50°C for 50 yr.

AREAS OF DESIGN CONSTRAINTS

POSTCLOSURE

- Sealing of Shafts, Ramps and Boreholes
- Postclosure Design Constraints (layout, waste package environment, water usage, thermal loading)

PRECLOSURE

- Radiological Health and Safety
- Retrievability
- Non-Radiological Health and Safety
- Technical Feasibility (reasonably available technology)

EXAMPLES OF CHARACTERIZATION DATA NEEDED FOR REPOSITORY DESIGN CONCERNS

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POSTCLOSURE CONCERN:

FUNCTION	PROCESS	PERFORMANCE MEASURE
SELECT ORIENTATION, GEOMETRY LAYOUT AND DEPTH OF UNDERGROUND FACILITY TO CONTRIBUTE TO CONTAINMENT AND ISOLATION, TAKING INTO ACCOUNT FLEXIBILITY TO ACCOMMODATE SITE SPECIFIC CONDITIONS	• VARY DEPTH, DIP, ORIENTATION AND LATERAL EXTENT OF UNDERGROUND FACILITY TO PROVIDE HOST ROCK WITH FAVORABLE CONTAINMENT AND ISOLATION CHARACTERISTICS	USABLE AREA ADEQUATE FOR 70,000 MTU OF WASTE
⋮	⋮	⋮

TENTATIVE GOAL	PERFORMANCE PARAMETER	TENTATIVE GOAL
AREA AVAIL. >> AREA NEEDED > 200 m OVERBURDEN STAY IN TSw2 STAY > 70 m ABOVE WATER TABLE	⋮	⋮
PROBABILITY < 0.1 IN 1000 YR THAT > 0.5 % OF WASTE PACKAGES WILL BE BREACHED BY TECTONIC PROCESSES OR EVENTS →	FAULT DESCRIPTION ⋮ RECURRENCE TIME FOR 5 cm DISP.	⋮ GREATER THAN 1000 YEARS

EXAMPLES OF CHARACTERIZATION DATA NEEDED FOR REPOSITORY DESIGN CONCERNS

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PRECLOSURE CONCERN:

SYSTEM ELEMENT	FUNCTION/ PROCESS	PERFORMANCE MEASURE
SURFACE	PROVIDE FACILITY SITES NOT JEOPARDIZED BY NATURAL OR MANMADE PHENOMENA	ACCEPTABILITY OF LOCATION OF SURFACE FACILITIES

TENTATIVE GOAL	PERFORMANCE PARAMETER	TENTATIVE GOAL
FACILITIES IMPORTANT TO SAFETY (FITS) NOT LOCATED OVER POTENTIALLY ACTIVE GEOLOGICAL STRUCTURES	PROBABILITY OF EXCEEDING 5 cm DISPLACEMENT UNDER FITS	LESS THAN 0.001 IN 100 YEARS
ACCEPTABLE POTENTIAL FOR VIBRATORY GROUND MOTION	PROBABILITY OF EXCEEDING DESIGN BASIS GROUND MOTION AT FITS	LESS THAN 0.1 IN 100 YEARS

GROUND-WATER FLOW

S. SINNOCK
W. WILSON

PERSPECTIVE ON INFORMATION NEEDS FOR GROUNDWATER FLOW AT NNWSI SITE

- **Mathematical basis for parameter needs**
- **Geographic basis for parameter needs**
- **Treatment of parameter uncertainty**
- **Treatment of conceptual uncertainty**

MATHEMATICAL BASIS FOR SELECTED PARAMETER NEEDS

(groundwater travel time)

MATHEMATICAL BASIS FOR MODELING

GWTT = d/v

WHERE

$$v = \frac{q}{n_e} = \frac{K \times \delta h/\delta l}{n_e}$$

IN UNSATURATED ZONE

$K = f(\psi_c)$

$\psi_c = f(\theta, S)$

PARAMETER NEEDS

d = STRATIGRAPHIC GEOMETRY(1) (HYDROGEOLOGIC UNITS)

q = WATER FLUX(1), (2)

K = PERMEABILITY(1), (2)

$\delta h/\delta l$ = PRESSURE FIELD(1), (2)

n_e = POROSITY(1), (2)

ψ_c = CAPILLARY MATRIC POTENTIAL(2)

θ = MOISTURE CONTENT(2)

S = SATURATION(2)

FOOTNOTES:

(1) UNSATURATED AND SATURATED ZONES

(2) FRACTURES AND MATRIX

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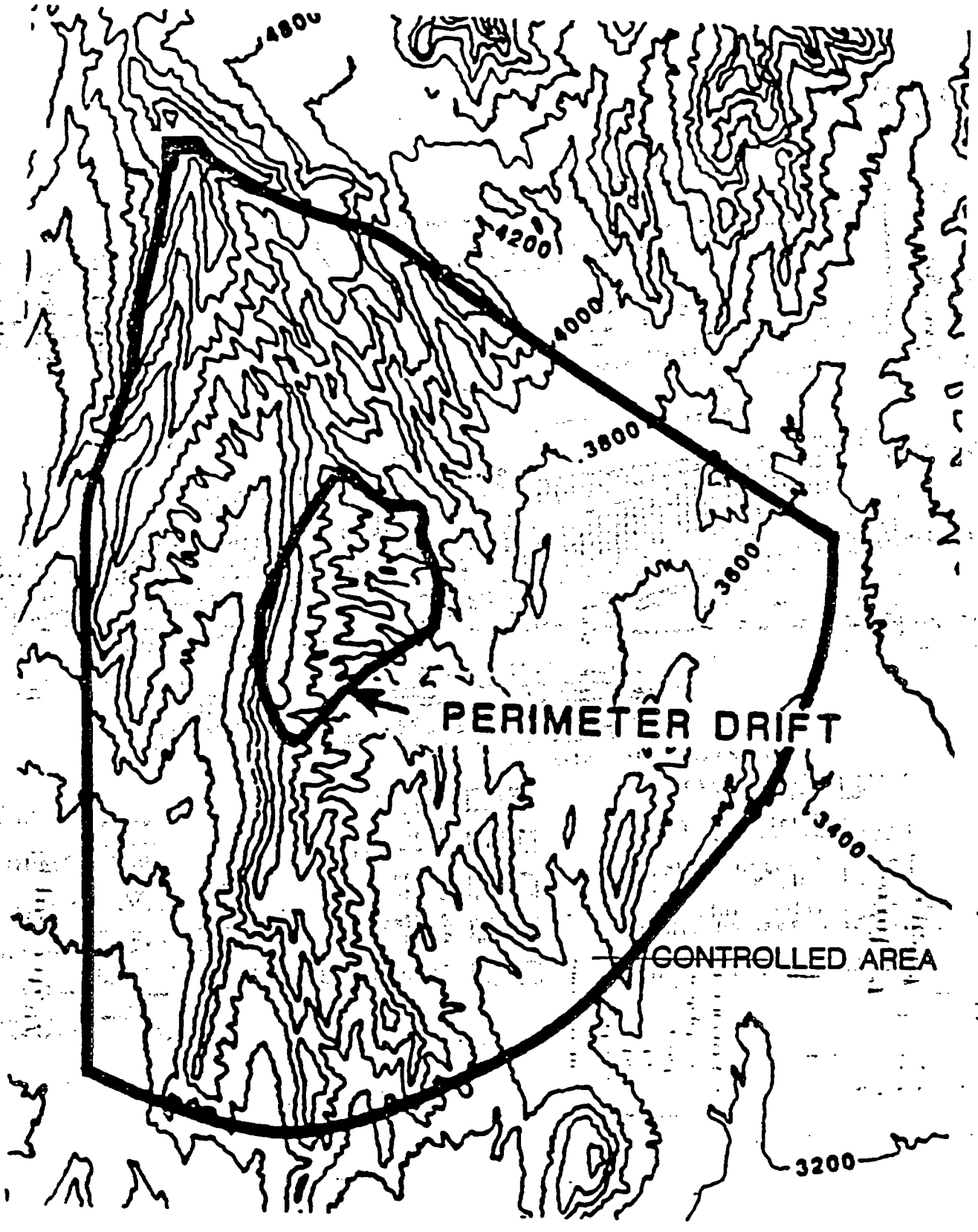
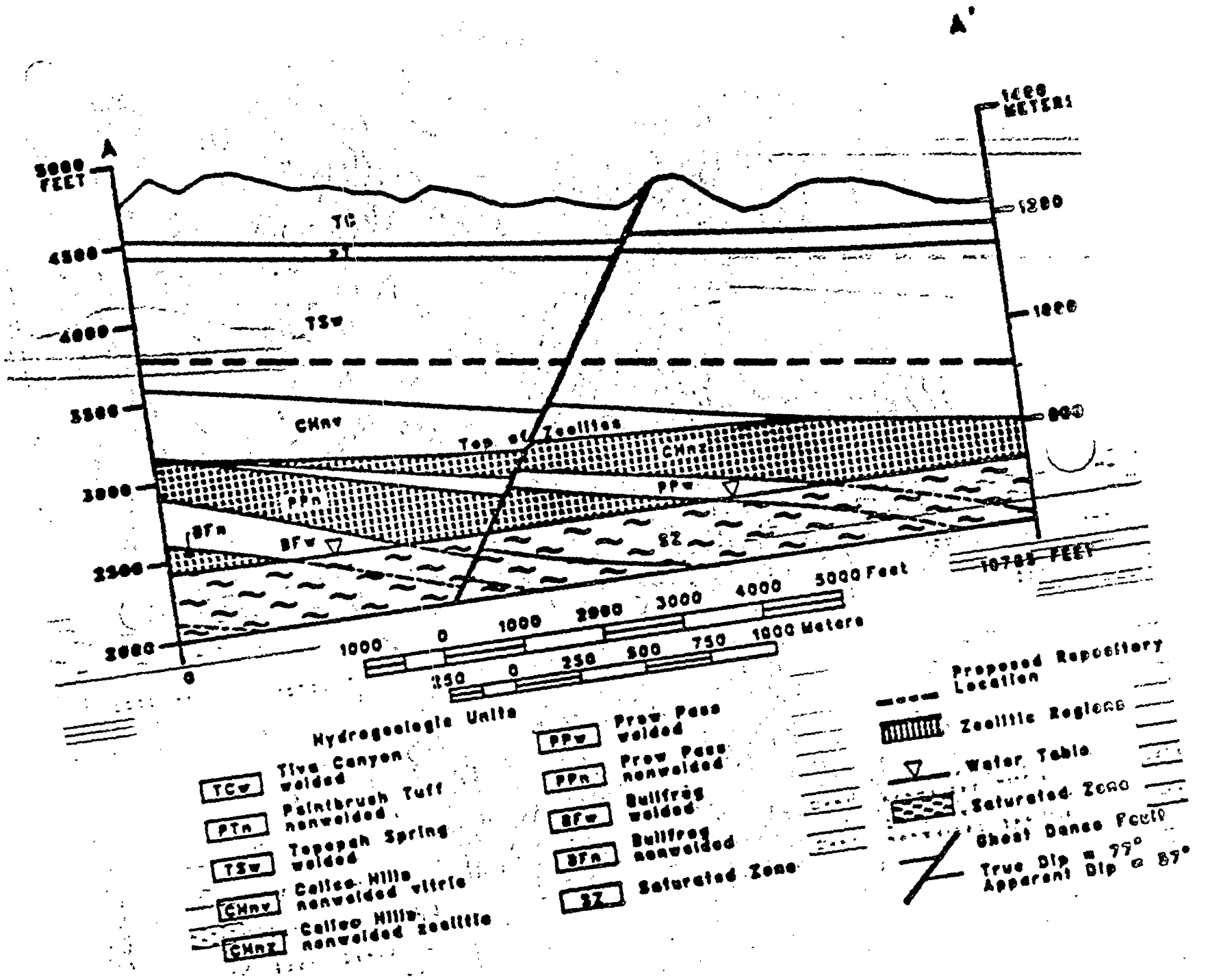
GEOGRAPHIC BASIS FOR SELECTED PARAMETER-NEEDS

(Groundwater Flow)

Performance or Design Usage	Area of Concern
▪ Groundwater Travel Time	Disturbed Zone to Accessible Environment * (Unsaturated Zone Emphasis)
▪ Total System Releases	Repository to Accessible Environment * (Unsaturated Zone Emphasis)
▪ Underground Facility Design	Vicinity of Sealed Shafts Vicinity of Drifts, Ramps (Unsaturated Zone Only)
▪ Water Supplies	Site Vicinity Aquifers (Saturated Zone Only)


4800
4200
4000
3800
3600
PERIMETER DRIFT
3400
CONTROLLED AREA
3200


A
A'
5000 FEET
4500
4000
3500
3000
2500
2000
1400 METERS
1200
1000
800
10700 FEET
TC
TSw
CHnv
Top of Zeolites
CHnz
PPn
PPw
BFn
BFw
SZ
0
1000
2000
3000
4000
5000 Feet
1000
0
1000
2000
3000
4000
1000 Meters
250
0
250
500
750
Hydrogeologic Units
TCw Tiva Canyon welded
PTn Paintbrush Tuff nonwelded
TSw Topopah Spring welded
CHnv Calico Hills nonwelded vitric
CHnz Calico Hills nonwelded zeolitic
PPw Prow Pass welded
PPn Prow Pass nonwelded
BFw Bullfrog welded
BFn Bullfrog nonwelded
SZ Saturated Zone
Proposed Repository Location
Zeolitic Regions
Water Table
Saturated Zone
Ghost Dance Fault
True Dip = 79°
Apparent Dip @ 87°

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EXAMPLE OF EXPLICIT PARAMETER NEEDS FOR ASSESSING GROUNDWATER FLOW IN UNSATURATED ZONE

PARAMETER	MATERIAL TYPE	SPATIAL LOCATION	CHARACTERIZATION GOAL
PERMEABILITY	MATRIX	BELOW REPOSITORY	HIGH CONFIDENCE IN MEAN VALUE
•	•	•	• STANDARD DEVIATION
•	•	•	• SPATIAL CORRELATION
•	FRACTURES	•	MEDIUM • MEAN VALUE
⋮			
POROSITY	MATRIX	BELOW REPOSITORY	HIGH • MEAN VALUE
⋮			
CONTACT ALTITUDE		BELOW REPOSITORY	HIGH • MEAN VALUE
⋮			
ETC (150 PARAMETERS)			

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TREATMENT OF PARAMETER UNCERTAINTY

Sensitivity Analysis

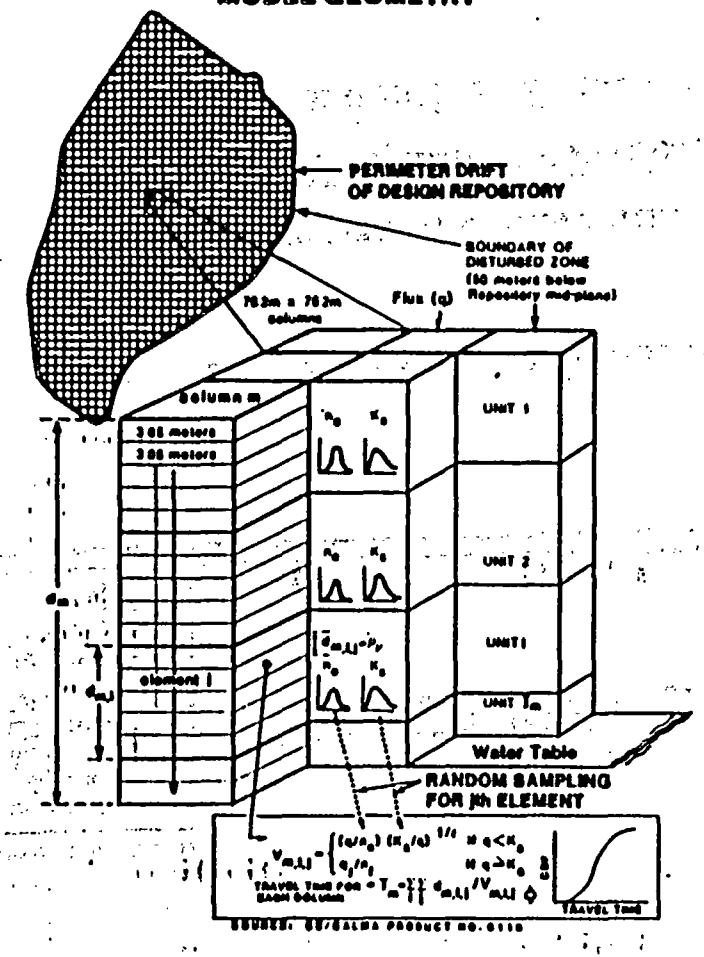
- Identify most influential variables

Uncertainty Analysis

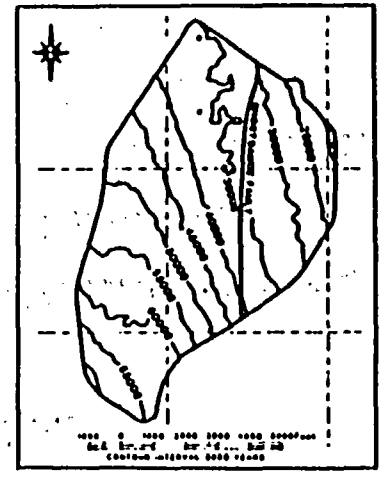
- Treat sensitive input variables as random distributions
- Probabalistic Prediction of GWTT
  - Monte Carlo
  - Direct Stochastic Simulation

GROUNDWATER TRAVEL TIME AT YUCCA MOUNTAIN

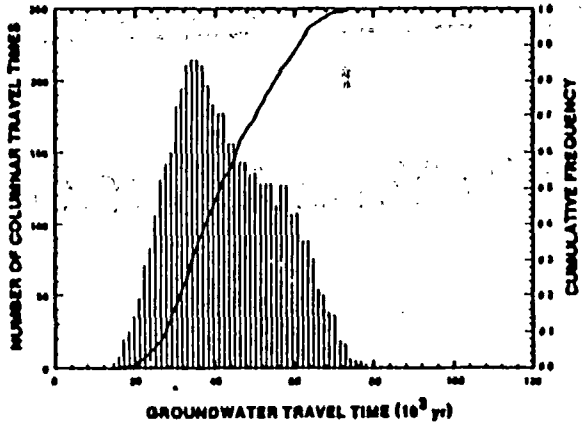
MODEL GEOMETRY



GEOGRAPHIC DISTRIBUTION



HISTOGRAM & CUMULATIVE-FREQUENCY DISTRIBUTION



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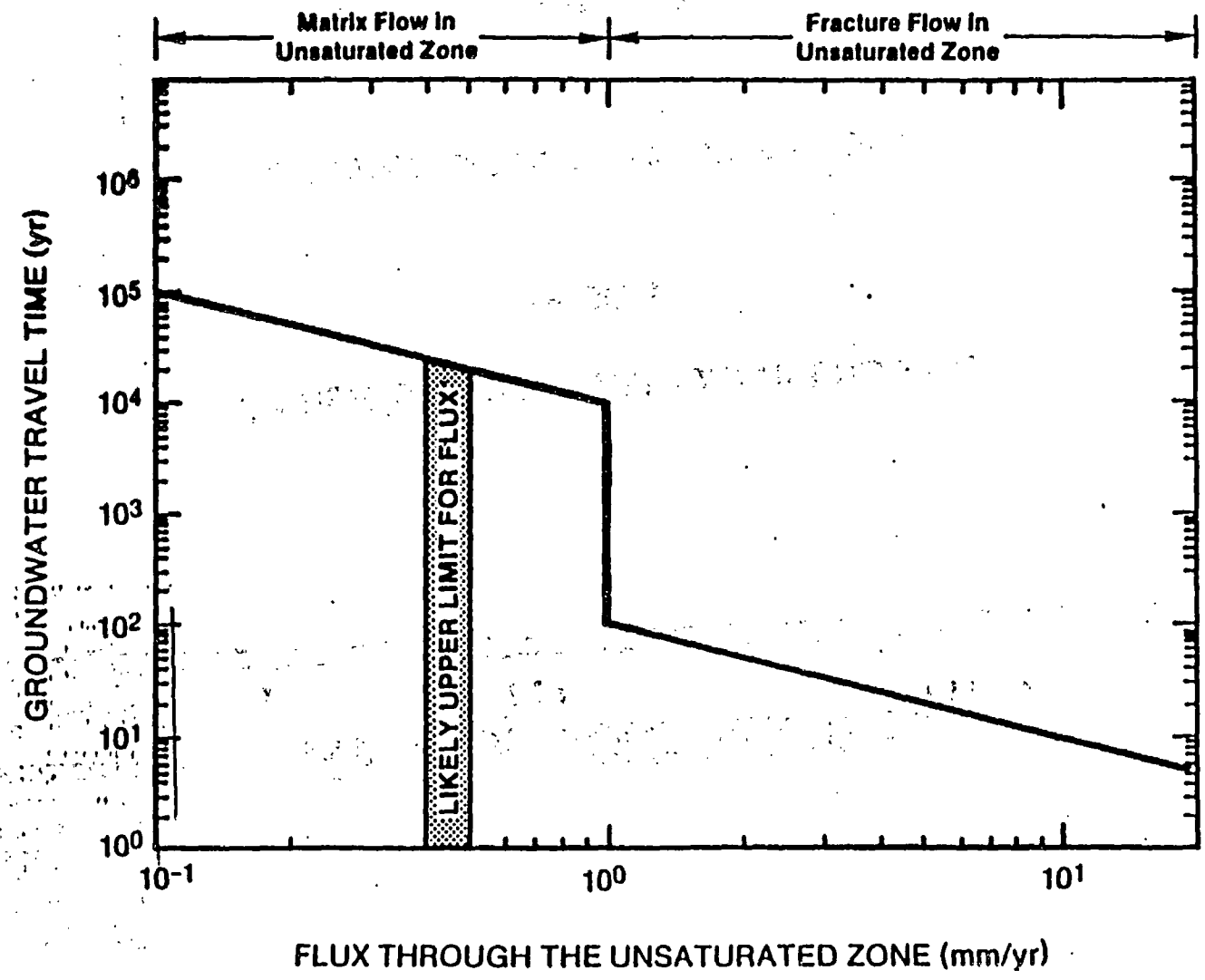
TREATMENT OF CONCEPTUAL UNCERTAINTY

- Less Amenable to Quantification
- Addressed by Consideration of Alternative Conceptual Models
  - Weighting by Professional Judgment
  - Extensive Dialogue with State, NRC, Expert Consultants
- Validation of Modeling Approaches
  - Calibration with respect to field observations (ψ, S, $\delta h/\delta \ell$)
  - Comparison to controlled field experiments
  - Comparison to controlled laboratory experiments
  - Periodic Formal Peer Review

GROUNDWATER FLOW TIMES



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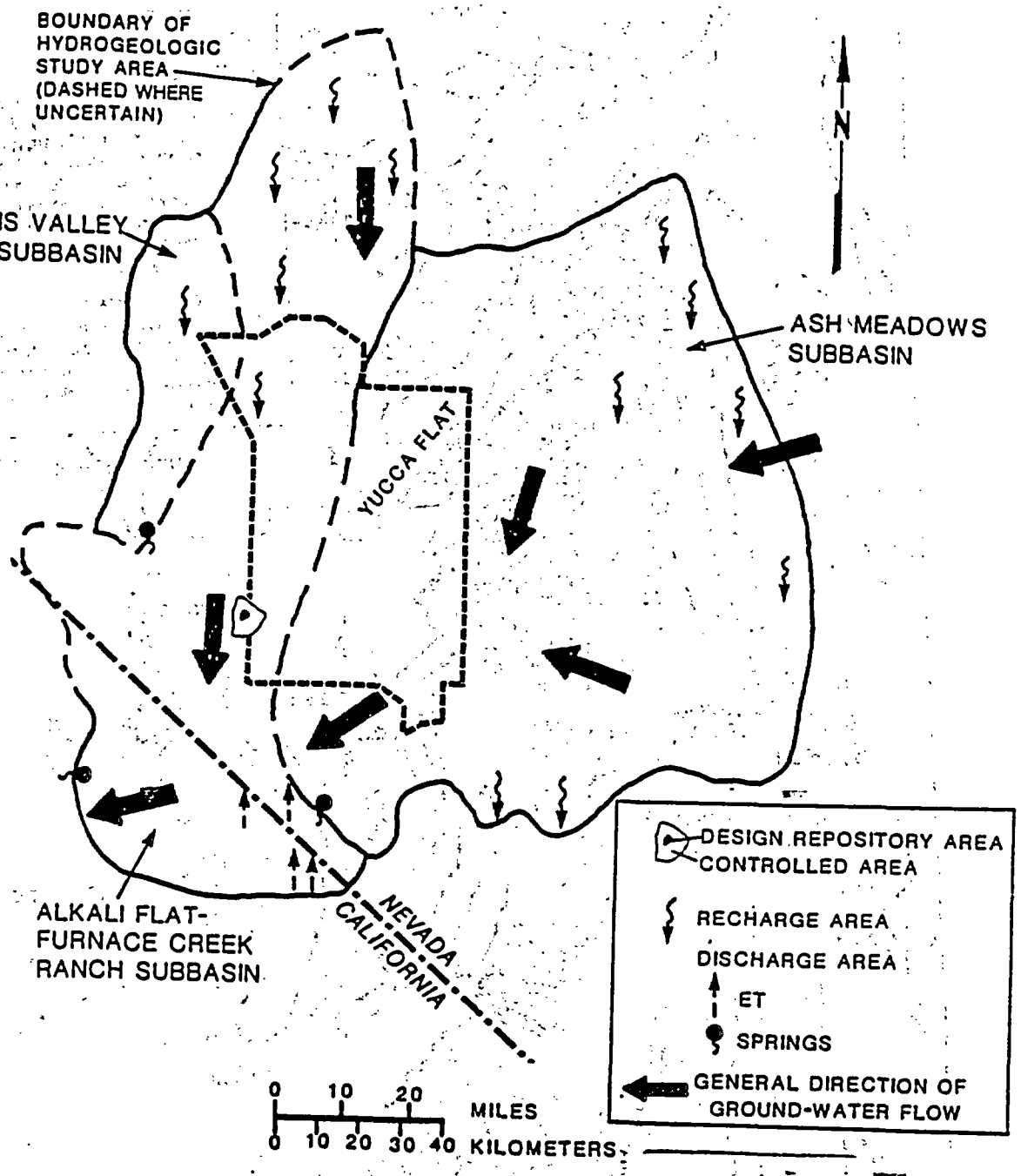
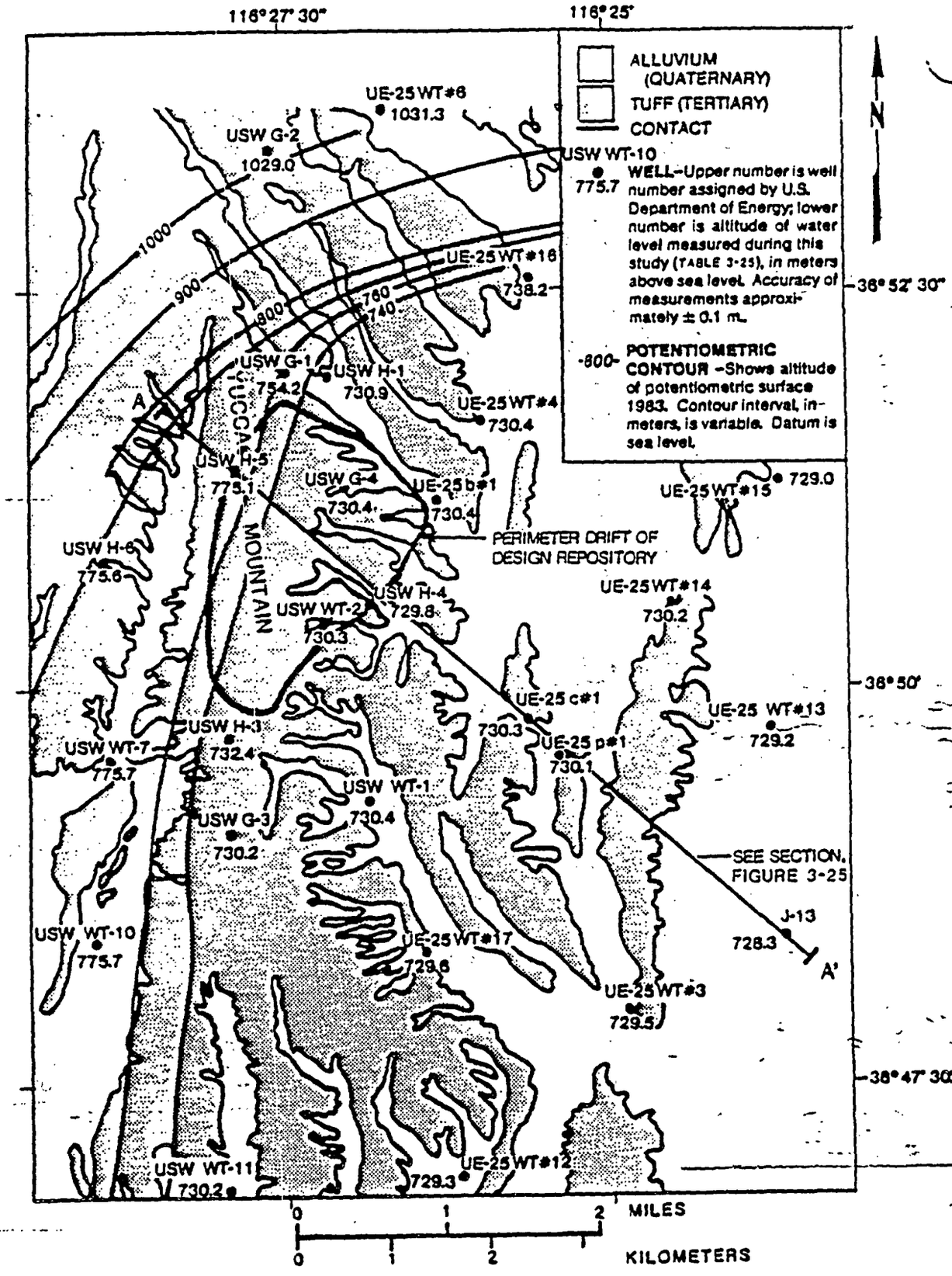
HYDROLOGIC REGIMES

- UNSATURATED-ZONE (UZ) HYDROLOGY
  - -- SITE
- SATURATED-ZONE (SZ) HYDROLOGY
  - -- SITE
  - -- REGION

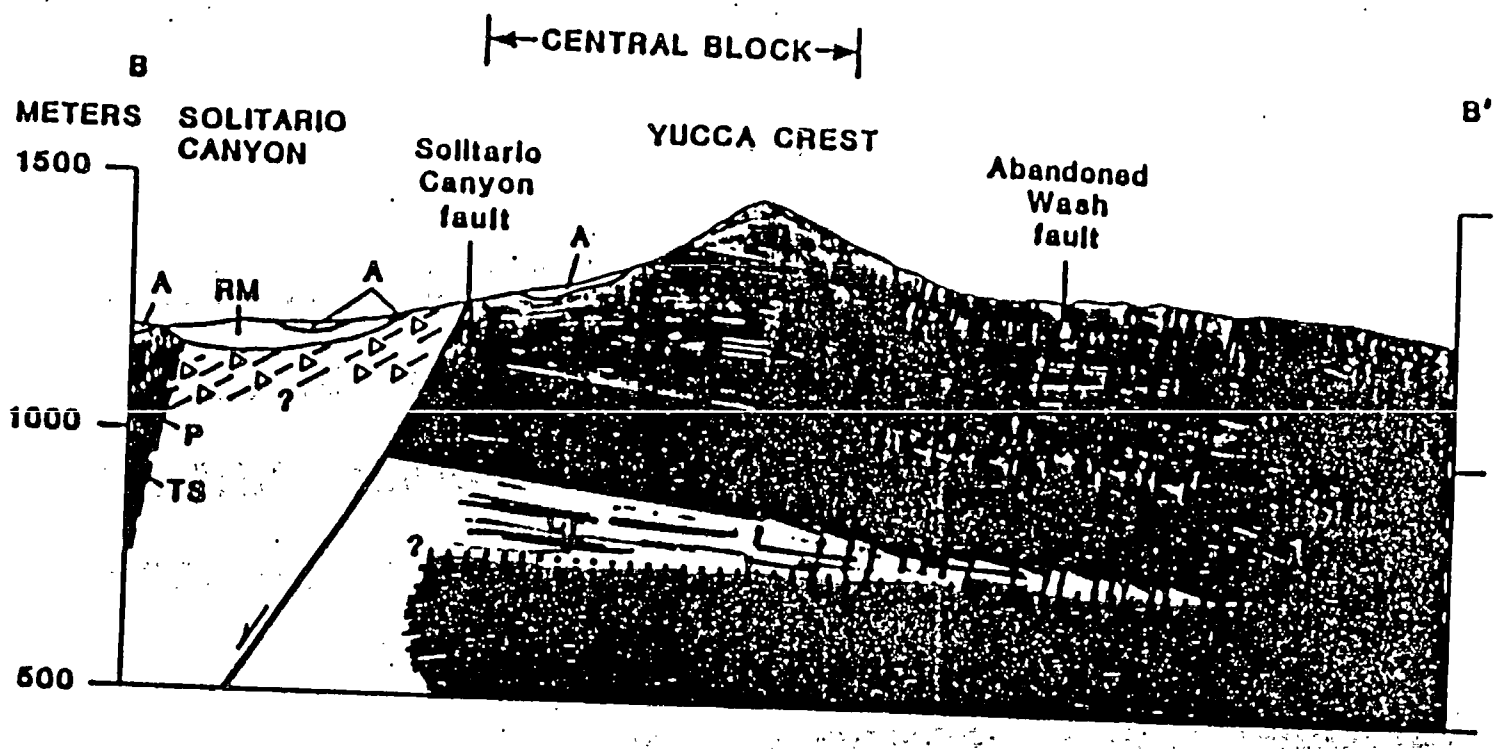

BOUNDARY OF HYDROGEOLOGIC STUDY AREA (DASHED WHERE UNCERTAIN)
OASIS VALLEY SUBBASIN
ASH MEADOWS SUBBASIN
YUCCA FLAT
ALKALI FLAT-FURNACE CREEK RANCH SUBBASIN
NEVADA
CALIFORNIA
N
DESIGN REPOSITORY AREA
CONTROLLED AREA
RECHARGE AREA
DISCHARGE AREA
ET
SPRINGS
GENERAL DIRECTION OF GROUND-WATER FLOW
0 10 20 MILES
0 10 20 30 40 KILOMETERS

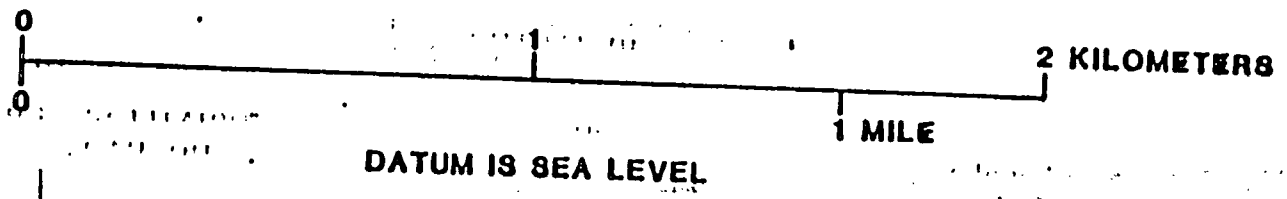

116°27'30"
116°25'
38°52'30"
38°50'
38°47'30"
N
ALLUVIUM (QUATERNARY)
TUFF (TERTIARY)
CONTACT
775.7 WELL–Upper number is well number assigned by U.S. Department of Energy; lower number is altitude of water level measured during this study (TABLE 3-25), in meters above sea level. Accuracy of measurements approximately ± 0.1 m.
-800- POTENTIOMETRIC CONTOUR –Shows altitude of potentiometric surface 1983. Contour interval, in meters, is variable. Datum is sea level.
UE-25 WT#6
1031.3
USW G-2
1029.0
USW WT-10
775.7
1000
900
800
760
740
UE-25 WT#16
738.2
USW G-1
754.2
USW H-1
730.9
UE-25 WT#4
730.4
A
YUCCA MOUNTAIN
USW H-5
775.1
USW G-4
730.4
UE-25 b#1
730.4
UE-25 WT#15
729.0
PERIMETER DRIFT OF DESIGN REPOSITORY
USW H-6
775.6
USW H-4
729.8
USW WT-2
730.3
UE-25 WT#14
730.2
UE-25 c#1
730.3
UE-25 WT#13
729.2
USW H-3
732.4
USW WT-7
775.7
UE-25 p#1
730.1
USW WT-1
730.4
USW G-3
730.2
SEE SECTION, FIGURE 3-25
J-13
728.3
A'
USW WT-10
775.7
UE-25 WT#17
729.6
UE-25 WT#3
729.5
USW WT-11
730.2
UE-25 WT#12
729.3
0 1 2 MILES
0 1 2 KILOMETERS

UZ FLOW AT YUCCA MOUNTAIN

SPECIAL ASPECTS

- APPLICABILITY OF EXISTING CONCEPTS AND THEORIES
- NONSTANDARD FIELD AND LAB TECHNIQUES
- MULTIPLE FLUIDS
- VARIABLE HYDRAULIC CONDUCTIVITY
- FRACTURE vs MATRIX FLOW
- SPATIALLY VARIABLE FLUX


CENTRAL BLOCK
B
B'
METERS
1500
1000
500
SOLITARIO CANYON
Solitario Canyon fault
YUCCA CREST
Abandoned Wash fault
A
RM
A
A
?
P
TS
?


0
1
2 KILOMETERS
0
1 MILE
DATUM IS SEA LEVEL

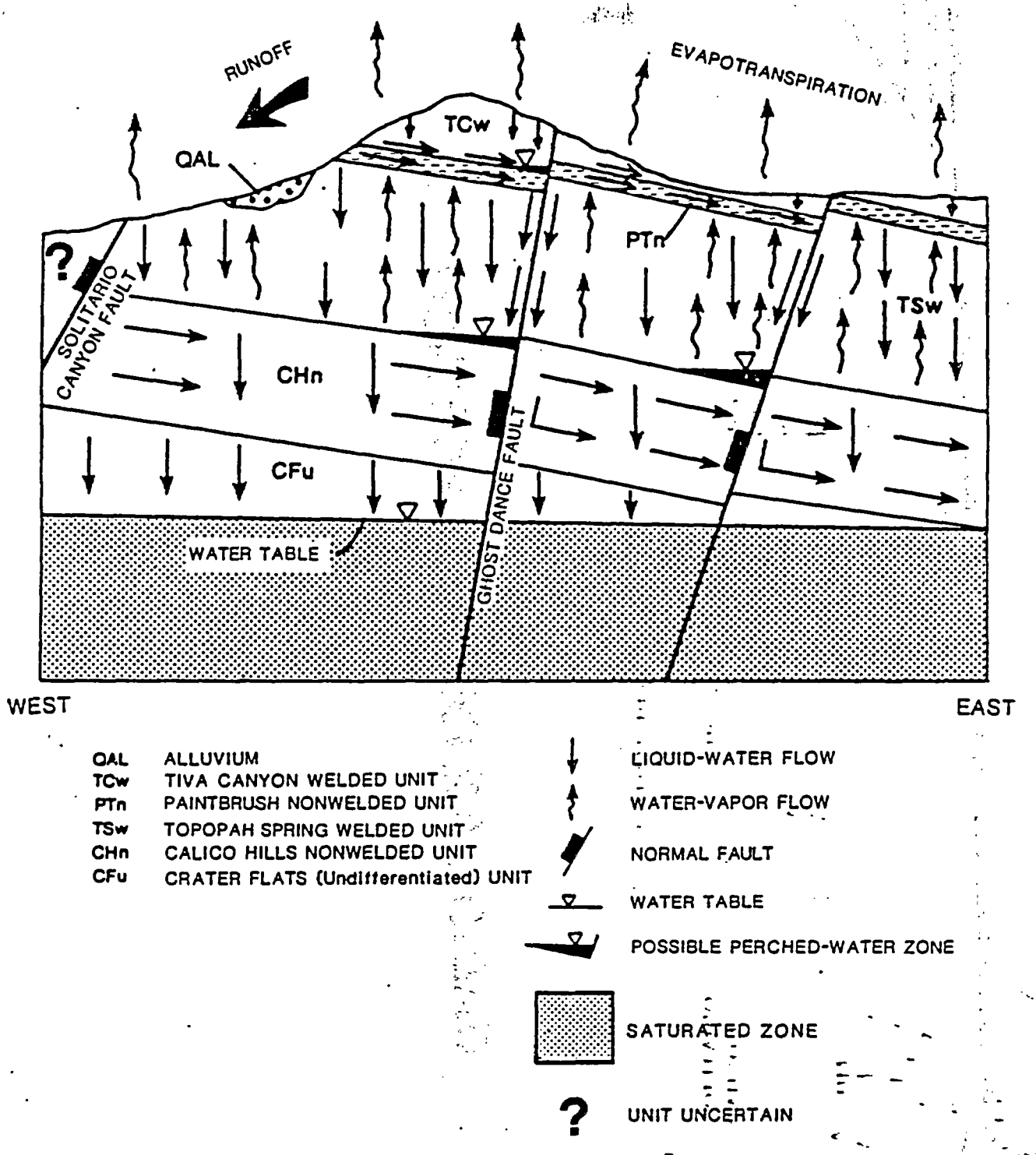


Figure 3-40. Generalized east-west section through Yucca Mountain showing conceptual moisture-flow system under natural conditions. Modified from Montazer and Wilson (1984).

RADIONUCLIDE RETARDATION

K. EGGERT

Radionuclide Retardation:

Slowing of Radionuclide Movement Along Transport Paths Through the Porous or Fractured Porous Media by Mechanical or Chemical Processes Relative to the Movement That Would be Expected in the Absence of Those Processes.

Examples of Retardation Processes Thought to be Significant at Yucca Mountain Include:

1. **Sorption**
   - **In Matrix**
   - **Along Fracture Surfaces**
2. **Precipitation**
3. **Matrix Diffusion**

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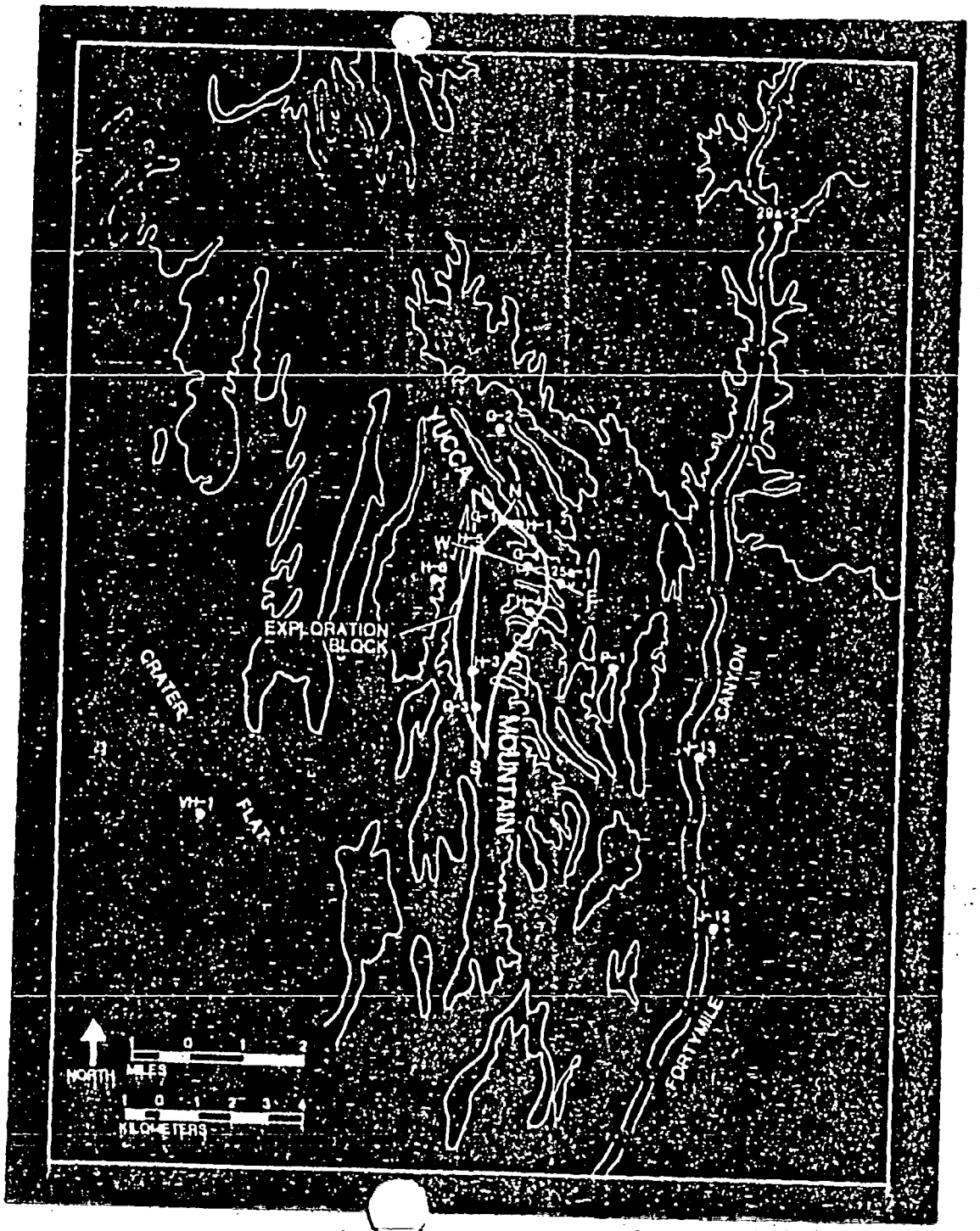

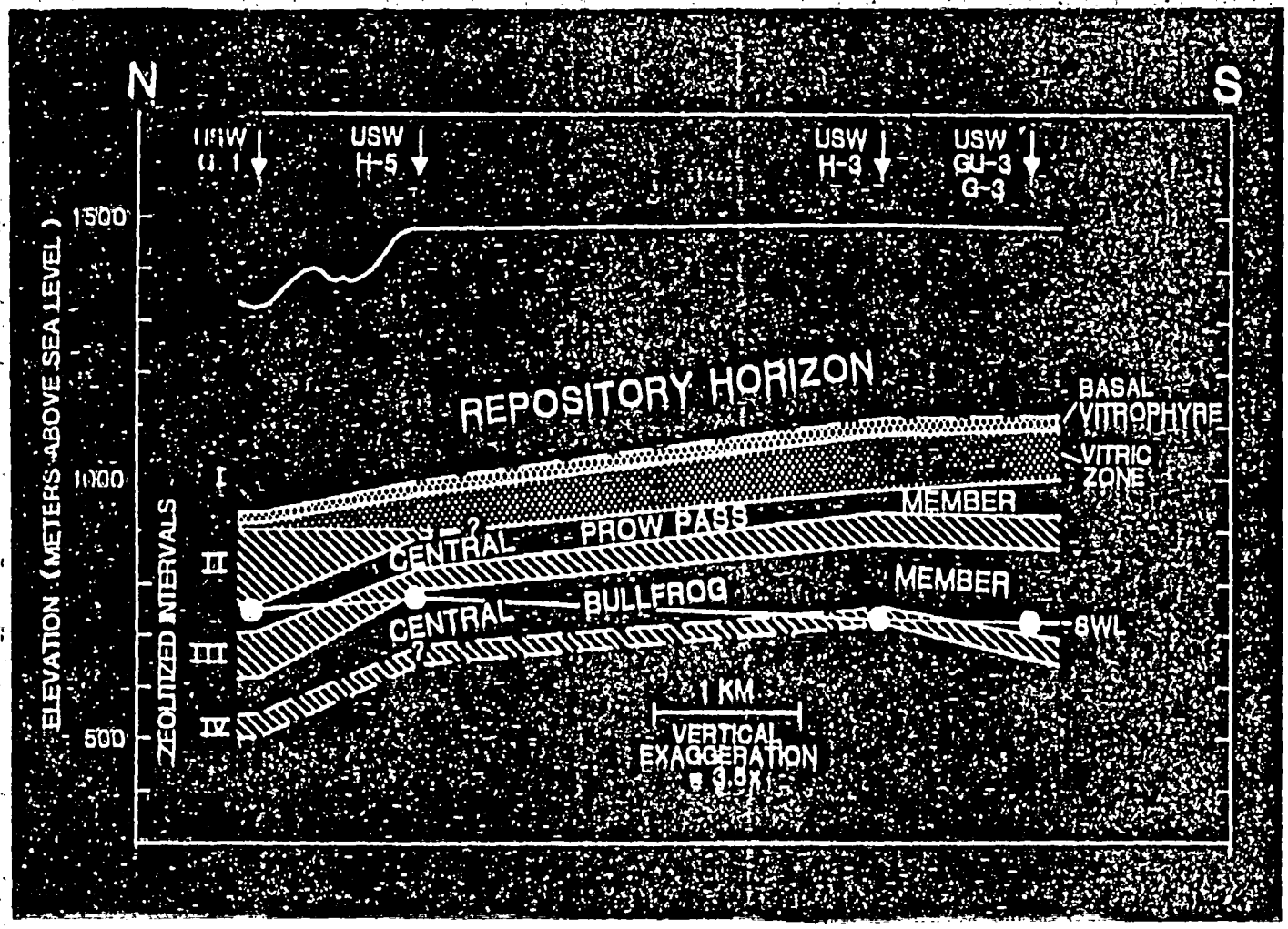
N
S
USW G-1
USW H-5
USW H-3
USW GU-3 G-3
1500
1000
500
ELEVATION (METERS ABOVE SEA LEVEL)
ZEOLITIZED INTERVALS
I
II
III
IV
REPOSITORY HORIZON
BASAL VITROPHYRE
VITRIC ZONE
MEMBER
PROW PASS
CENTRAL
BULLFROG
MEMBER
CENTRAL
SWL
1 KM
VERTICAL EXAGGERATION = 3.8X

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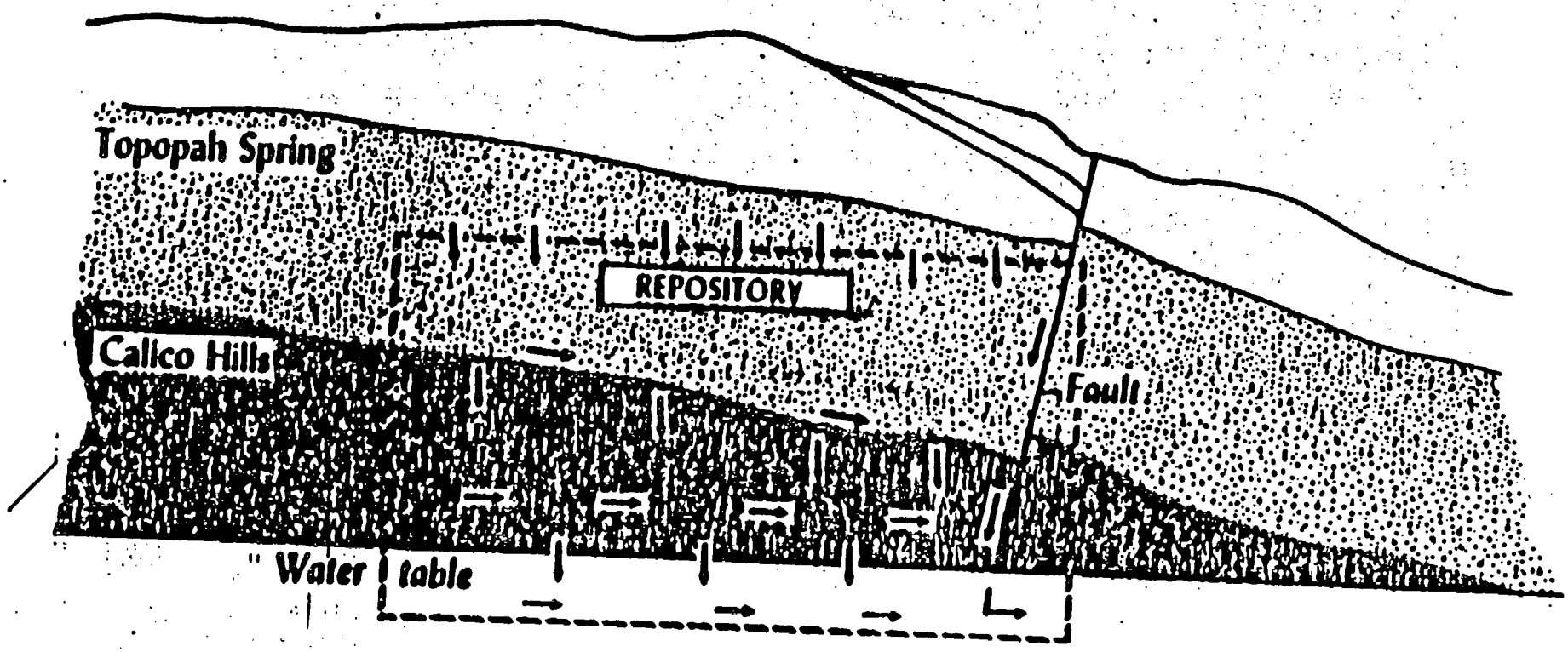
YUCCA MOUNTAIN



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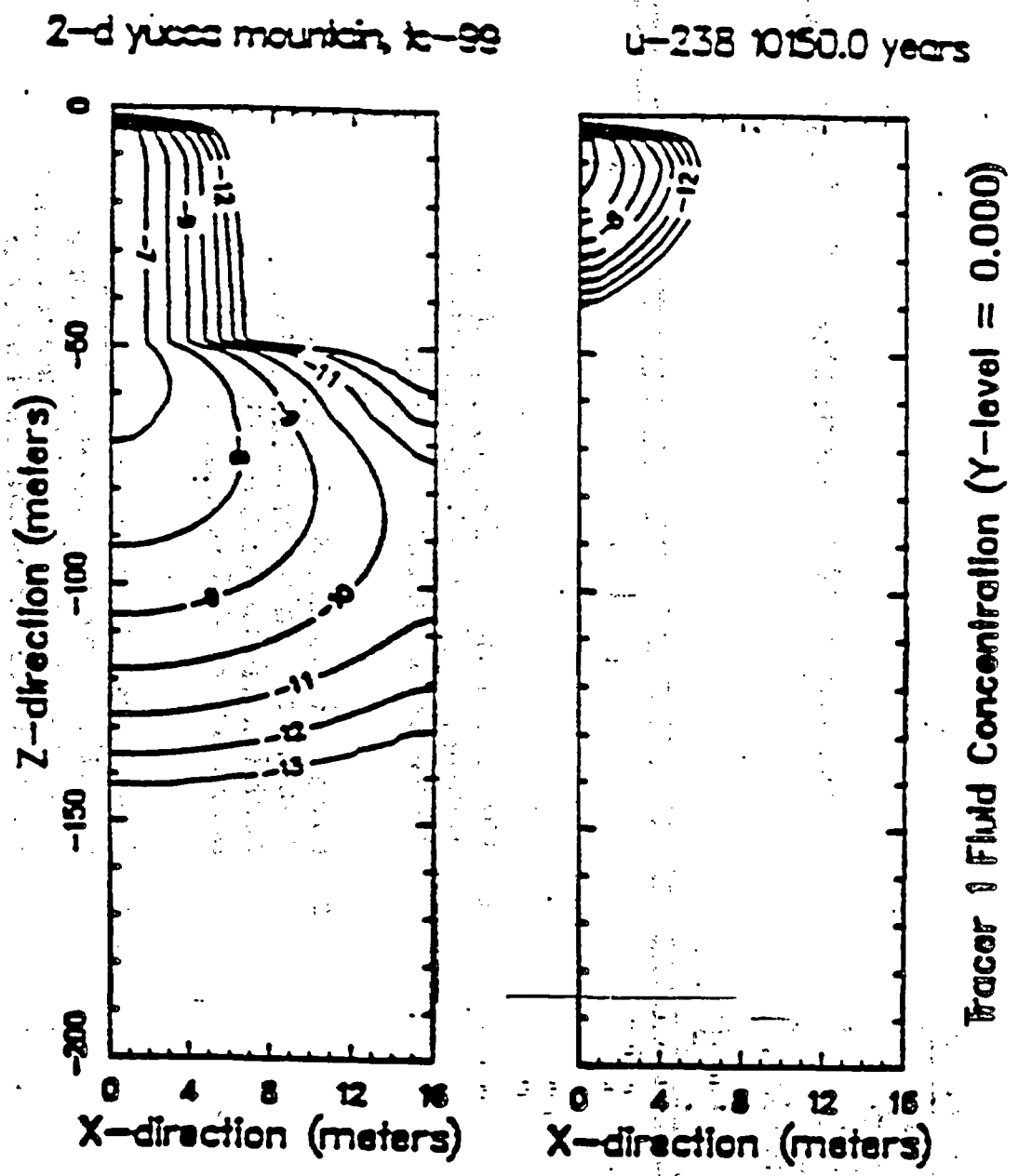
Transport Calculations from a Single Waste Package



Relevance of Retardation to Performance

- There is a significant potential for radionuclide retardation to affect transport of Yucca Mountain.
- The total system performance assessment calls for retardation coefficients for radionuclides in the inventory of EBS releases.
- Under currently assumed expected conditions, groundwater travel time alone may be sufficient to meet release limits at the accessible environment.
- However, transport mechanisms must be studied in order to justify these assumptions; and,
- under unexpected conditions, retardation may be required.

- CHEMISTRY IN UNSATURATED SOIL/ROCK
  vapor–rock interactions
  (hydro–thermo–chemical)

- FRACTURE FLOW – Is it important in unsaturated rock?

- COLLOID migration
  precipitates
  particulates

- STOCHASTIC BEHAVIOR
  need mean $c = c(x_1, x_2, \ldots, x_n)$
  and variance $c = \ell(x_1, \ldots, x_n, \sigma_1, \ldots, \sigma_n)$
  where x_i = variable, σ_i = uncertainty in x_i

- COUPLED PROCESSES
  flux $J_i = \sum_j L_{ij} F_j$ where F_j are driving forces

  what are L_{ij} ?, especially what are L_{ij}, $i \neq j$?

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Yucca Mountain

Radionuclide Retardation Related Studies Underway at LANL

1. Groundwater Chemistry
2. Retardation by Sorption Mechanisms (Sorption)
3. Retardation by Precipitation (Solubility)
4. Effective Retardation by Transport Mechanisms (Dynamic Transport)
5. Integrated Modeling of Transport at Yucca Mountain (Retardation Sensitivity)

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YUCCA MOUNTAIN

Sorption

- Recent work has concentrated on the derivation of basic thermodynamic data for from site specific sorption data from batch sorption experiments.

- Technique is based on deconvoluting a Fredholm integral representing total concentration of an adsorbed species as the sum of the adsorbed concentrations and specific sites.

- The potential use of this inverse method is to allow prediction of effective partition coefficients associated with mineral assemblages.

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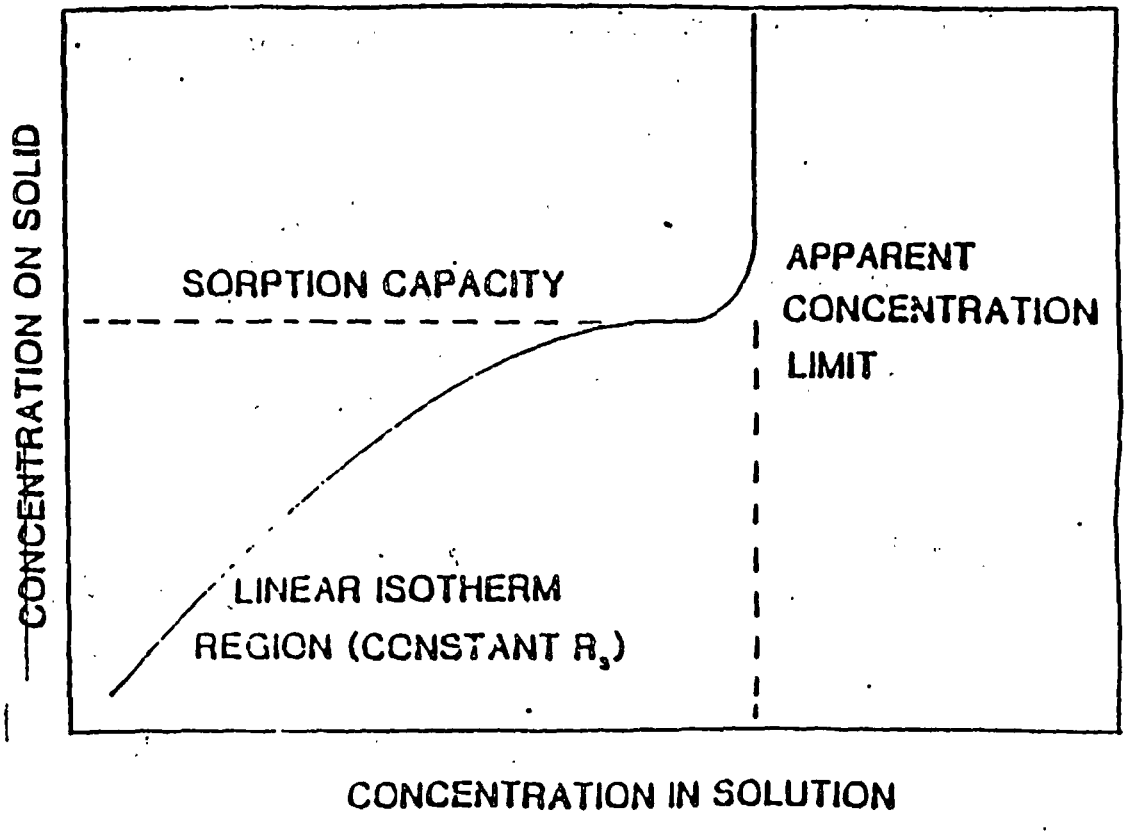
SCHEMATIC SORPTON ISOTHERM



Representative sorption ratios (distribution coefficients) and retardation factors for eight radionuclide elements with Yucca Mountain tuff[a]

Waste element	Welded tuff Topopah Spring Member porosity = 11%		Bedded tuff Topopah Spring Member porosity = 35%		Bedded tuff - tuffaceous beds of Calico Hills porosity = 35%	
	Sorption ratio, R_d (ml/g)	Retardation factor[b,c]	Sorption ratio, R_d (ml/g)	Retardation factor[b,c]	Sorption ratio, R_d (ml/g)	Retardation factor[b,c]
Americium (Am)	1,200	25,000	180	820	4,600	21,000
Cesium (Cs)	290	6,000	16,000	73,000	7,800	35,000
Neptunium (Np)	7	150	ND[d]	ND	11	50
Plutonium (Pu)	64	1,300	120	540	140	630
Strontium (Sr)	53	1,100	17,000	77,000	3,900	17,000
Technetium (Tc)	0.3	7	2.5[e]	12	ND	ND
Uranium (U)	1.8	37	2.5	12	5.3	26
Barium (Ba)	900	18,000	38,000	180,000	94,000	440,000

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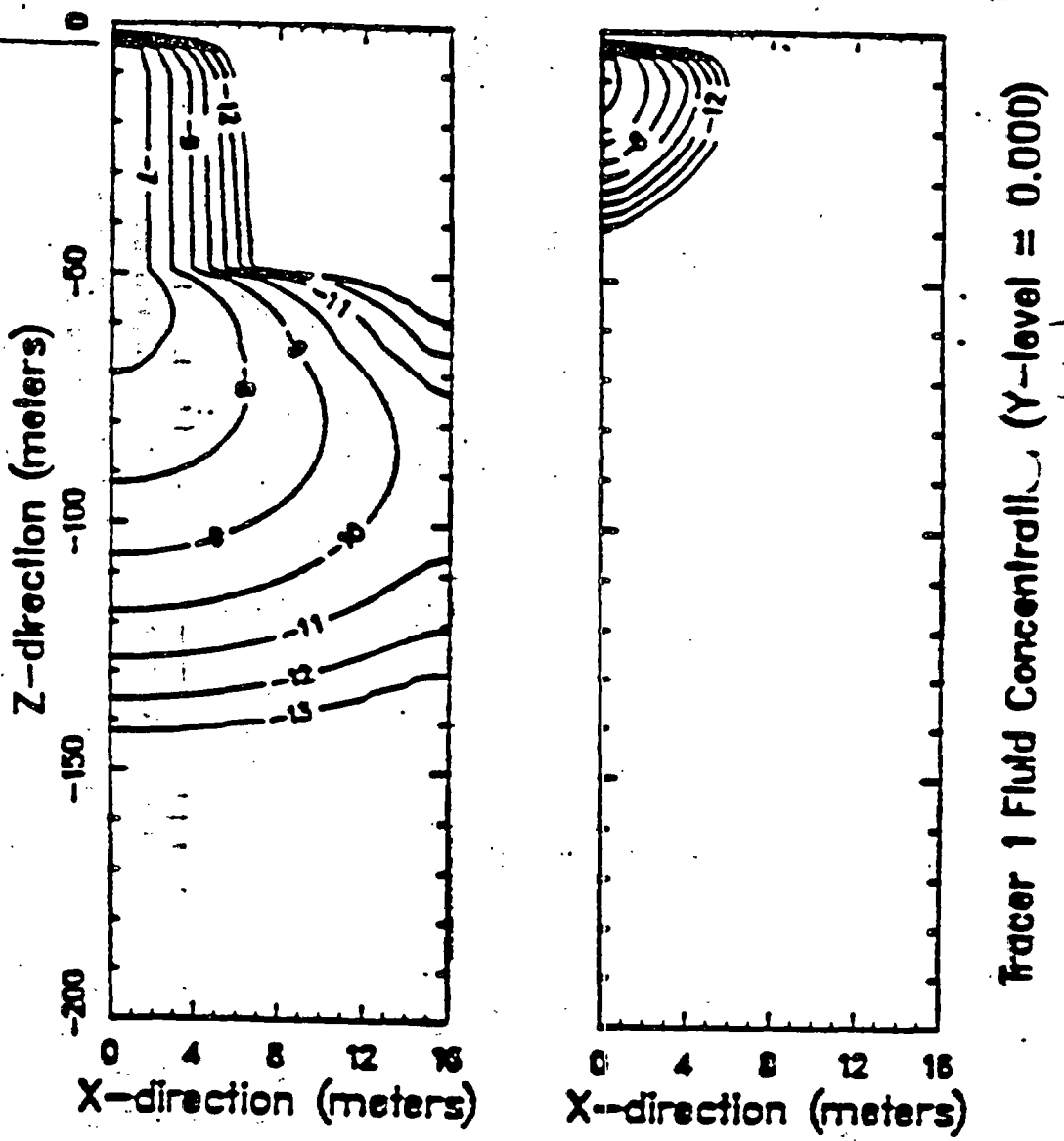
Transport Calculations from a Single Waste Package



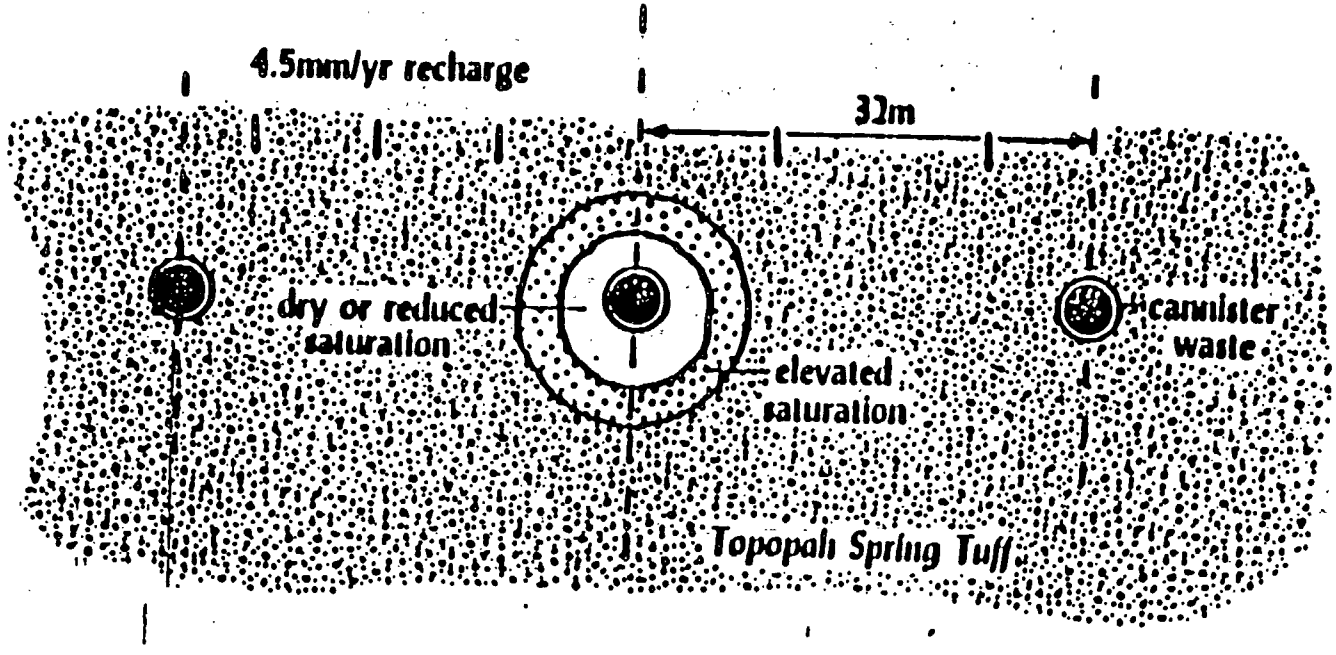
Transport Dynamics

Based on J-13 water, transport in the form of psuedo colloids is not expected to be a problem due to the lack of colloidal material in undisturbed J-13 water; however, if colloids are formed:

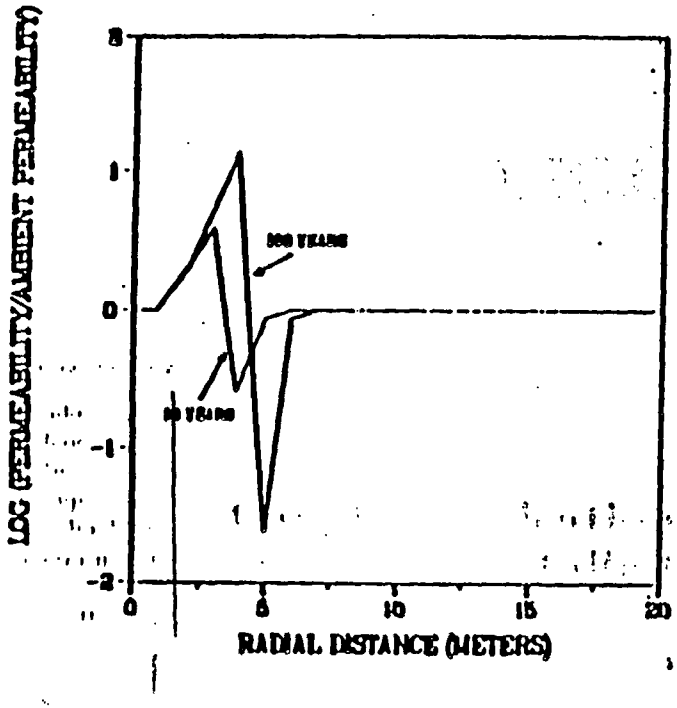
- The larger colloids appear to move at rates consistent with the hydraulic aperture of the fractures, while smaller colloids are slowed by mixing with "dead" water in the fractures.

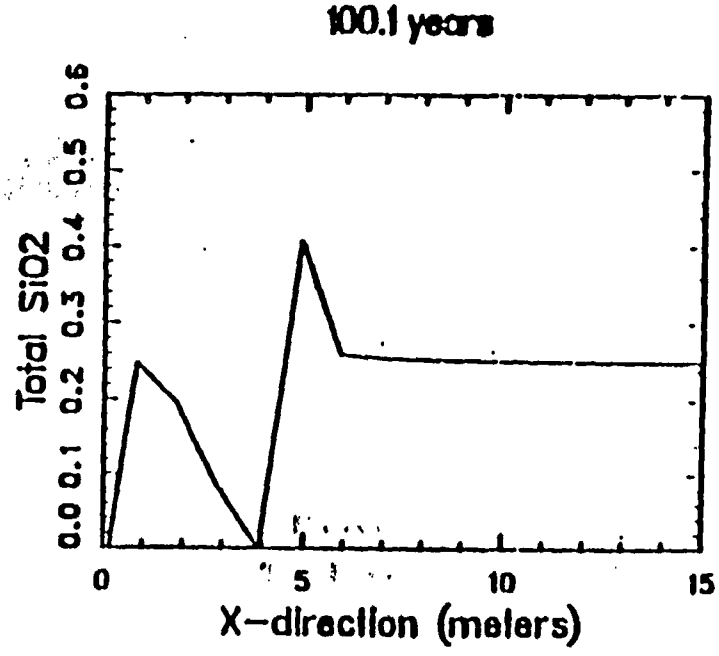
- Column experiments have yielded a rapidly moving fraction (~1%) of sorbing tracers that may require a colloidal explanation, eg. anomolies in break through curves indicate that Am behaves like a colloidal material.

Coupled Hydrothermal Transport Processes Near a Horizontally Emplaced Waste Package



Coupled Hydrothermal and Transport Calculations

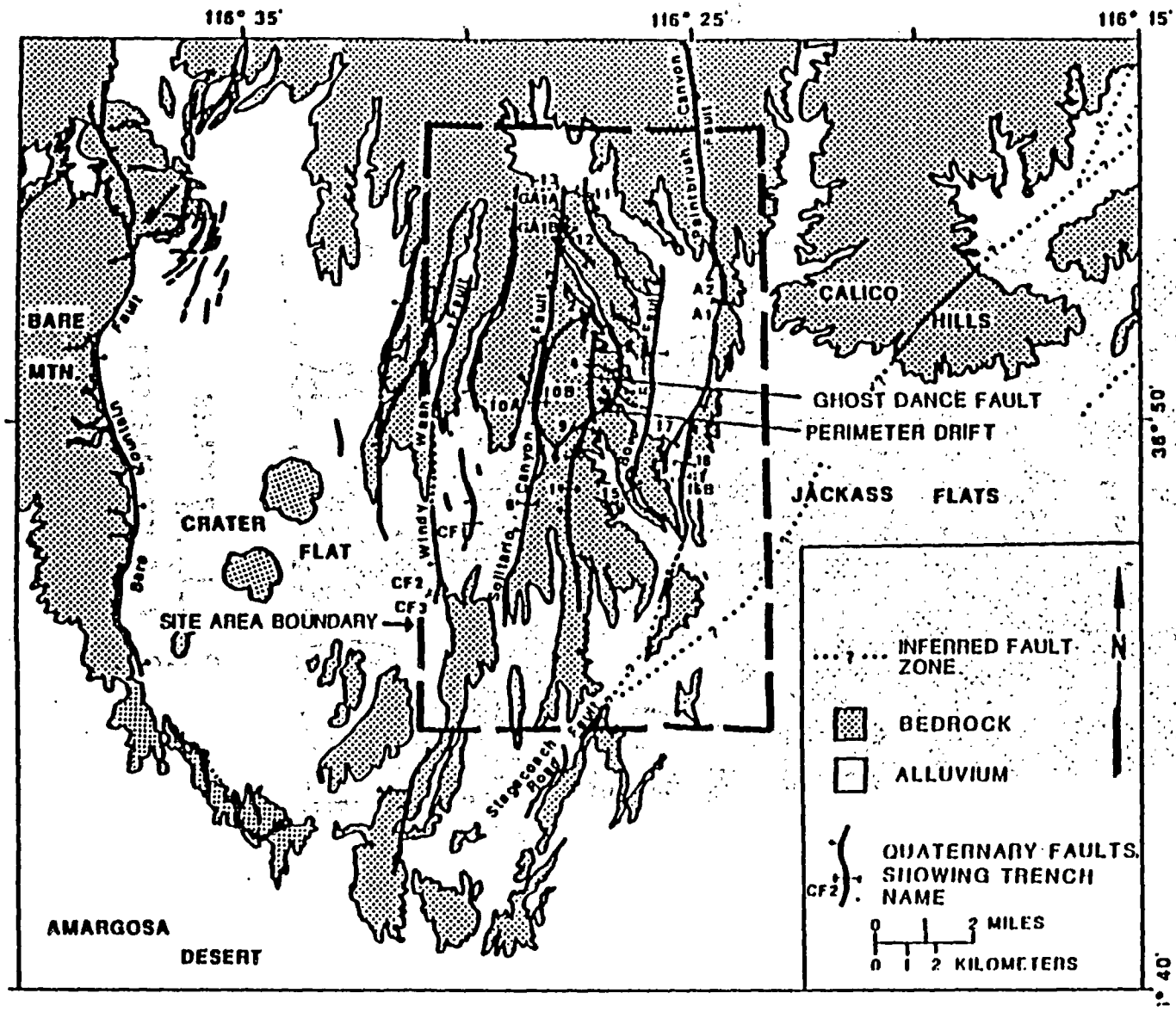


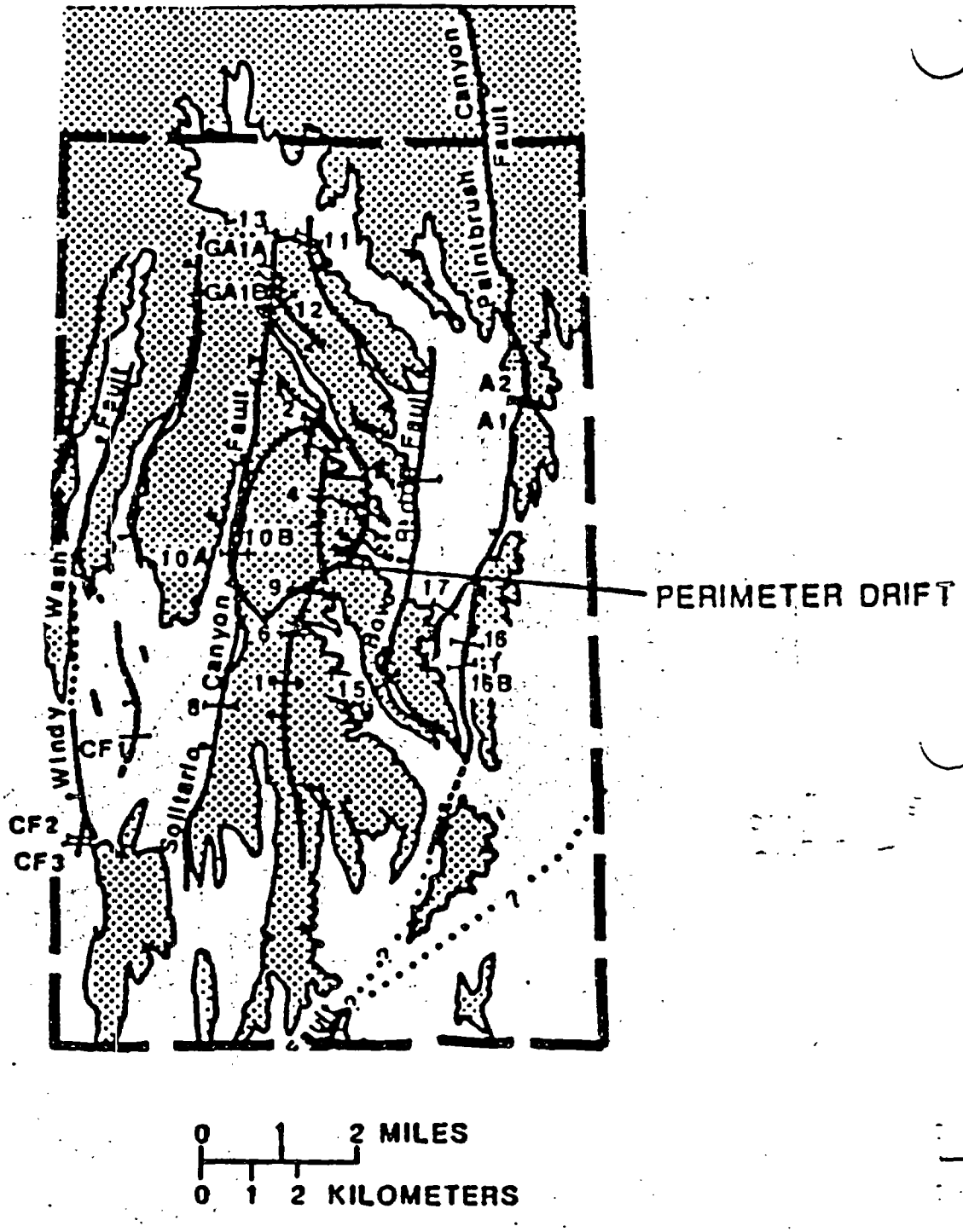


TECTONICS

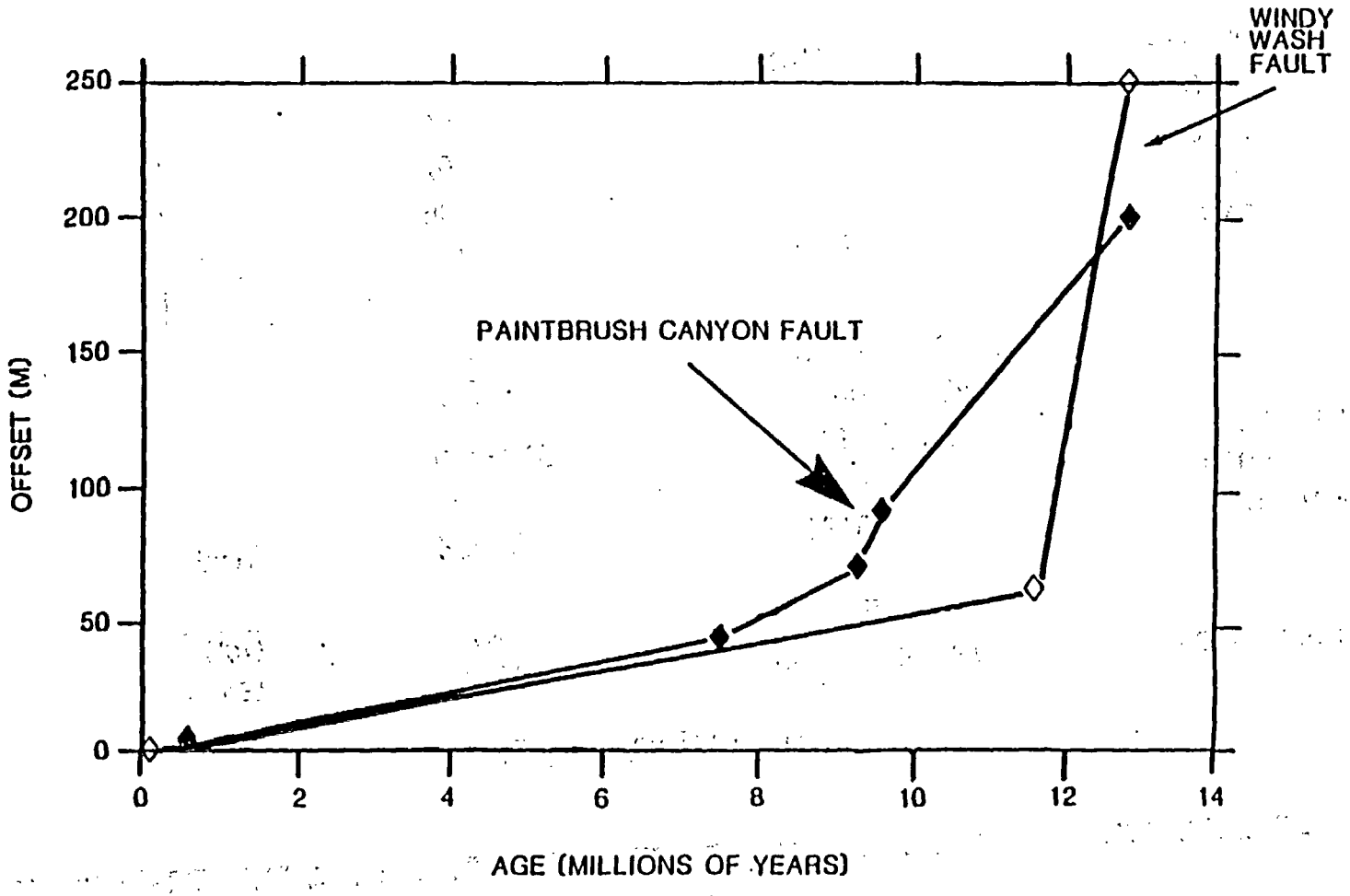
T. GRANT

J. FRAZIER


116° 35'
116° 25'
116° 15'
36° 50'
36° 40'
BARE
MTN
CRATER
FLAT
SITE AREA BOUNDARY
AMARGOSA
DESERT
CALICO
HILLS
JACKASS
FLATS
GHOST DANCE FAULT
PERIMETER DRIFT
Windy Wash Fault
Solitaire Canyon Fault
Paintbrush Canyon Fault
Stagecoach Road Fault
Bare Mtn Fault
CF1
CF2
CF3
GA1A
GA1B
10A
10B
A1
A2
INFERRED FAULT ZONE
BEDROCK
ALLUVIUM
QUATERNARY FAULTS SHOWING TRENCH NAME
0 1 2 MILES
0 1 2 KILOMETERS
N

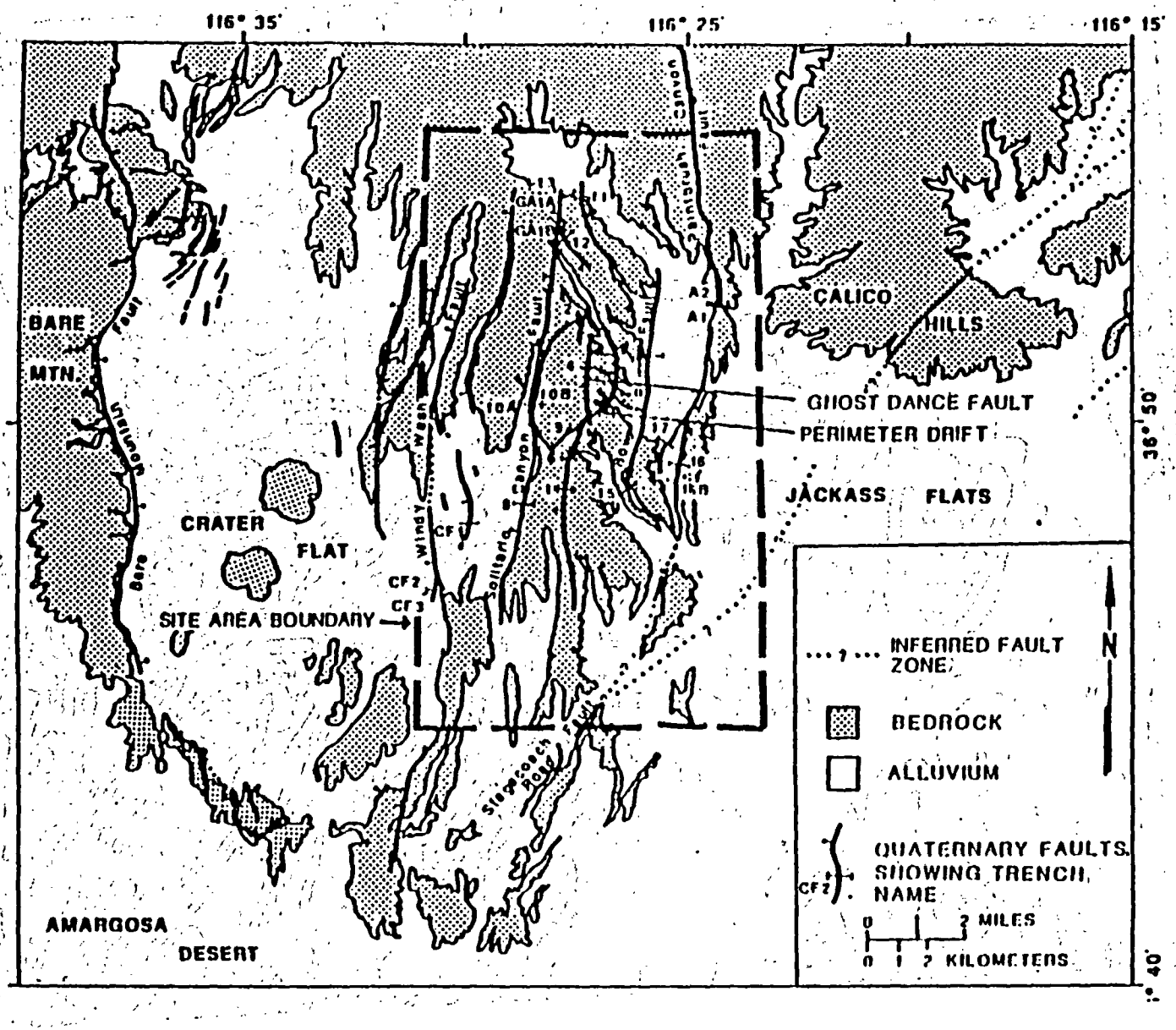

PERIMETER DRIFT
Paintbrush Canyon Fault
Solitario Canyon Fault
Windy Wash Fault
Bow Ridge Fault
13
GA1A
GA1B
11
12
2
A2
A1
4
10B
10
9
17
6
16
16B
15
8
CF1
CF2
CF3
0 1 2 MILES
0 1 2 KILOMETERS

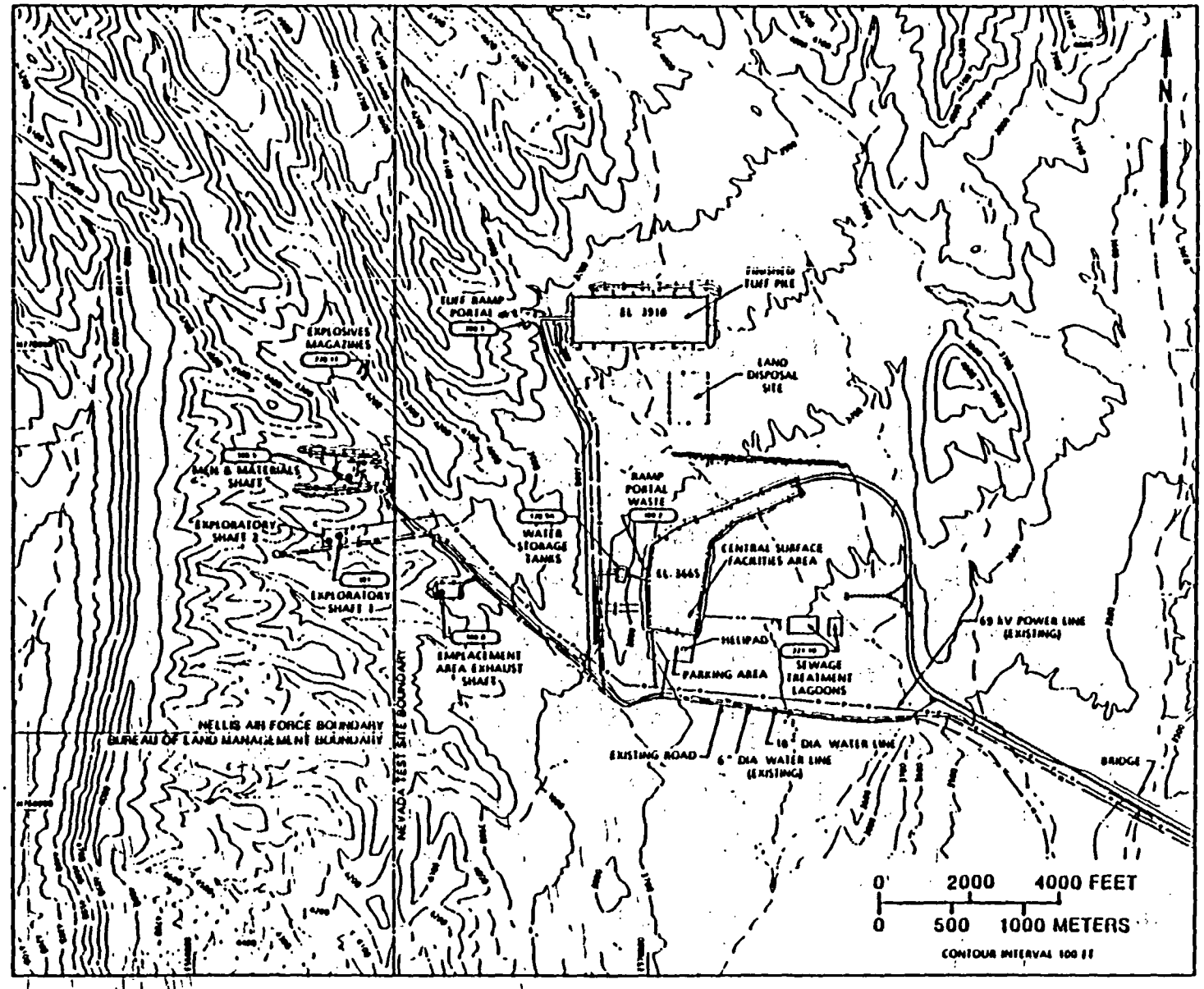
RATE OF DISPLACEMENT



FAULT CHARACTERISTICS

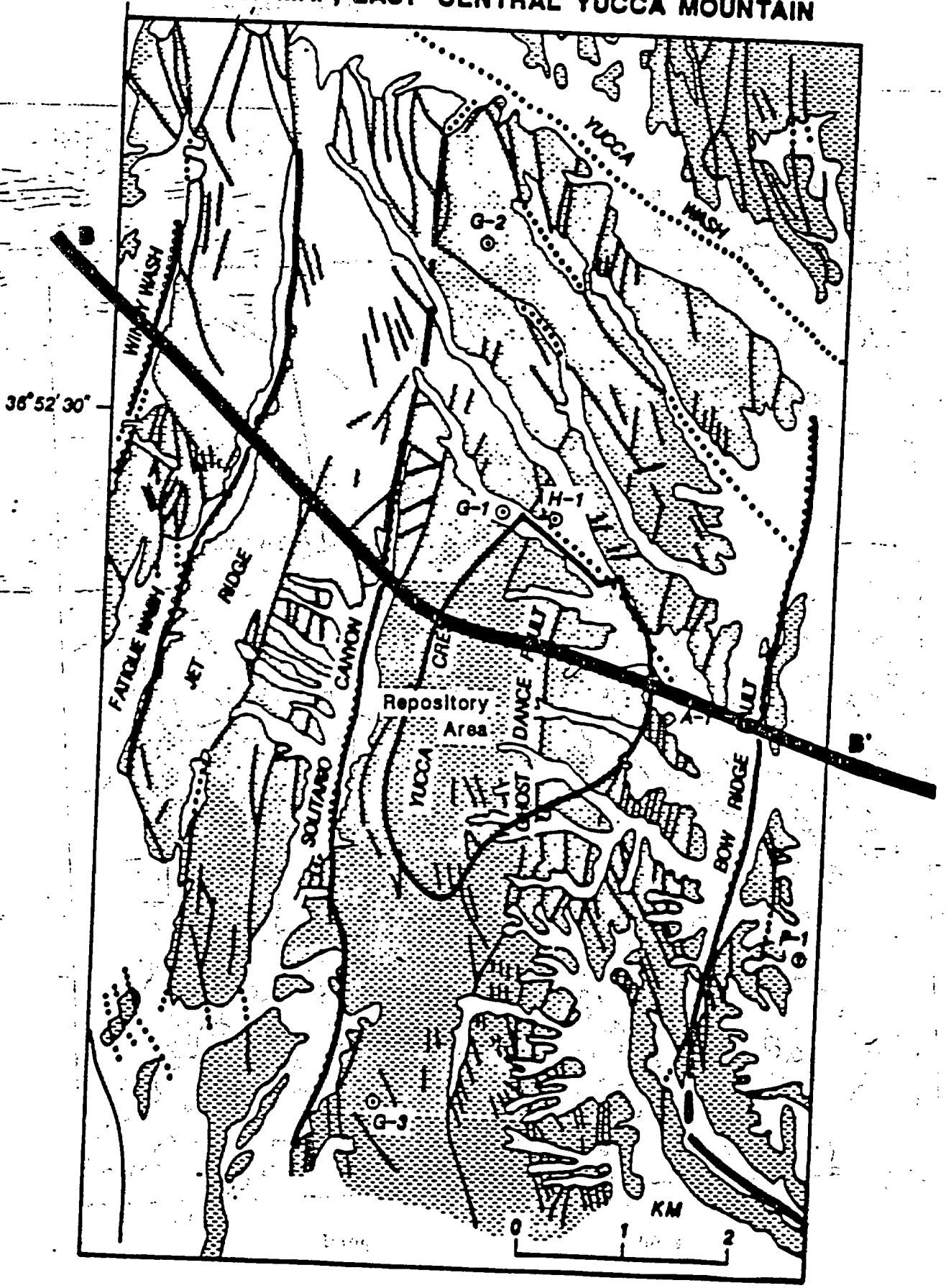
FAULT	LENGTH (KM)	OFFSET (M)	AGE OF OFFSET (MY)	AVERAGE SLIP RATE (MM/YR)
WINDY WASH	6-19	200-450	12.9	0.10-0.30
		60	11.6	0.005
		0.4-0.6	0.19-0.27	0.001-0.003
		0.2	0.005-0.040	-
		<0.1	0.003-0.0065	-
PAINTBRUSH CANYON	17-31	200	12.9	0.03
		90	9.6	0.06
		70	9.3	0.01
		45	7.5	0.006
		4.1	<0.7	~0.008
		2.1	-	-

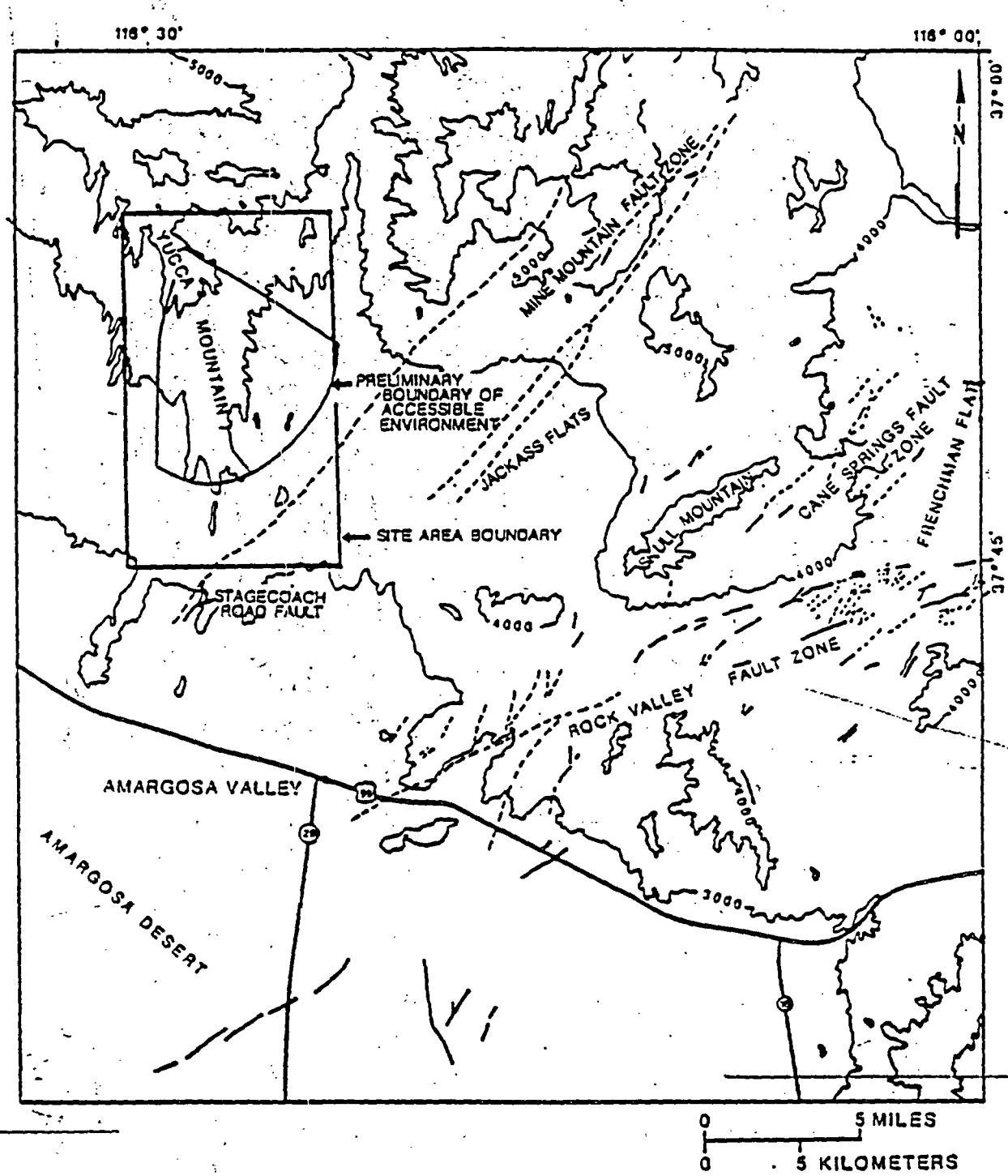

116° 35'
116° 25'
116° 15'
36° 50'
36° 40'
BARE
MTN.
CRATER
FLAT
SITE AREA BOUNDARY
AMARGOSA
DESERT
CALICO
HILLS
JACKASS
FLATS
GHOST DANCE FAULT
PERIMETER DRIFT
INFERRED FAULT ZONE
BEDROCK
ALLUVIUM
QUATERNARY FAULTS SHOWING TRENCH NAME
0 1 2 MILES
0 1 2 KILOMETERS
N


N
EXPLOSIVES MAGAZINES
MAIN & MATERIALS SHAFT
EXPLORATORY SHAFT 2
EXPLORATORY SHAFT 1
EMPLACEMENT AREA EXHAUST SHAFT
NELLIS AIR FORCE BOUNDARY
BUREAU OF LAND MANAGEMENT BOUNDARY
NEVADA TEST SITE BOUNDARY
WATER STORAGE TANKS
RAMP PORTAL WASTE
EL. 3665
CENTRAL SURFACE FACILITIES AREA
HELIPAD
PARKING AREA
SEWAGE TREATMENT LAGOONS
LAND DISPOSAL SITE
EXISTING ROAD
6" DIA WATER LINE (EXISTING)
10" DIA WATER LINE
69 kV POWER LINE (EXISTING)
BRIDGE
0' 2000 4000 FEET
0 500 1000 METERS
CONTOUR INTERVAL 100 FT

116°30'

FAULT MAP, EAST-CENTRAL YUCCA MOUNTAIN





Map showing relation of proposed repository area to Mine Mountain, Cane Spring, Rock Valley, and Stagecoach Road fault zones.

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PROJECT INTERACTIONS WITH TECTONICS

PROJECT COMPONENTS

PRECLOSURE OPERATIONS
- SURFACE WASTE HANDLING FACILITIES
- UNDERGROUND FACILITIES
- AREA OF WASTE STORAGE

POSTCLOSURE PERIOD
- AREA OF WASTE STORAGE
- CONTROLLED AREA +0.5 KM

TECTONIC ACTIVITY

VOLCANIC ACTIVITY
- ASHFALL
- INTRUSION/ERUPTION

FAULT DISPLACEMENT

STRAIN DEFORMATIONS

VIBRATORY GROUND MOTIONS

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SELECTED TECHNICAL CONCERNS FOR TECTONICS

TECHNICAL CONCERNS	PROPOSED GOALS
VOLCANIC ERUPTION THROUGH AREA OF WASTE STORAGE	PROB. $< 10^{-6}$/YR
FAULT DISPLACEMENT AT:	
- SURFACE WASTE HANDLING FACILITIES	PROB. OF 5 CM $< 10^{-4}$/YR
- AREA OF WASTE STORAGE	PROB. OF 5 CM $< 10^{-4}$/YR
GROUND MOTIONS AT SURFACE WASTE HANDLING FACILITIES	PROB. OF EXCEEDING DESIGN BASIS $< 10^{-3}$/YR
CHANGES TO HYDROLOGIC CONDITIONS	PROB. OF 100 M RISE IN WATER TABLE $< 10^{-5}$/YR
	CHANGES IN ROCK CONDUCTIVITY OR FRACTURE PERMEABILITY < FACTOR OF 2

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FAULT DISPLACEMENT AT WASTE HANDLING FACILITIES

CHARACTERIZATION PROCEDURES	CURRENT STATUS
1. ID SIGNIFICANT FAULTS WITHIN 100 M - NO MOVEMENT WITHIN 100,000 YRS - QUATERNARY SLIP RATE < 0.001 MM/YR	NONE KNOWN
2. ID POTENTIALLY SIFNIFICANT QUATERNARY WITHIN 5 KM	3 KNOWN
3. ESTIMATE ANNUAL PROBABILITY FOR EXCEEDING 5 CM	$< 10^{-4}$/YR

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VIBRATORY GROUND MOTIONS AT WASTE HANDLING FACILITIES

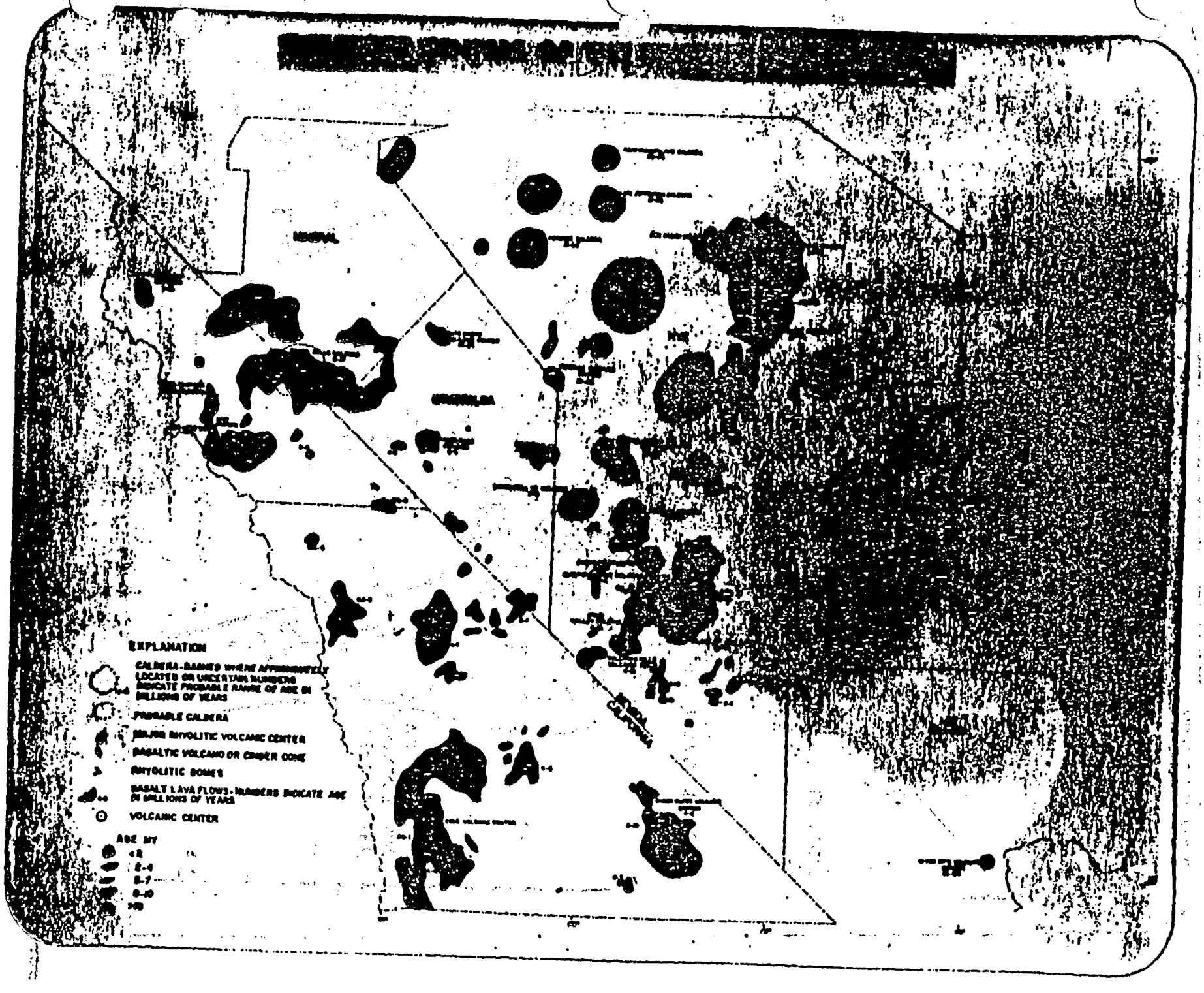
CHARACTERIZATION PROCEDURES	CURRENT STATUS
1. IDENTIFY SEISMOGENIC SOURCES	LOCAL FAULTS CONTROL
2. DETERMINE EXCEPTIONAL EARTHQUAKES	MODERATE EARTHQUAKE
3. DETERMINE ATTENUATION RELATIONS	PUBLISHED USING CALIFORNIA DATA
4. ADD EFFECTS OF LOCAL GEOLOGY	LIMITED UNE RECORDINGS
5. DEVELOP TIME HISTORIES/SPECTRA	DESIGN BASIS 0.4 - 0.6 G
6. DETERMINE MOTIONS FOR UNEs	< NATURAL EARTHQUAKES
7. ESTIMATE PROB. FOR EXCEEDING DESIGN	0.4 G < 10^{-3}/YR

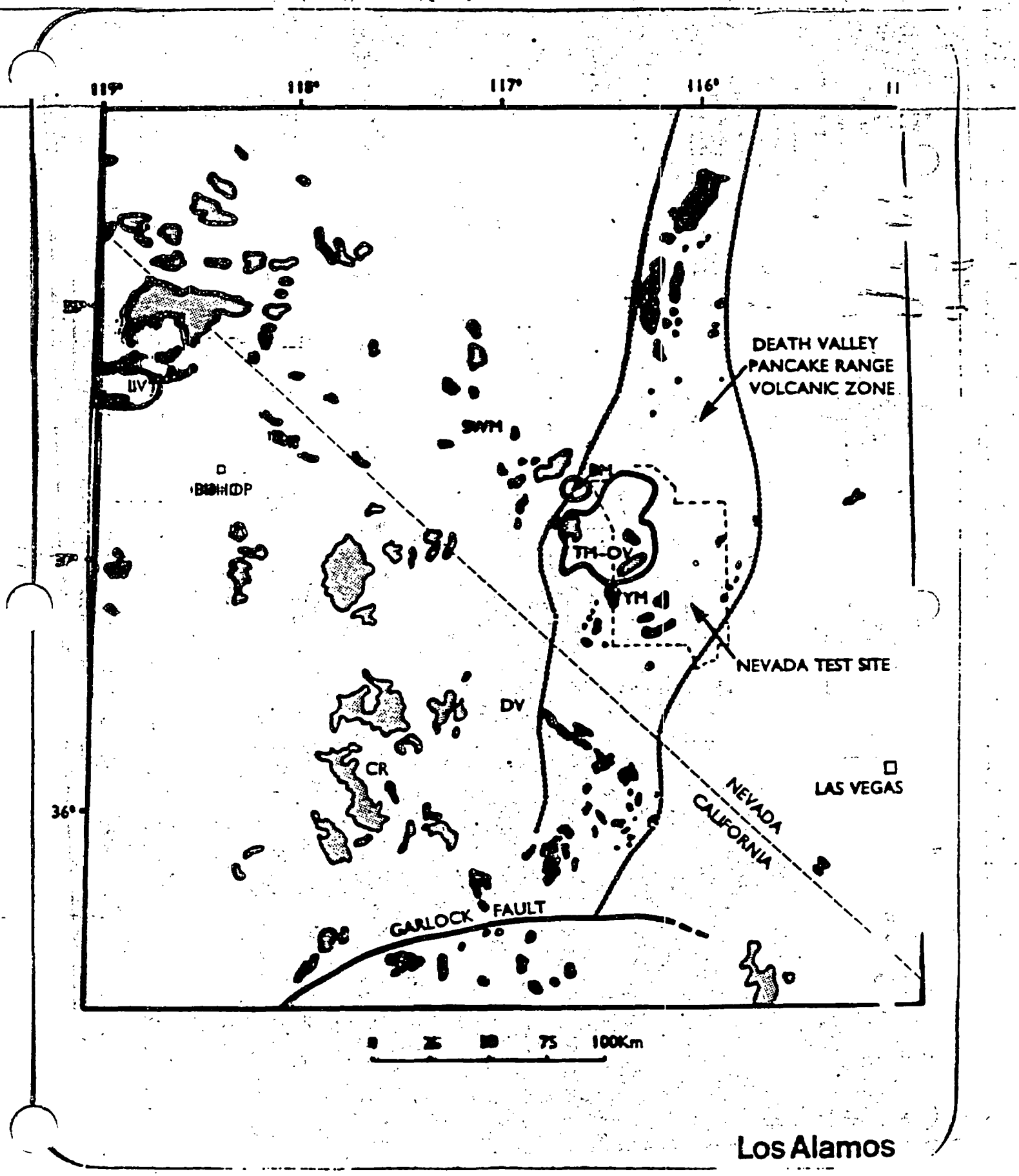
KEY TECHNICAL NEEDS FOR TECTONICS

- LOCAL QUATERNARY FAULTS (< 10 KM)
  - EXTENT, GEOMETRY, DATED OFFSETS, COMPLETENESS
- SEISMOGENIC CAPABILITIES
  - EARTHQUAKE RECURRENCE, MAX. MAGNITUDE
- FAULTING POTENTIAL
  - SYMPATHETIC SLIP, GEOLOGIC STABILITY, PROBABILITIES
- VIBRATORY GROUND MOTIONS
  - REPRESENTATIVE TIME HISTORIES, MAGNITUDE - DISTANCE ATTENUATION, PROBABILITIES
- TECTONIC-HYDROLOGIC INTERACTIONS

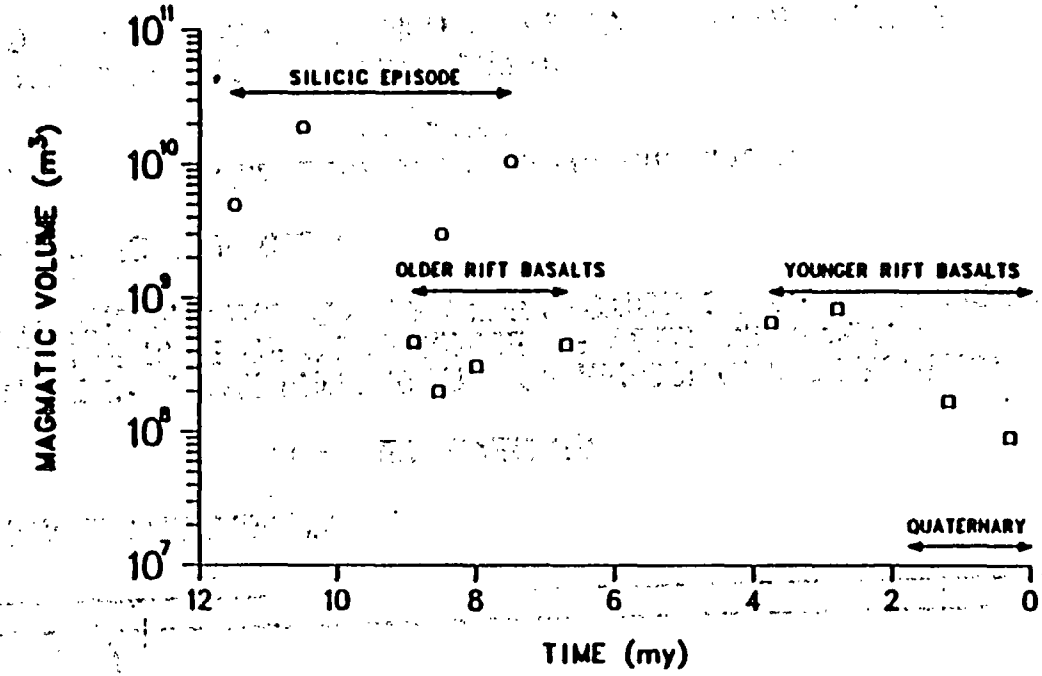
VOLCANISM

B. CROWE


EXPLANATION
CALDERA-DASHED WHERE APPROXIMATELY LOCATED OR UNCERTAIN. NUMBERS INDICATE PROBABLE RANGE OF AGE IN BILLIONS OF YEARS
PROBABLE CALDERA
MAJOR RHYOLITIC VOLCANIC CENTER
BASALTIC VOLCANO OR CINDER CONE
RHYOLITIC DOMES
BASALT LAVA FLOWS-NUMBERS INDICATE AGE IN MILLIONS OF YEARS
VOLCANIC CENTER
AGE MY
<2
2-4
5-7
8-10
>10


119°
118°
117°
116°
37°
36°
DEATH VALLEY
PANCAKE RANGE
VOLCANIC ZONE
NEVADA TEST SITE
LAS VEGAS
NEVADA
CALIFORNIA
GARLOCK FAULT
DV
CR
TM-OV
YM
SWM
BIGHORN
LIV
0
25
50
75
100Km

Los Alamos


SILICIC EPISODE
OLDER RIFT BASALTS
YOUNGER RIFT BASALTS
QUATERNARY
MAGMATIC VOLUME (m³)
10¹¹
10¹⁰
10⁹
10⁸
10⁷
12
10
8
6
4
2
0
TIME (my)

PROBABILITY CALCULATIONS

CONDITIONAL PROBABILITY

Pr = (E2 GIVEN E1)

WHERE Pr IS THE PROBABILITY OF REPOSITORY DISRUPTION
E1 IS THE RATE OF OCCURRENCE OF VOLCANIC EVENTS
E2 IS THE PROBABILITY OF INTERSECTION OF A REPOSITORY GIVEN E1

PROBABILITY FORMULATION

Pr(no disruptive event before time t)
$= \exp^{(-\lambda t p)}$

WHERE λ = THE RATE PARAMETER
AND p = THE PROBABILITY THE EVENT IS DISRUPTIVE

RATE PARAMETER (λ)

-- CONE COUNTS/TIME
-- RATE OF MAGMA GENERATION

DISRUPTION PARAMETER (p)

-- a/A
-- FOR YUCCA MOUNTAIN
AREA OF THE REPOSITORY / AREA OF RATE CALCULATION

PROBABILITY CALCULATIONS (CONT)

AREA OF RATE CALCULATION

- -- MINIMUM AREA CIRCLE AND MINIMUM AREA ELLIPSE
- -- ENCLOSES VOLCANIC CENTERS AND REPOSITORY
- -- STRUCTURAL SETTING OF VOLCANIC CENTERS

PROBABILITY CALCULATIONS ARE ASSEMBLED AS A MATRIX

- -- TWO RATE DETERMINATIONS
- -- TWO AREA RATIOS
- -- MAXIMUM AND MINIMUM VALUES DEFINE PROBABILITY RANGE
- -- INDIVIDUAL VALUES NOT EMPHASIZED

→ YUCCA MOUNTAIN CALCULATIONS: 10^{-8} TO 10^{-10} YEAR^{-1}

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CONSEQUENCE ANALYSIS (LOGAN ET AL., 1982)

Los Alamos

1. INTRUSION OF BASALT MAGMA THROUGH A REPOSITORY
   - -- SURFACE ERUPTION (STROMBOLIAN)
   - -- FED BY LINEAR DIKES
   - -- BASALT PARAMETERS FROM FIELD STUDIES
2. WASTE DISPERSAL ASSUMED TO FOLLOW PATTERNS OF LITHIC FRAGMENTS
   - -- 15-20 PERCENT DEPOSITED IN SCORIA CONE
   - -- 50 TO 80 PERCENT DEPOSITED IN SCORIA-FALL SHEET
   - -- 2 TO 5 PERCENT REGIONALLY DISPERSED
3. RELEASE CALCULATIONS FOR TWO HYPOTHETICAL REPOSITORIES
   - -- UNREPROCESSED SPENT FUEL
   - -- REPROCESSED WASTE
   - -- REPOSITORY AREA OF 1640 M^2, 10 YR OLD WASTE
   - -- RANDOM DIKE ORIENTATION (INVENTORY FRACTION OF 8×10^{-5})
   - -- ALL CONTACTED WASTE CARRIED TO THE SURFACE
4. DOSE CALCULATIONS
   - -- DOSE FROM WASTE IN THE ERUPTION COLUMN
   - -- DOSE FROM WASTE-BEARING SCORIA DEPOSITS
   - -- TOTAL ACTIVITY TRANSPORTED TO THE SURFACE
5. RECALULATED FOR HYDROVOLCANIC ERUPTION COMPONENT

NEW TOPICS REQUIRING REVISION OF PROBABILITY CALCULATIONS

AEROMAGNETIC ANOMALIES

- -- PROBABLY BURIED BASALT CENTERS
- -- REQUIRE INFORMATION FOR RATE CALCULATIONS

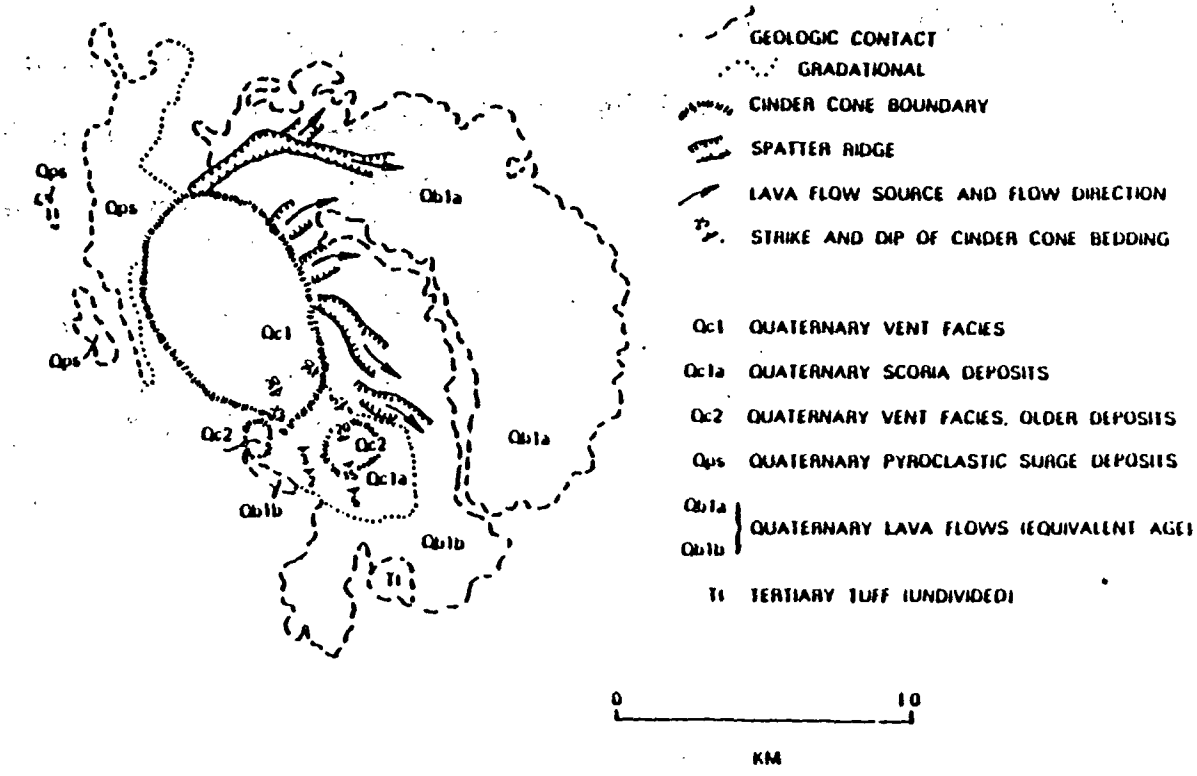
AGE OF THE LATHROP WELLS VOLCANIC CENTER

- -- NEW EVIDENCE SUGGESTS CONE MAY BE 20,000 YEARS
- -- EVIDENCE FOR POLYCYCLIC VOLCANISM

TIME-SPACE MODEL FOR DISTRIBUTION OF BASALTIC CENTERS

- -- SUGGEST YUCCA MOUNTAIN AREA PAST PEAK OF VOLCANIC ACTIVITY

→ FOCUS ON YOUNGEST VOLCANIC ACTIVITY
→ AGE DATING TECHNIQUES


Qps
Qps
Qps
Qb1a
Qc1
Qc2
Qc2
Qc1a
Qb1a
Qb1b
Qb1b
Tt
GEOLOGIC CONTACT
GRADATIONAL
CINDER CONE BOUNDARY
SPATTER RIDGE
LAVA FLOW SOURCE AND FLOW DIRECTION
STRIKE AND DIP OF CINDER CONE BEDDING
Qc1 QUATERNARY VENT FACIES
Qc1a QUATERNARY SCORIA DEPOSITS
Qc2 QUATERNARY VENT FACIES, OLDER DEPOSITS
Qps QUATERNARY PYROCLASTIC SURGE DEPOSITS
Qb1a
Qb1b
QUATERNARY LAVA FLOWS (EQUIVALENT AGE)
Tt TERTIARY TUFF (UNDIVIDED)
0
10
KM

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AGE CONSTRAINTS AND UNCERTAINTY LATHROP WELLS SCORIA CONE

Los Alamos

1. CONE DEGRADATION PARAMETERS
   - -- CONSISTENT WITH AN AGE OF LESS THAN 20,000 YEARS
   - -- BEST MATCH 15,000 YEAR OLD CONE, CIMA VOLCANIC FIELD
2. SOIL DEVELOPMENT
   - -- ANALYSES NOT COMPLETED
   - -- PROFILES CONSISTENT WITH AGE OF LESS THAN 20,000 YEARS
3. DESERT VARNISH
   - -- NOT CALIBRATED FOR CONE
   - -- ANGULAR, Ti-Cr BEARING MAGNETITE CRYSTALS
   - -- SUGGESTIVE OF RECENT ERUPTION
   - -- POSITION IN VARNISH CONSISTENT WITH YOUNG AGE
4. ^{14}C AGE OF 19,900 PLUS/MINUS 300 CARBON YEARS
   - -- TECHNIQUE NOT WELL ESTABLISHED
5. CONCLUSIONS
   - -- AGE AND DETAILED CHRONOLOGY NOT RESOLVED
   - -- CURRENT DATA ARE CONSISTENT WITH AGE OF 20,000 YEARS
   - -- PROBLEM MUST BE CAREFULLY EVALUATED FOR RISK ASSESSMENT

REQUIRED STUDIES (CONT)

EXPERIMENTAL MEASUREMENTS
CRYSTALLIZATION AGE OR SURFACE EXPOSURE AGE
DUAL LABORATORY MEASUREMENTS FOR COMPARISON

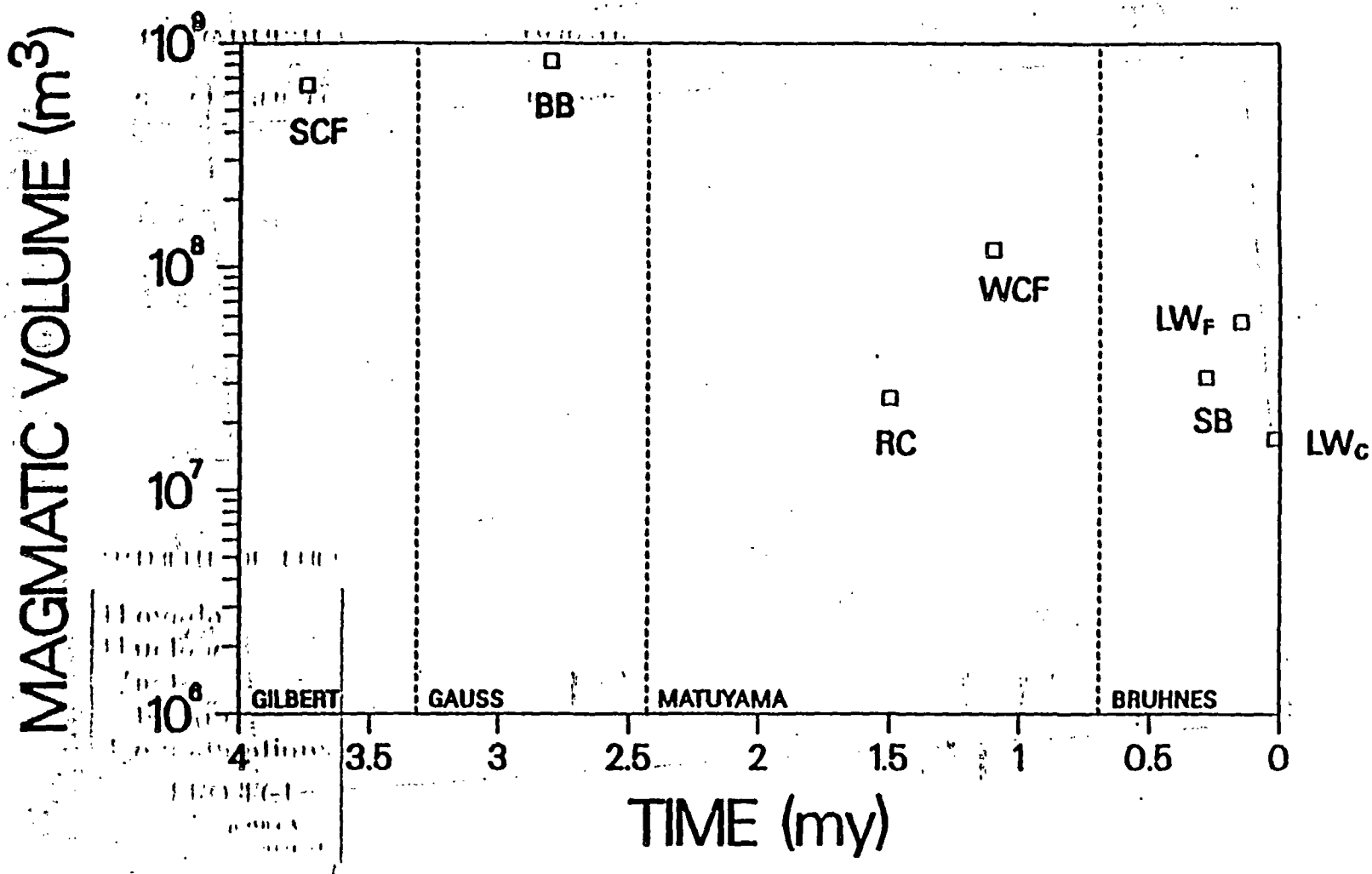
1. ^{3}He AGES (SURFACE EXPOSURE AGE)
   - -- NEAR-SURFACE COSMOGENIC PRODUCTION OF ^{3}He
   - -- REQUIRES CALIBRATION OF PRODUCTION RATES
   - -- MEASUREMENTS AT TWO LABORATORIES
     - LOS ALAMOS
     - BERKELEY

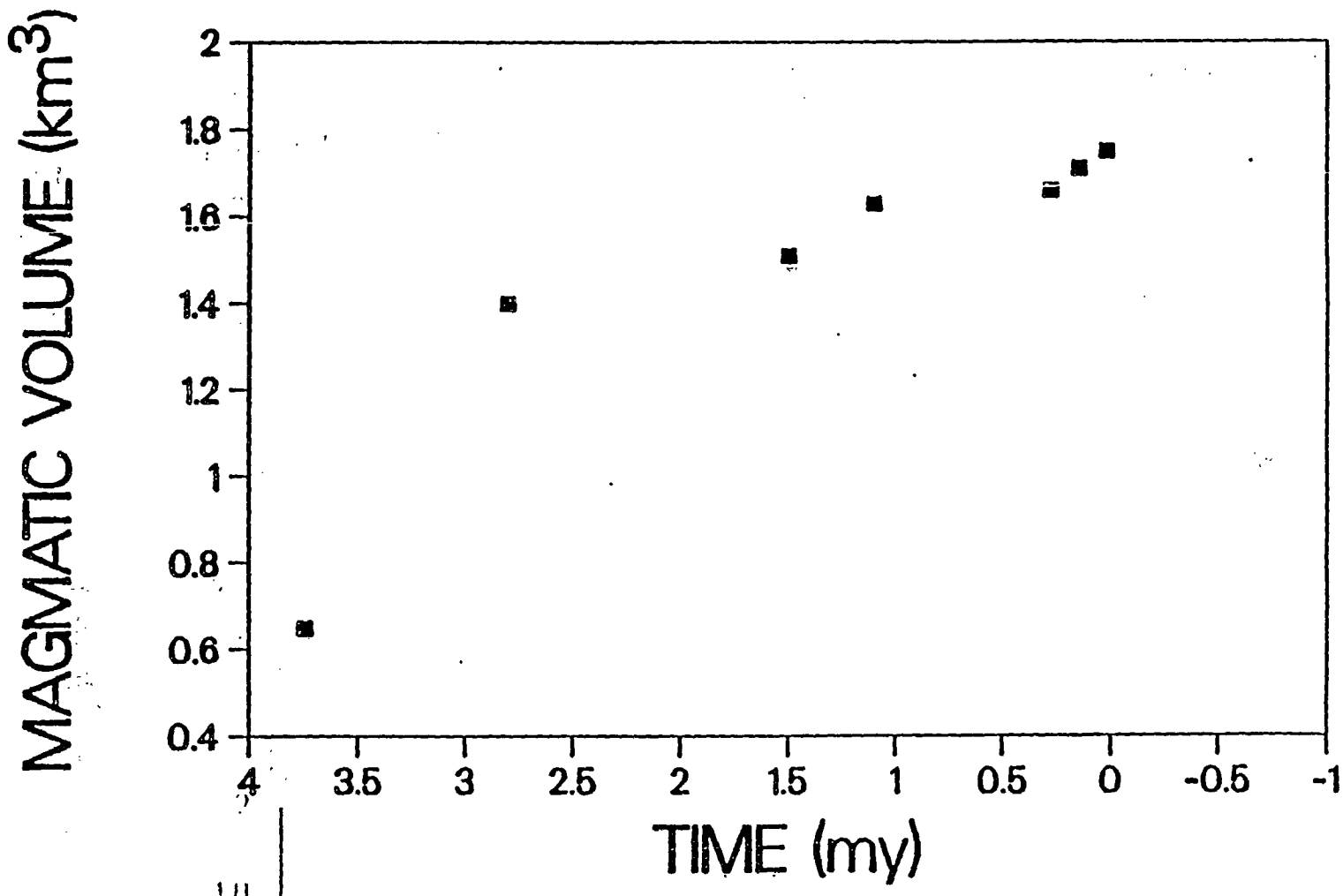
2. ^{36}Cl (SURFACE EXPOSURE AGE)
   - -- COSMOGENIC PRODUCTION OF ^{36}Cl
   - -- NM TECH PhD STUDENT (NOT NNWSI FUNDED)

3. U-Th DISEQUILIBRIUM
   - -- 75,000 HALF-LIFE
   - -- GIVES CRYSTALLIZATION AGE
   - -- MEASUREMENTS AT TWO LABORATORIES
     - LOS ALAMOS (MASS SPEC)
     - USGS (CONVENTIONAL COUNTING)

4. VARNISH DATING TECHNIQUES

5. MAGNETIC POLE POSITIONS


MAGMATIC VOLUME (m3)
10^9
10^8
10^7
10^6
SCF
BB
WCF
RC
LWF
SB
LWC
GILBERT
GAUSS
MATUYAMA
BRUHNES
4
3.5
3
2.5
2
1.5
1
0.5
0
TIME (my)


MAGMATIC VOLUME (km3)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
TIME (my)

POTENTIAL FOR HYDROTHERMAL ACTIVITY

J. STUCKLESS
S. MATTSON

U.S. DEPARTMENT OF ENERGY
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Nevada Nuclear Waste Storage Investigations PROJECT
YUCCA MOUNTAIN
OGR

HYDROTHERMAL STUDIES INTRODUCTION

DATA ARE OBTAINED FROM:

1. **DIRECT THERMAL MEASUREMENTS**

2. **EXAMINATION OF HYDROTHERMAL DEPOSITS AND ALTERATION ASSEMBLAGES**

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HYDROTHERMAL STUDIES INTRODUCTION

- HYDROTHERMAL DEPOSITS ARE ONE TYPE OF HYDROGENIC DEPOSIT
- HYDROTHERMAL DEPOSITS ARE INVESTIGATED UNDER THIS ACTIVITY UNTIL TEMPERATURE OF DEPOSITION IS ESTABLISHED
- THIS PRESENTATION WILL CONCENTRATE ON HYDROGENIC DEPOSITS

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STATEMENT OF PROBLEM

1. DO ANY HYDROGENIC DEPOSITS OR HYDROTHERMAL DATA HAVE SIGNIFICANT IMPLICATIONS FOR REPOSITORY PERFORMANCE?

   A) STABILITY OF WASTE PACKAGE?

   B) TRAVEL TIME TO BIOSPHERE?

2. DO ANY HYDROGENIC DEPOSITS HAVE POTENTIAL ECONOMIC IMPLICATIONS?

HYDROGENIC DEPOSITS

1. MINERALS AND MINERALOIDS PRECIPITATED FROM WATER

2. TYPES IDENTIFIED AROUND YUCCA MOUNTAIN:
   - A. CALCITE AND OPALINE SILICA
   - B. SILICA-CEMENTED BRECCIA
   - C. DRUSY QUARTZ AND OTHER RUG FILLINGS

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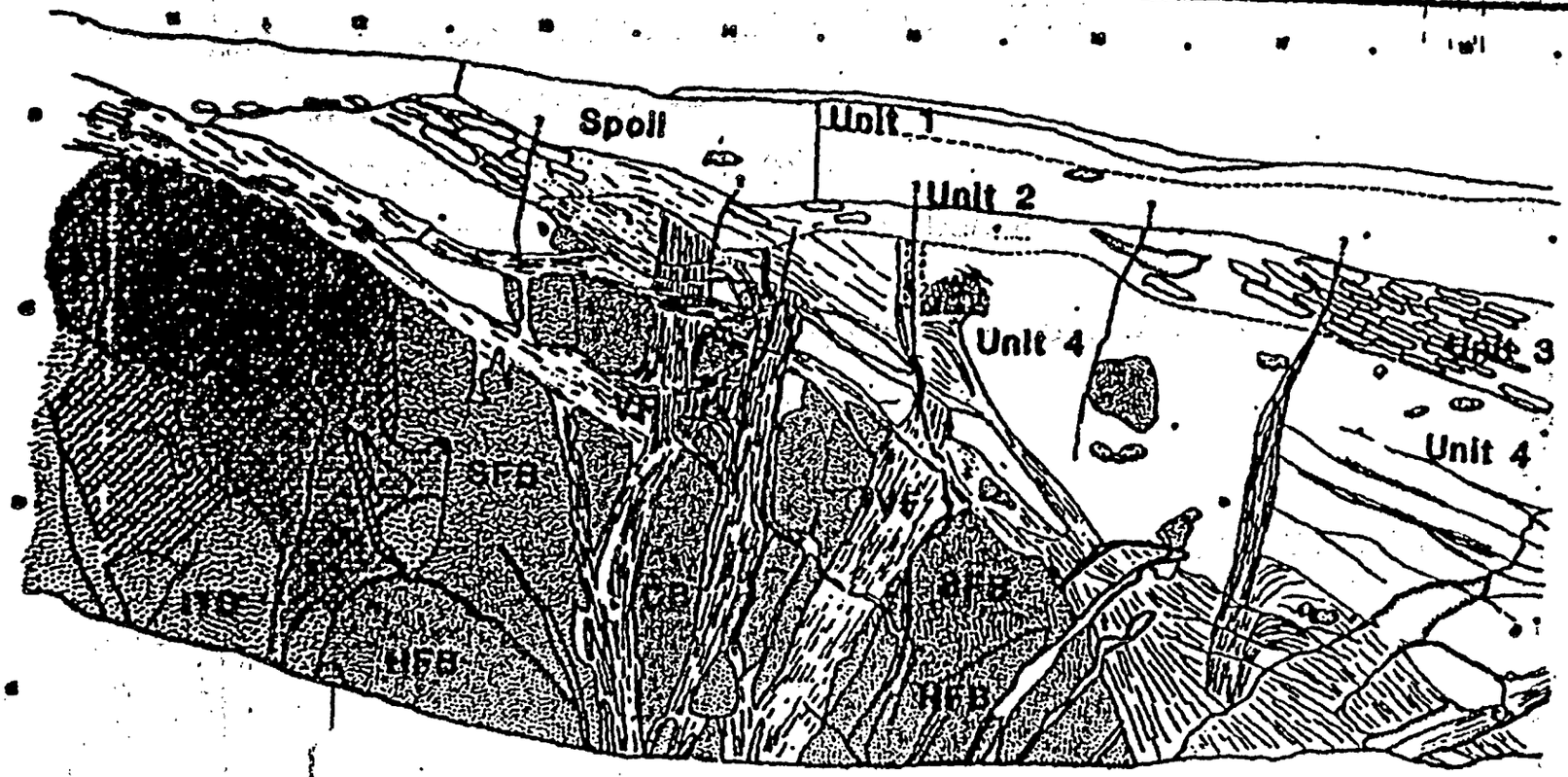
TRENCH 14

Current Status

U.S. DEPARTMENT OF THE INTERIOR · GEOLOGICAL SURVEY



MAP OF SOUTH WALL OF TRENCH 14

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MODES OF ORIGIN FOR HYDROGENIC DEPOSITS

U.S. DEPARTMENT OF THE INTERIOR · GEOLOGICAL SURVEY

1. Pedogenic : Deposited by meteoric waters as part of the soil-forming process.

2. Cold springs : Ground water of deep or shallow origin moved along fractures.

3. Hydrothermal springs : Water heated by any of several mechanisms & moved up fractures.

4. Seismic springs : Hot or cold waters moved along faults as a direct result of faulting.

TRENCH 14
Current Status

(CONTINUED)

1. Available data are consistent with a pedogenic origin for the calcite and opaline silica deposit.

2. Preliminary findings argue against high temperature origin for calcite and silica.
   a) Stable isotopes suggest ~15°C.
   b) Fine-grained texture suggests low T.
   c) No obvious alteration of wall rock.
   d) Opal types and occurrences are consistent with low T origin.

TRENCH 14
Current Status

(CONTINUED)

3. Low-temperature spring seems unlikely.
   a) Biota are not abundant.
   b) Opal occurrence is not consistent with low-temperature spring analogues.

4. Four ages for calcite and opal suggest deposition more than 400,000 years ago.

TRENCH 14
Current Status

(CONTINUED)

5. Silica-cemented breccias are probably older than calcite & opaline silica (based on field relations).
   - Depositional mechanism is currently unknown.

6. Drusy quartz is oldest hydrogenic deposit and may be syn-volcanic.
   - fluid-inclusion and isotope data suggest higher temperature of formation than for calcite and opaline silica.

SCIENTIFIC APPROACH

COORDINATED INTERDISCIPLINARY STUDIES

a) Field work

b) Mineralogy

c) Geochemistry

d) Fluid inclusions

e) Geochronology

f) Tracer isotopes

g) Stable isotopes

h) Paleontology

i) Hydrology

j) Data integration

Factors which influence the evaluation of the potential for hydrothermal activity at the site in the future.

- Past occurrences and recurrence intervals of hydrothermal activity
- Present thermal regime
- The potential for recurring volcanism/plutonism, tectonic activity, etc., at and near the site that could cause hydrothermal activity

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YUCCA MOUNTAIN

ALTERATION MINERALOGY AND AGE PALOEHYDROTHERMAL SYSTEM AT YUCCA MOUNTAIN BELOW 3000 FT

MINERALOGY

Clay minerals -	Interstratified illite/smectites with minor amounts of chlorite, kaolinite(?), and interstratified chlorite/smectite
Quartz -	Generally, in fractures and zeolitized tuff
Zeolite (Analcime) -	Greater than 500M in depth
Calcite -	Common in groundmass, fractures, and vugs

MINOR ALTERATION PHASES

Albite, fluorite, barite, hematite, manganese minerals, and disseminated pyrite

Temperature of Alteration:

Approximately 275°C ± 50°C in drillhole G-2 and 100°C ± 50°C in drillhole G-1.

- Mineralogical assemblage
- Fluid inclusions

Age: K/Ar dates on illites/smectites

10.9 ± 0.5 M yr.
11.0 ± 0.5 M yr.

Timber Mountain Tuff Age 11.3 ± 0.3

Alteration above 3000 Ft

- Sorptive zeolites (clinoptilolite and mordenite)
- Cristobalite
- Opal CT
- Plus minor phases (e.g., manganese mineral along fractures)

Processes - Authigenesis, vapor phase activity, burial diagenesis

PLANNED FUTURE WORK ON ALTERATION MINERALOGY

- Whole rock alteration and secondary mineralogy found in vugs, fractures, and veins.

- Includes X-ray diffraction, petrography, mineral chemistry, estimates of temperature (by stable isotope determinations, fluid inclusion homogeneation temperatures, and mineral and assemblage evaluation), and dating

- Dating techniques are limited
  - K-Ar dating of illites
  - U-series and U-trend techniques
  - Electron spin resonance (ESR) dating
    - quartz
    - calcite?
    - zeolite?

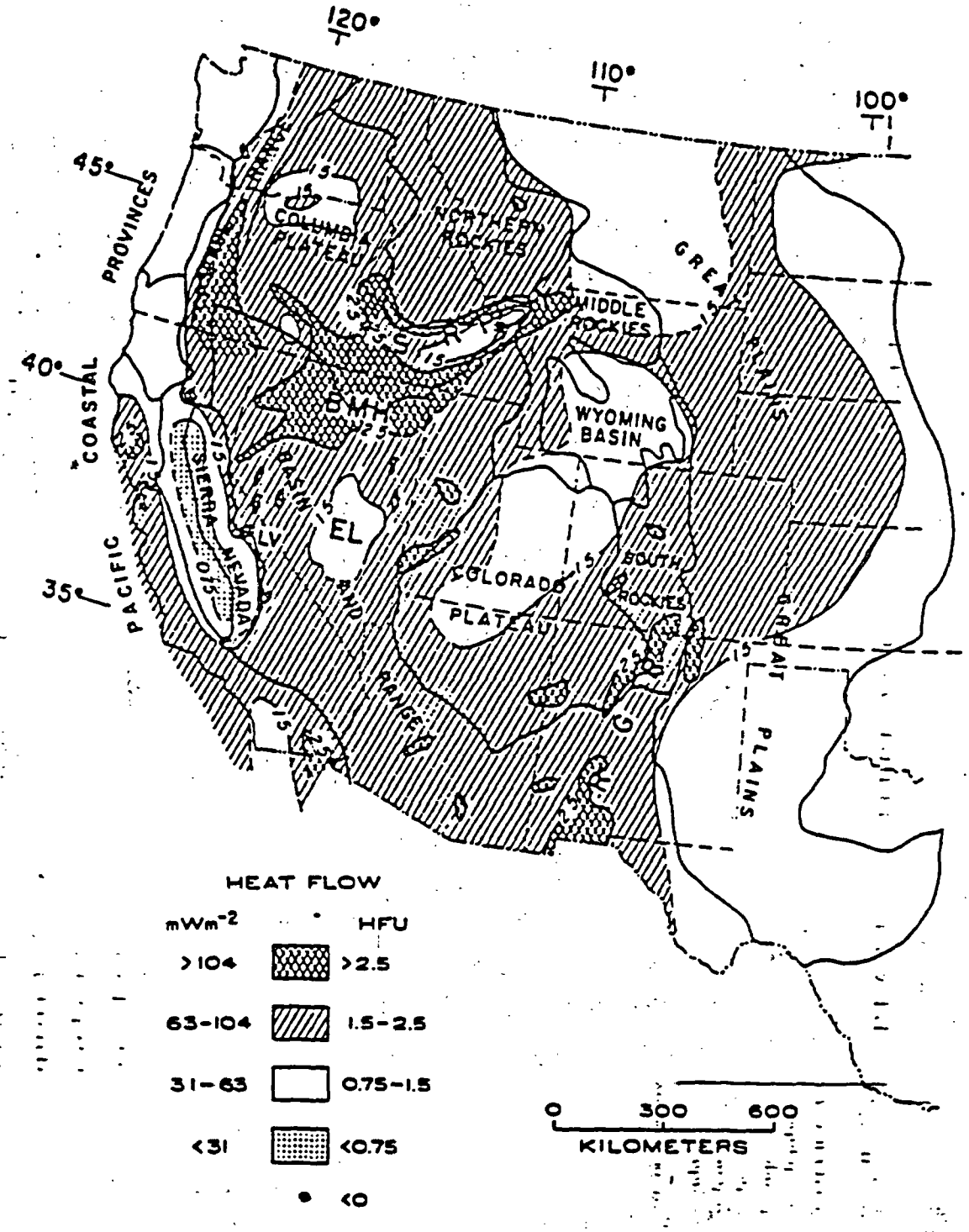

FIGURE 13.5. Map of the western United States showing heat-flow contours (in heat-flow units, HFU, 1 HFU = 41.8 mWm^{-2}), heat-flow provinces, and major physiographic divisions (SRP: Snake River Plain; BMH: Battle Mountain High; EL: Eureka Low; RGR: Rio Grande Rift Zone; Y: Yellowstone; LV: Long Valley).

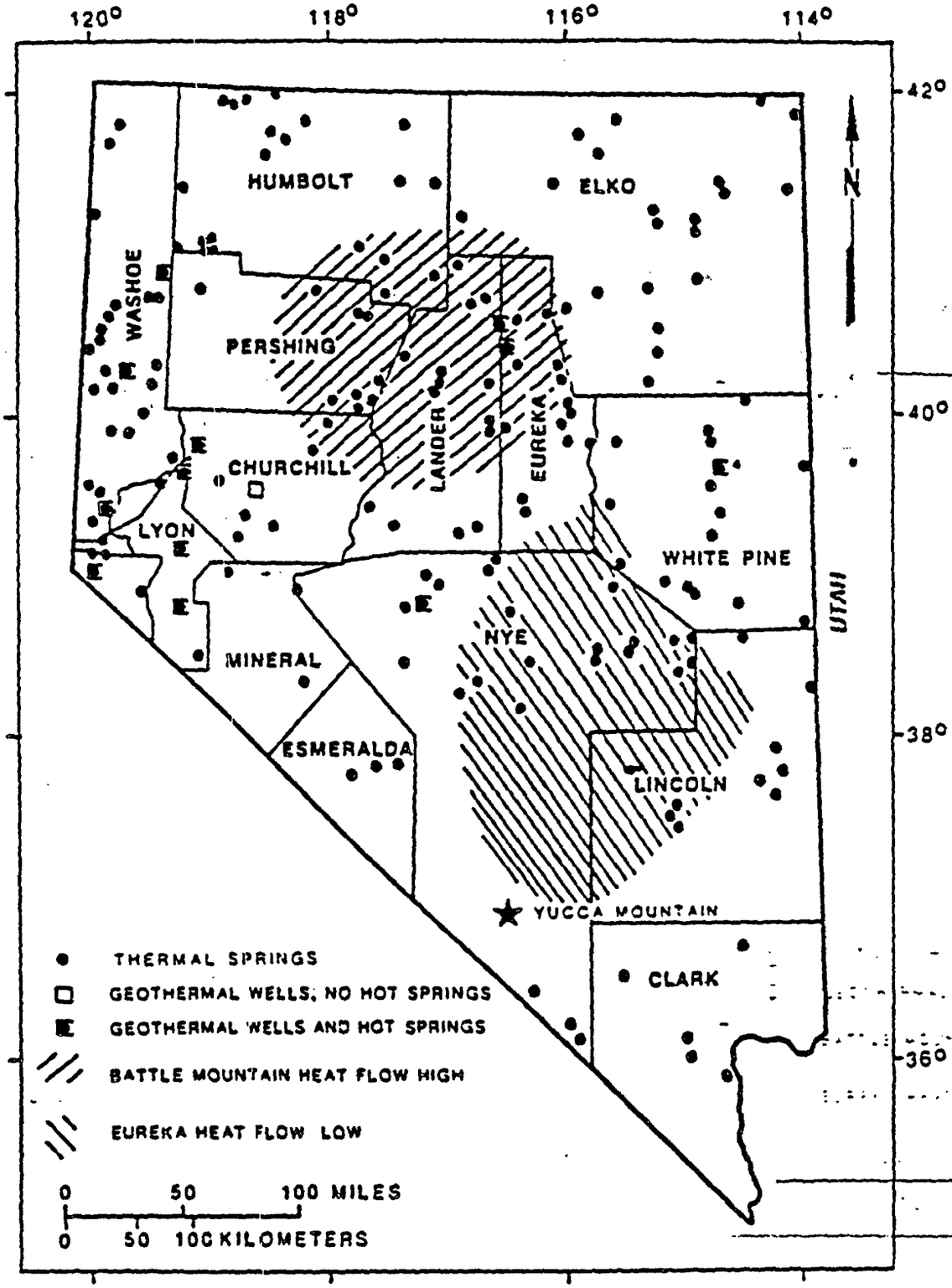

Figure 1-86. Hot springs and geothermal wells and low-temperature thermal resources in Nevada. The Battle Mountain-High and the Eureka-Low heat-flow regions are also shown. Modified from Garside (1974)

Annual Ambient Temperature ≈16-18°C

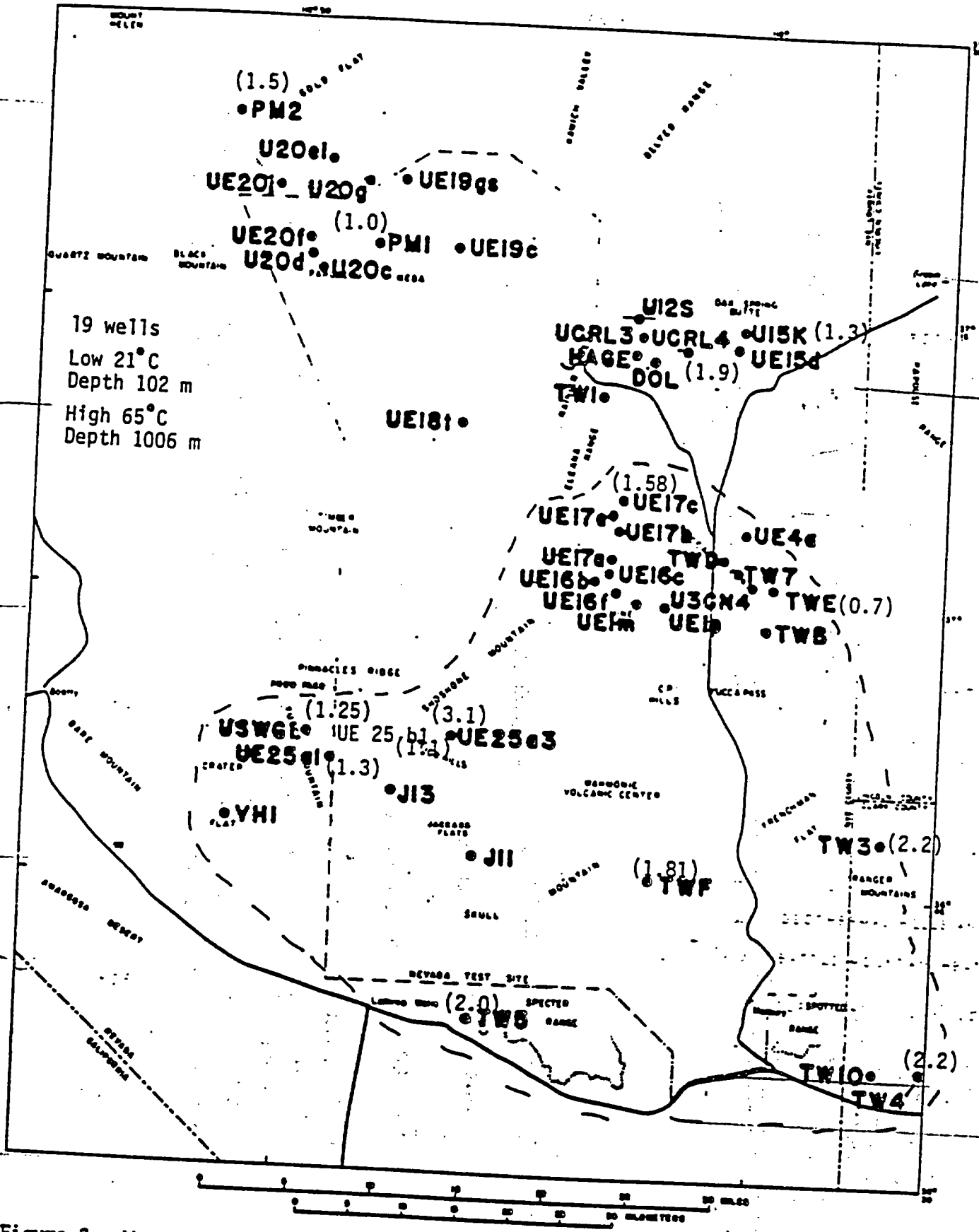

Figure 2. Map of the test-site region showing locations of wells discussed in the text. Numbers in brackets are in HFU

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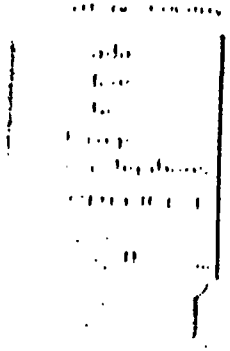
Nevada Nuclear Waste Storage Investigations PROJECT

YUCCA MOUNTAIN

THERMAL REGIME AT YUCCA MOUNTAIN

New Information to be obtained

- Temperature data
- Temperature gradient data
- Assessment and evaluation of present temperature, thermal conductivity, and heat flow data to allow recommendations for new Site Characterization Activities that will lead to a final assessment of the potential for hydrothermal activity



PRESENTATION

TO

U. S. NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

BY

CARL JOHNSON

NEVADA AGENCY FOR NUCLEAR PROJECTS

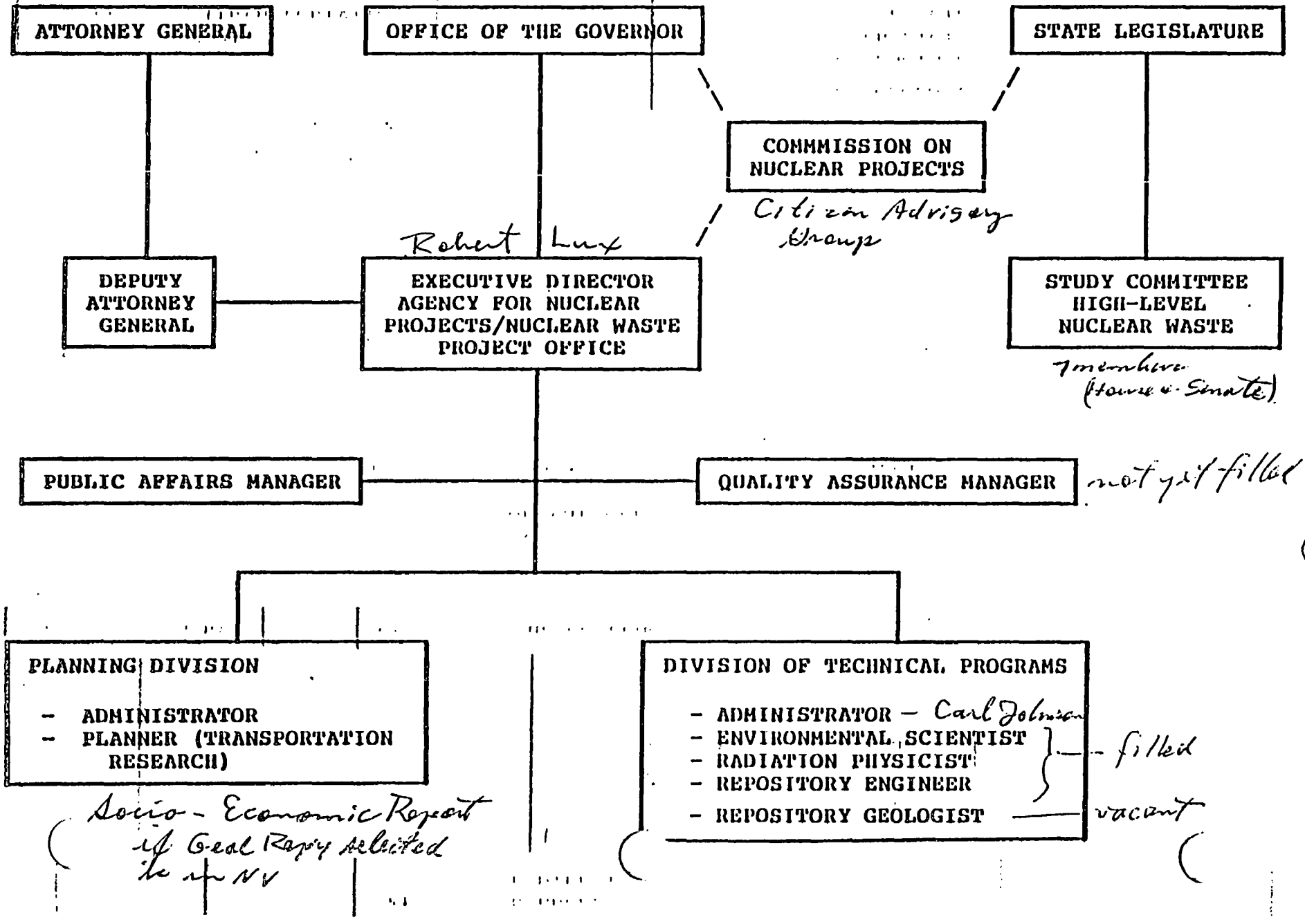
JULY 29, 1987

AGENDA

- STATE ORGANIZATION
- STATE TECHNICAL CONCERNS
- STATE TECHNICAL PROGRAMS

STATE OF NEVADA AGENCY FOR NUCLEAR PROJECTS

ORGANIZATIONAL CHART



NUCLEAR WASTE PROJECT OFFICE
TECHNICAL PROGRAMS

CARL A. JOHNSON
ADMINISTRATOR

Independently Appointed Experts
TECHNICAL ADVISORY GROUP

Range $150K to 1.5M/yr (yr to yr basis)

STAFF

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REPOSITORY ENGINEER

CHARLES MALONE PhD
ENVIRONMENTAL SCIENTIST

PETER SPIEGLER PhD
RADIATION PHYSICIST

?
REPOSITORY
GEOLOGIST/HYDROLOGIST

CONTRACTORS

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HYDROLOGY

CENTER FOR NEOTECTONIC STUDIES
UNIVERSITY OF NEVADA RENO
GEOLOGY
SEISMOLOGY

MIFFLIN & ASSOCIATES
PALEOCLIMATE
GEOCHEMISTRY

DEPARTMENT OF GEOSCIENCE
UNIVERSITY OF NEVADA-LAS VEGAS
VOLCANISM

SARGENT & LUNDY ENGINEERS
QUALITY ASSURANCE
To develop a QA Pgm for this office & contractors

STATE PROGRAM GOALS

- TO INSURE THAT PUBLIC HEALTH AND SAFETY AND THE ENVIRONMENT ARE ADEQUATELY PROTECTED THROUGH ALL PHASES OF REPOSITORY SITING, CONSTRUCTION, OPERATIONS, CLOSURE, AND DECOMMISSIONING.

- TO ASSESS SOCIAL AND ECONOMIC IMPACTS THAT THE STATE OF NEVADA COULD EXPERIENCE AS A RESULT OF REPOSITORY SITING AND DEVELOPMENT WITH APPROPRIATE MITIGATION STRATEGY.

- TO PROVIDE FOR LOCAL GOVERNMENT COORDINATION AND FOR PUBLIC PARTICIPATION IN THE PROJECT.

- TO PROVIDE FOR EFFECTIVE POLICY GUIDANCE TO THE GOVERNOR AND OTHER STATE LEADERS.

- TO PROVIDE FOR SOUND AND EFFICIENT ADMINISTRATION AND MANAGEMENT OF THE STATE EVALUATION PROGRAM.

Agency started in 1983 following passage of NWPA

This Office (HLW) has no responsibility for Beatty LLW Rpsty.

Bullfrog Co. 12 mi sq. ~~to~~ to be created to ~~house~~ include YMtn Site only – no people – ∴ ~~$~~ from DOE to B/F Co. will go to state & then be ~~equal~~ distributed to "1 other counties. Co. has not yet appointed 3 commissioners to adm. the Co. Co. Seat presently

HEALTH AND SAFETY OBJECTIVES

- DETERMINE TECHNICAL ISSUES CRITICAL TO THE HEALTH AND SAFETY OF NEVADANS AND THEIR ENVIRONMENT.

- REVIEW RELEVANT U.S. DEPARTMENT OF ENERGY (DOE) PROGRAM PLANS, TECHNICAL STUDIES, AND OTHER DOCUMENTS TO ASSURE INTEGRATION OF NEVADA CONCERNS, ONGOING AWARENESS OF FEDERAL ACTIVITIES, INPUT INTO PROGRAM DESIGNS AND COORDINATION OF THE SCHEDULE OF ACTIVITIES.

- PROVIDE FOR STATE INITIATED, INDEPENDENT STUDY OF TECHNICAL ISSUES THAT HAVE BEEN IDENTIFIED AS CRITICAL AND THAT (A) ARE NOT BEING ADDRESSED BY D.O.E. AND THEIR CONTRACTORS, OR (B) THAT THE METHODS OR RESULTS USED BY THE D.O.E. AND THEIR CONTRACTORS ARE IN QUESTION BY THE STATE OF NEVADA, OR (C) THE AREAS OF STUDY ARE SO CRITICAL THAT DUPLICATIVE STUDIES ARE WARRANTED.

- PROVIDE ON-SITE MONITORING OF ALL FEDERAL TECHNICAL FIELD AND LABORATORY ACTIVITIES WITH REGARD TO SITE SCREENING AND CHARACTERIZATION IN ORDER TO MAKE COMMENTS AND RECOMMENDATIONS AND TO UNDERSTAND HOW THESE TECHNIQUES AND METHODS AFFECT THE OVERALL STUDY.

ISSUES CRITICAL TO

HEALTH, SAFETY AND THE ENVIRONMENT

SITE SUITABILITY ISSUES

1) CHARACTERIZATION OF MOISTURE MOVEMENT THROUGH THE UNSATURATED ZONE.

2) RELATIONSHIP OF YUCCA MOUNTAIN GROUNDWATER REGIME TO THE REGIONAL AQUIFER SYSTEM. future L.V. water supply source.

3) EFFECT OF FUTURE CLIMATIC VARIATIONS AND RESULTING CHANGES IN THE HYDROGEOLOGIC REGIME ON THE INTEGRITY OF THE SITE. unsaturat. will site eventually become saturated.

✓ 4) EFFECTS OF FUTURE FAULTING OR OTHER TECTONIC EVENTS ON THE INTEGRITY OF THE SITE.

✓ 5) EFFECTS OF FUTURE VOLCANISM ON THE INTEGRITY OF THE SITE.

✓ 6) HUMAN INTERFERENCE OF SITE DUE TO PERCEIVED PRESENCE OF EXTRACTABLE NATURAL RESOURCES.

Stf NV Feels that fatal flaws in some of the above (may) (would) disqualify the proposed site. [✓ 4, 5 & 6 above]

□ - #1 has some potential of disqualifying

vertical emplacement mode preferable to
horizontal " " less chance for container rupture/damage.

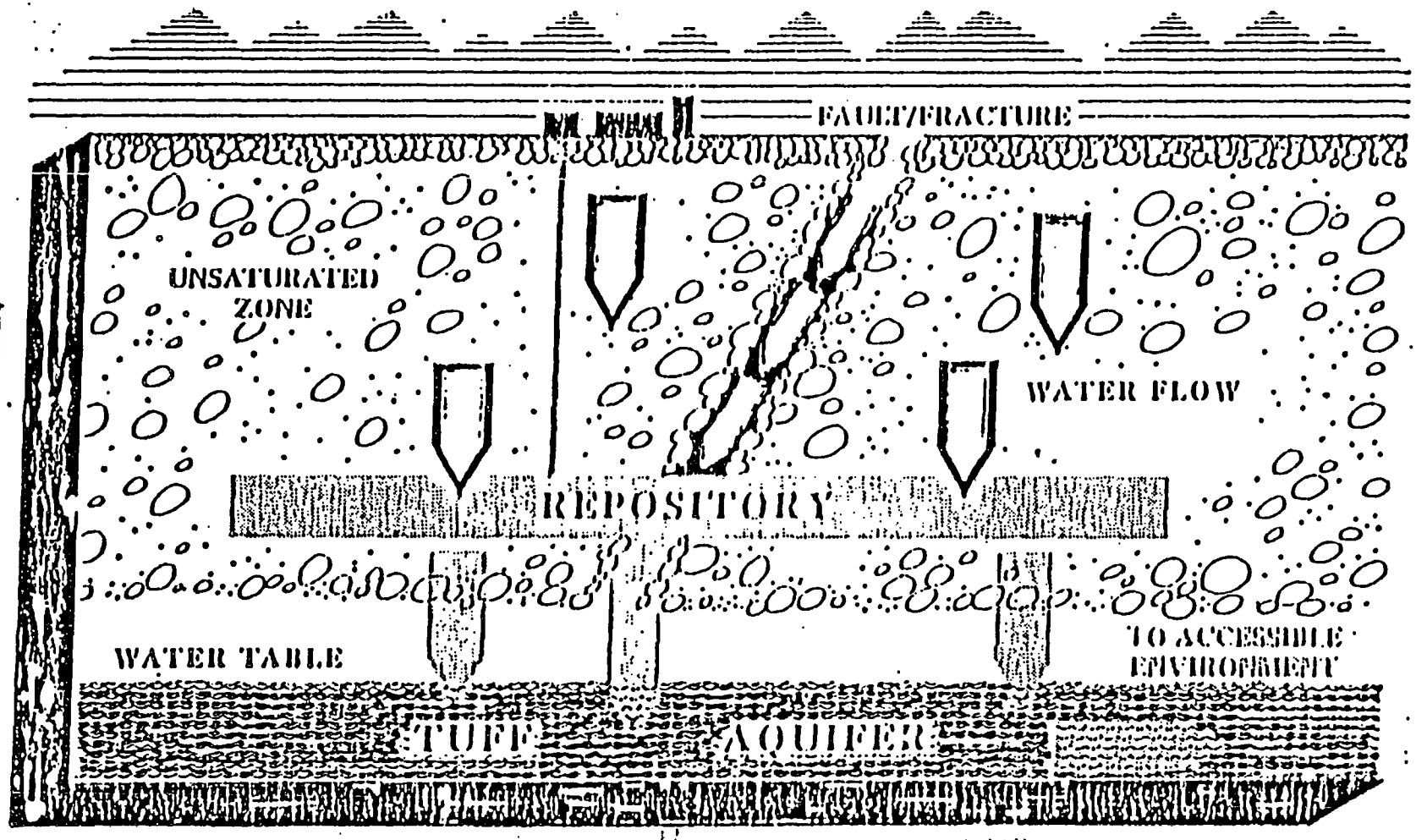
MOISTURE MOVEMENT THRU UNSATURATED ZONE

EVIDENCE

- TUFF ROCKS HIGHLY FRACTURED
- ROCK MATRIX PERMEABILITY LOW
- ROCK MATRIX SATURATION 40 PERCENT TO 90 PERCENT
- RAINER MESA DATA SUGGESTS LARGE COMPONENT OF FRACTURE FLOW
- PERCHED WATER DATA IN DRILL-HOLE WASH MAY SUGGEST FRACTURE FLOW
- MANY IN-SITU HYDROLOGIC PARAMETER VALUES UNKNOWN
- CONTRIBUTION OF MATRIX FLOW VS. FRACTURE FLOW CRITICAL TO CALCULATION OF GROUND WATER TRAVEL TIMES
- PRESENT STATE-OF-THE-ART HYDROLOGIC CODES DO NOT REALISTICALLY MODEL SITE UNSATURATED ZONE

CONCLUSION

- SITE UNSATURATED ZONE HYDROGEOLOGIC CONDITIONS COMPLEX
- USING CONSERVATIVE DATA, SITE DOES NOT MEET GROUND WATER TRAVEL TIME REQUIREMENTS


FAULT/FRACTURE
UNSATURATED ZONE
WATER FLOW
REPOSITORY
WATER TABLE
TO ACCESSIBLE ENVIRONMENT
TUFF AQUIFER

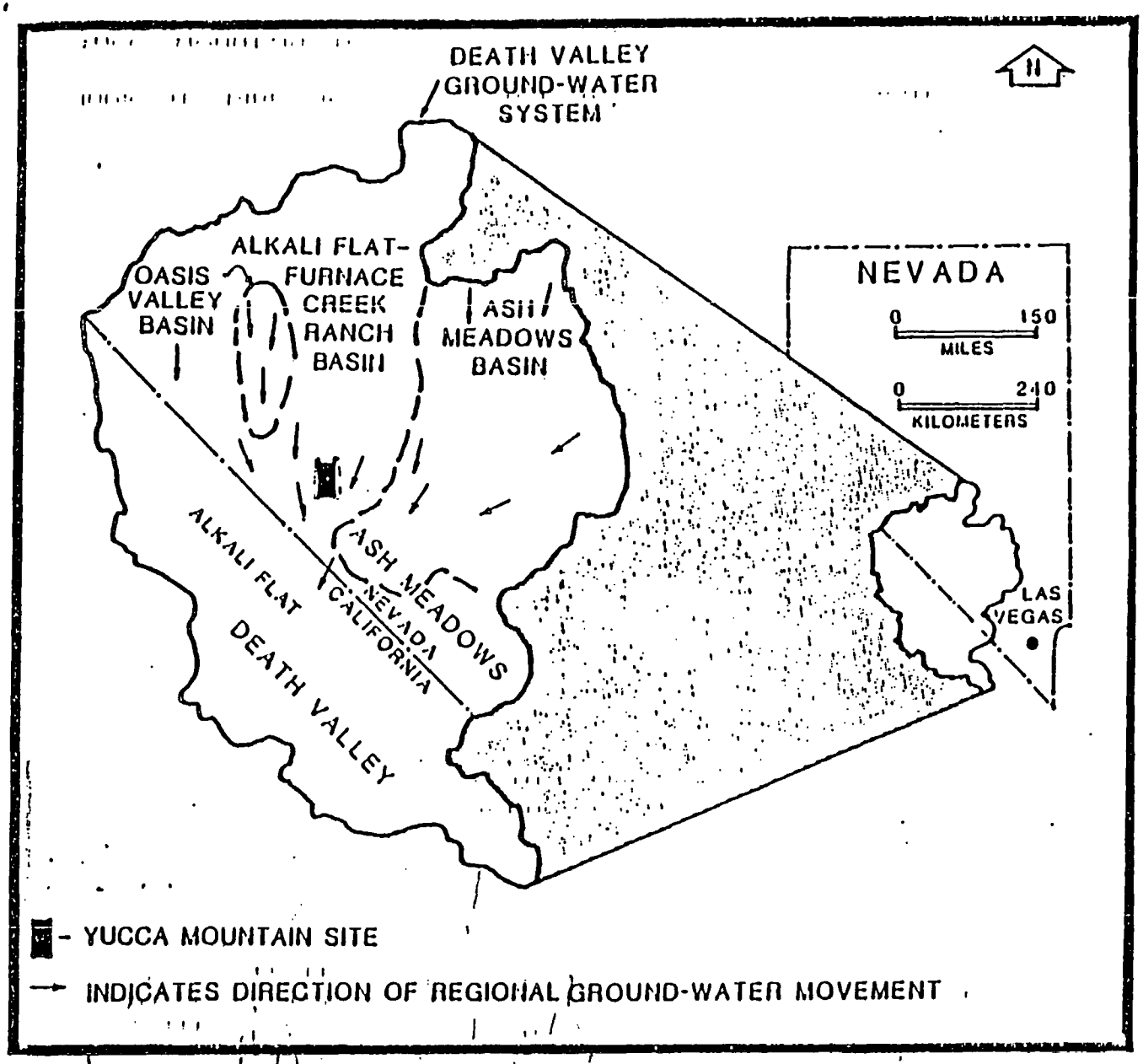
MOVEMENT THRU SATURATED ZONE

EVIDENCE

- TUFF-ALLUVIAL AQUIFER BENEATH SITE AND AMARGOSA VALLEY
- WATER TABLE GRADIENT NEARLY FLAT BENEATH SITE, BUT SUBSTANTIALLY HIGHER NORTH AND WEST OF SITE
- TUFF-ALLUVIAL AQUIFER FLOW RATES OF 300 METERS/DAY
- REGIONAL CARBONATE AQUIFER DEEP BENEATH SITE
- CONTINUITY BETWEEN TUFF-ALLUVIAL AQUIFER AND REGIONAL CARBONATE AQUIFER UNKNOWN

CONCLUSION

- TUFF-ALLUVIAL AQUIFER MAY NOT SATISFY GROUND WATER TRAVEL TIME REQUIREMENTS
- POTENTIAL FOR CONTAMINATION OF CARBONATE AQUIFER, A POSSIBLE FUTURE WATER SUPPLY SOURCE


DEATH VALLEY
GROUND-WATER
SYSTEM
N
OASIS
VALLEY
BASIN
ALKALI FLAT-
FURNACE
CREEK
RANCH
BASIN
ASH
MEADOWS
BASIN
NEVADA
0
150
MILES
0
240
KILOMETERS
ALKALI FLAT
DEATH VALLEY
ASH MEADOWS
NEVADA
CALIFORNIA
LAS
VEGAS
- YUCCA MOUNTAIN SITE
INDICATES DIRECTION OF REGIONAL GROUND-WATER MOVEMENT

FUTURE CLIMATE CHANGES

EVIDENCE

- PAST CLIMATE COOLER AND WETTER THAN PRESENT
- DRILL HOLE AND REGIONAL MAPPING DATA SUGGESTS SUBSTANTIALLY HIGHER WATER TABLES IN PAST
- DRILL HOLE DATA SUGGESTS NUMEROUS PERCHED WATER ZONES IN PAST
- MAPPING SUGGESTS PAST SPRING DISCHARGE OCCURRENCES AT SITE

CONCLUSION

- POTENTIAL FOR INCREASED RECHARGE AND SIGNIFICANT RISE IN WATER TABLE IF AREA RETURNS TO PLUVIAL CLIMATIC CONDITIONS IN FUTURE

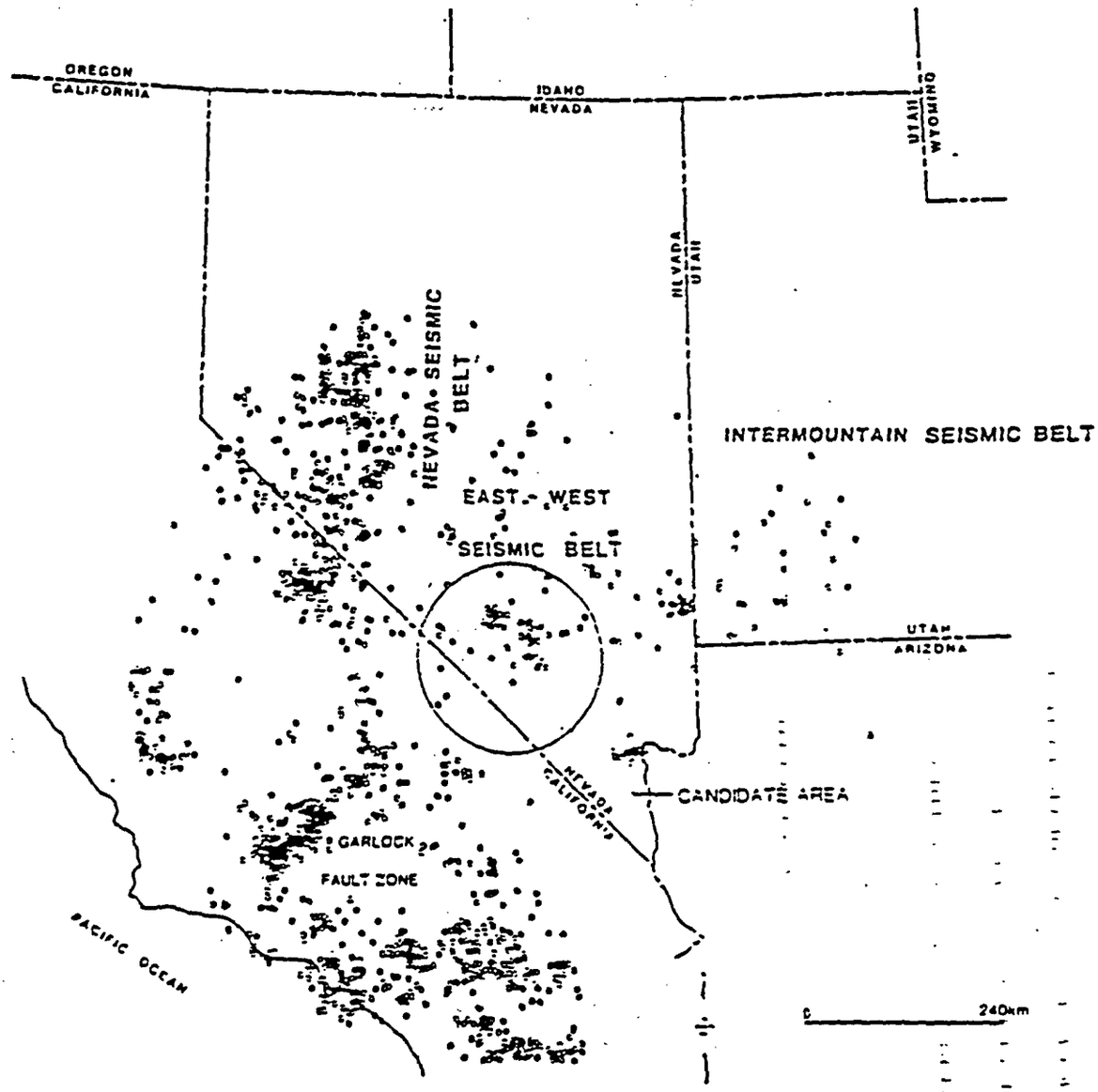
ACTIVE FAULTING AND TECTONICS

EVIDENCE

- SITE WITHIN WALKER-LANE STRUCTURAL ZONE
- REGION OF HIGH SEISMIC ACTIVITY
- STRESS DATA SUGGEST FAULTS NEAR FAILURE
- FAULTS PREDOMINANTLY STRIKE-SLIP MOTION
- FAULT MOVEMENT AS YOUNG AS 3,000 YEARS AGO
- MAGNITUDE 6.5 - 7.3 EARTHQUAKE POSSIBLE AT SITE
- 1.1 M OF DISPLACEMENT POSSIBLE
- PEAK GROUND ACCELERATION EXCEEDING 1.0 G POSSIBLE AT SITE
- NUCLEAR TESTING COULD PRODUCE SIGNIFICANT VIBRATORY GROUND MOTION AT SITE

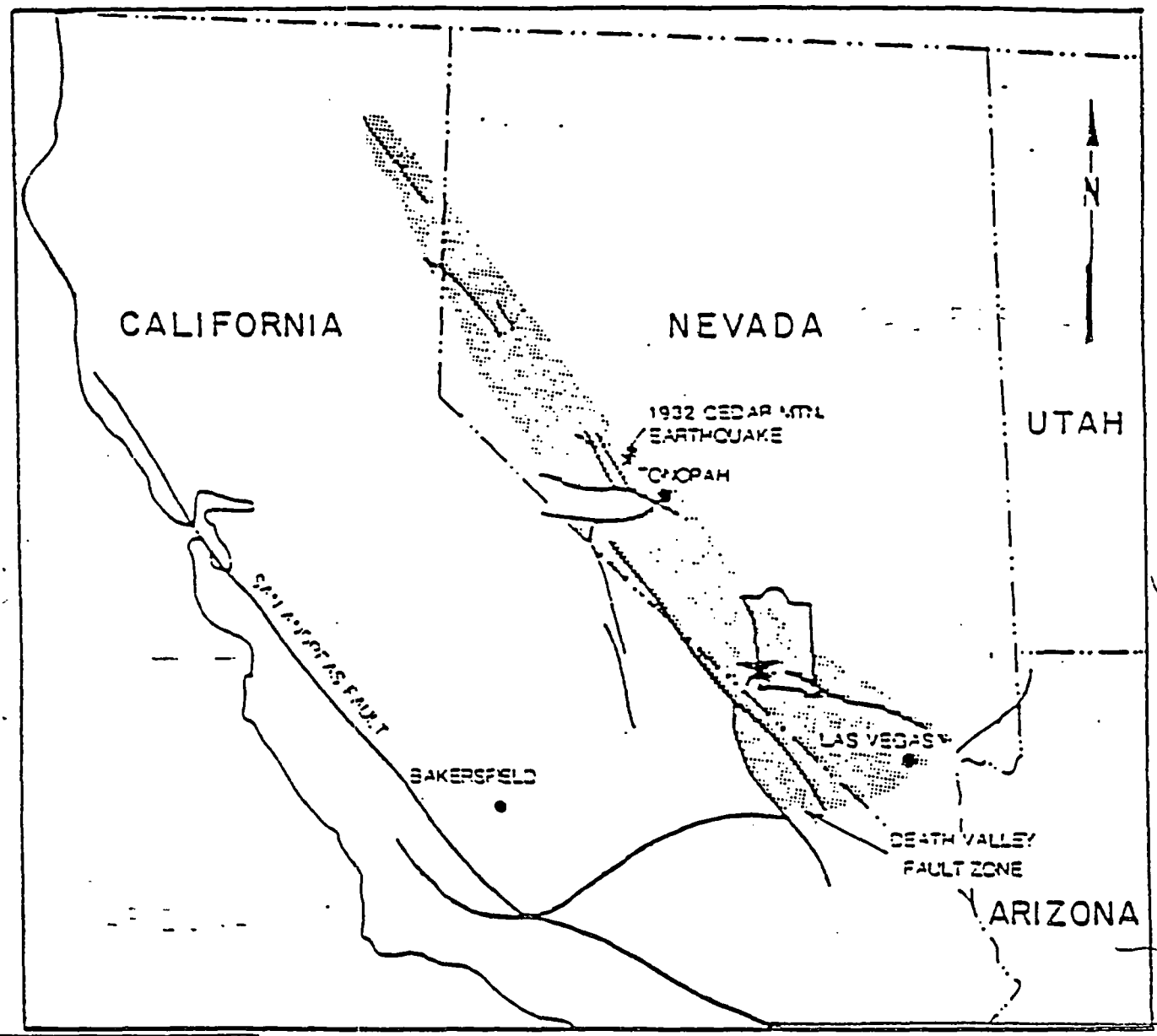
CONCLUSION

- FAULTS AT SITE CONSIDERED ACTIVE
- REPOSITORY COULD EXPERIENCE LARGE EARTHQUAKE, WITH SIGNIFICANT GROUND DISPLACEMENT AND HIGH GROUND ACCELERATION



HISTORIC EARTHQUAKES OF MERCALLI INTENSITY ≥ V OR MAGNITUDE ≥ 4.0
WITHIN 400 KM OF THE CANDIDATE AREA THROUGH 1974

WALKER LANE STRUCTURAL ZONE

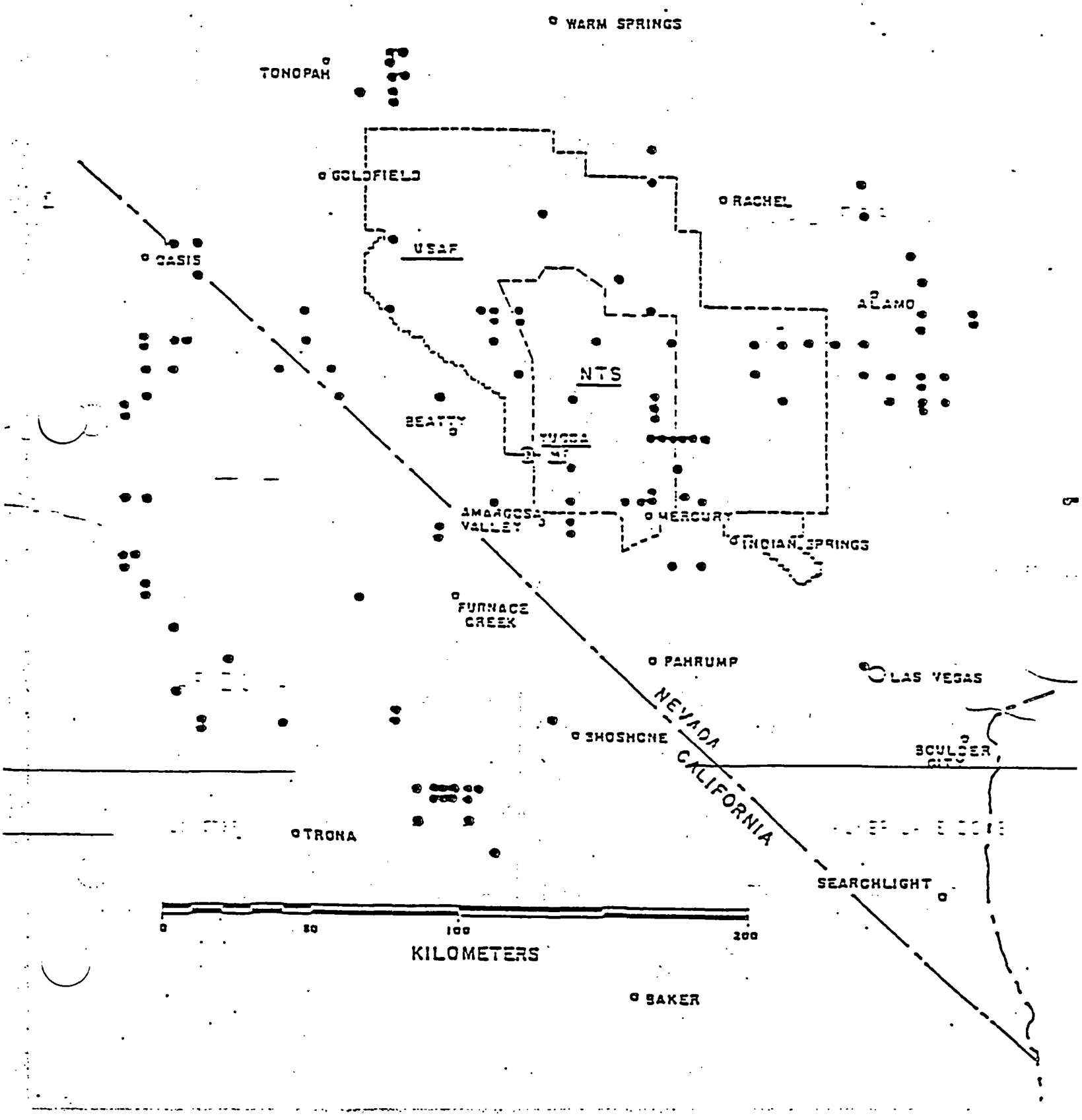


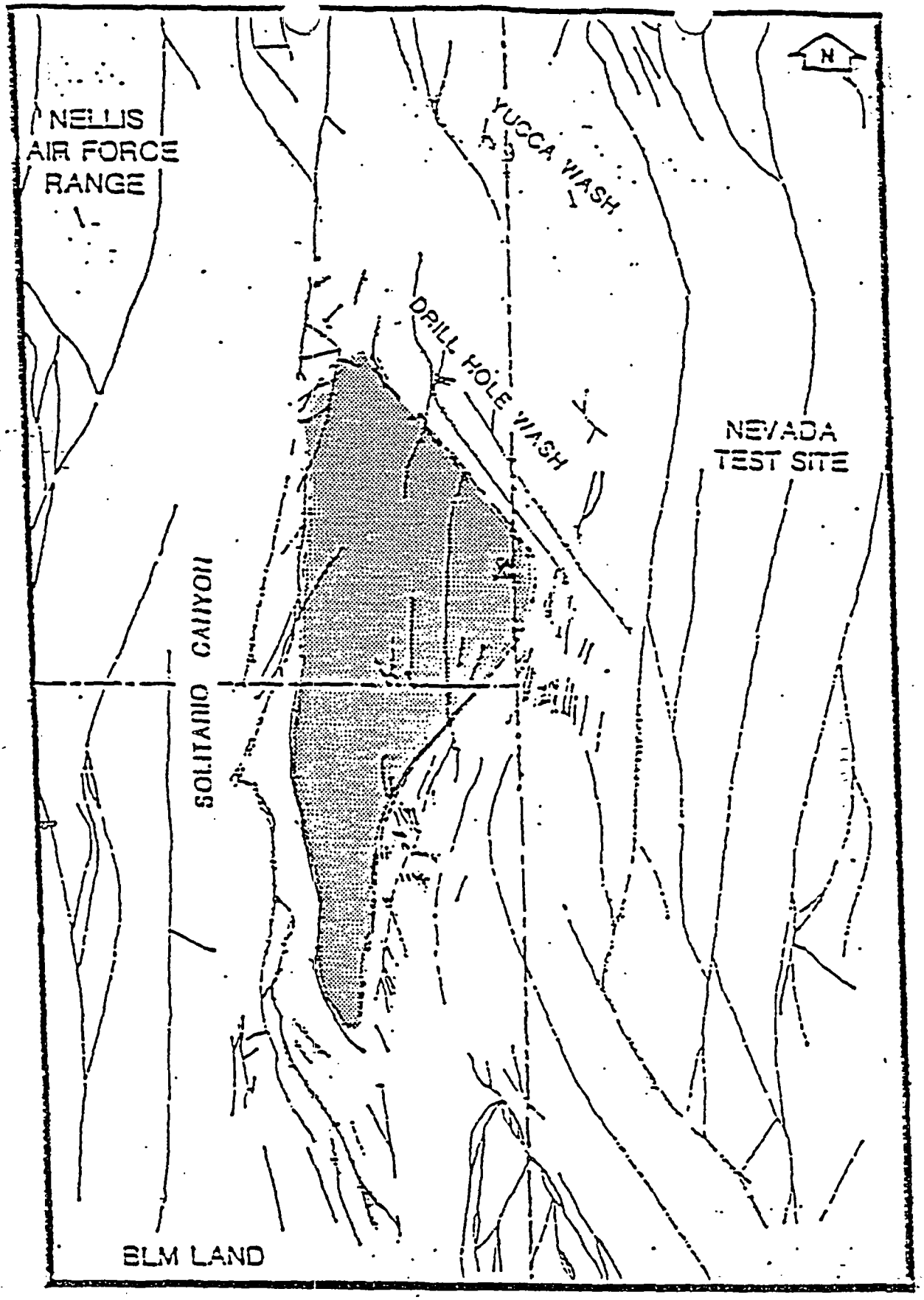
WALKER LANE ZONE

0 100 200 300 KILOMETERS

YUCCA MOUNTAIN AREA

EARTHQUAKE EPICENTERS WITHIN 150 KM OF YUCCA MT.





FROM DOE/RW-0012

YUCCA MOUNTAIN
AREA FAULTS

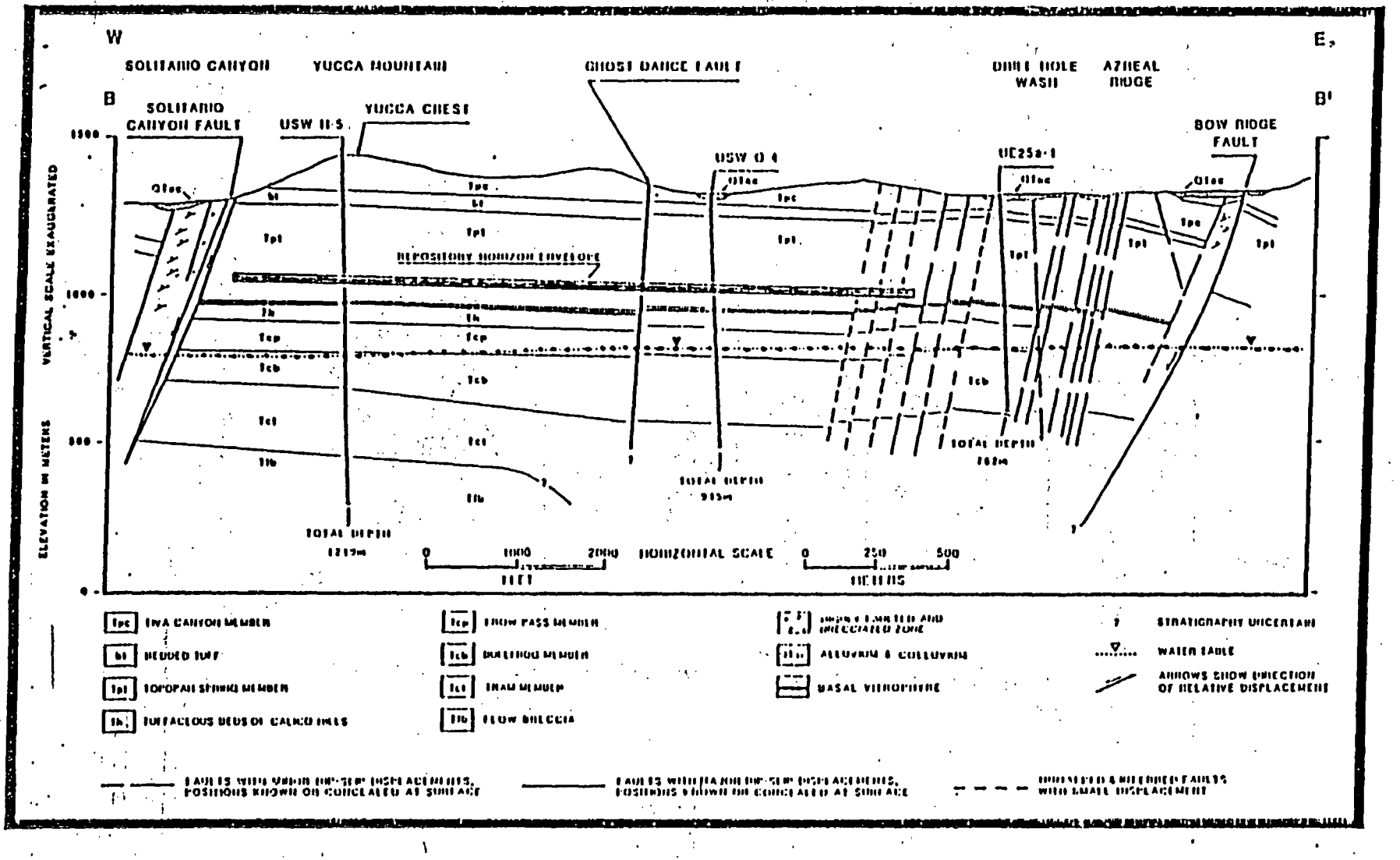
0 10,000
FEET

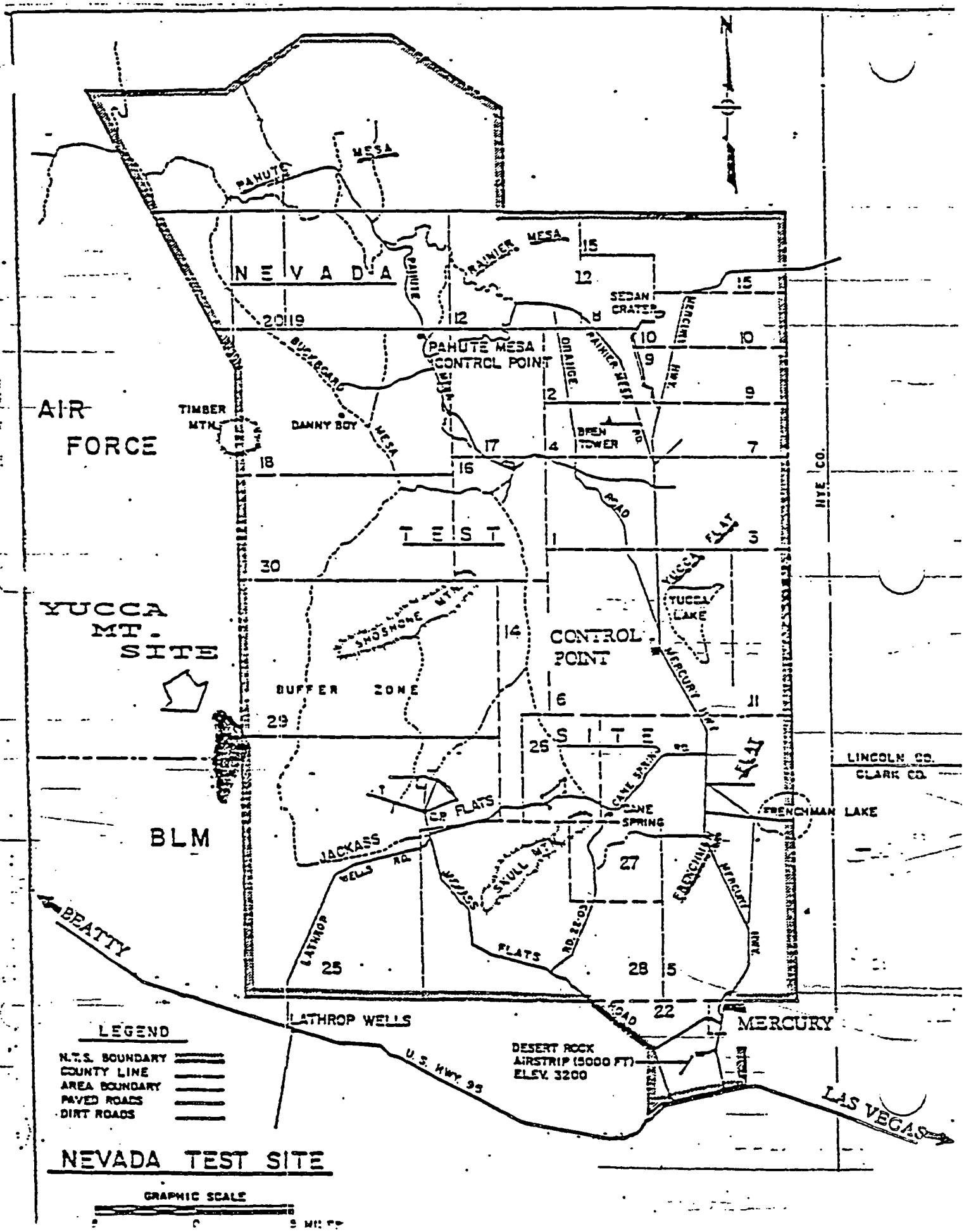
0 2,000
METERS

PRIMARY REPOSITORY AREA

SURFACE LOCATION OF FAULTS

BLM - BUREAU OF LAND MANAGEMENT


W
E
B
B'
SOLITARIO CANYON
YUCCA MOUNTAIN
GHOST DANCE FAULT
DRILL HOLE WASH
AZHEAL RIDGE
SOLITARIO CANYON FAULT
USW H-5
YUCCA CREST
USW G-4
UE25a-1
BOW RIDGE FAULT
REPOSITORY HORIZON ENVELOPE
TOTAL DEPTH
VERTICAL SCALE EXAGGERATED
ELEVATION IN METERS
HORIZONTAL SCALE
FEET
METERS
TIVA CANYON MEMBER
BEDDED TUFF
TOPOPAH SPRING MEMBER
TUFFACEOUS BEDS OF CALICO HILLS
PROW PASS MEMBER
BULLFROG MEMBER
TRAM MEMBER
FLOW BRECCIA
ALLUVIUM & COLLUVIUM
BASAL VITROPHYRE
STRATIGRAPHY UNCERTAIN
WATER TABLE
ARROWS SHOW DIRECTION OF RELATIVE DISPLACEMENT



NEVADA TEST SITE

VOLCANISM

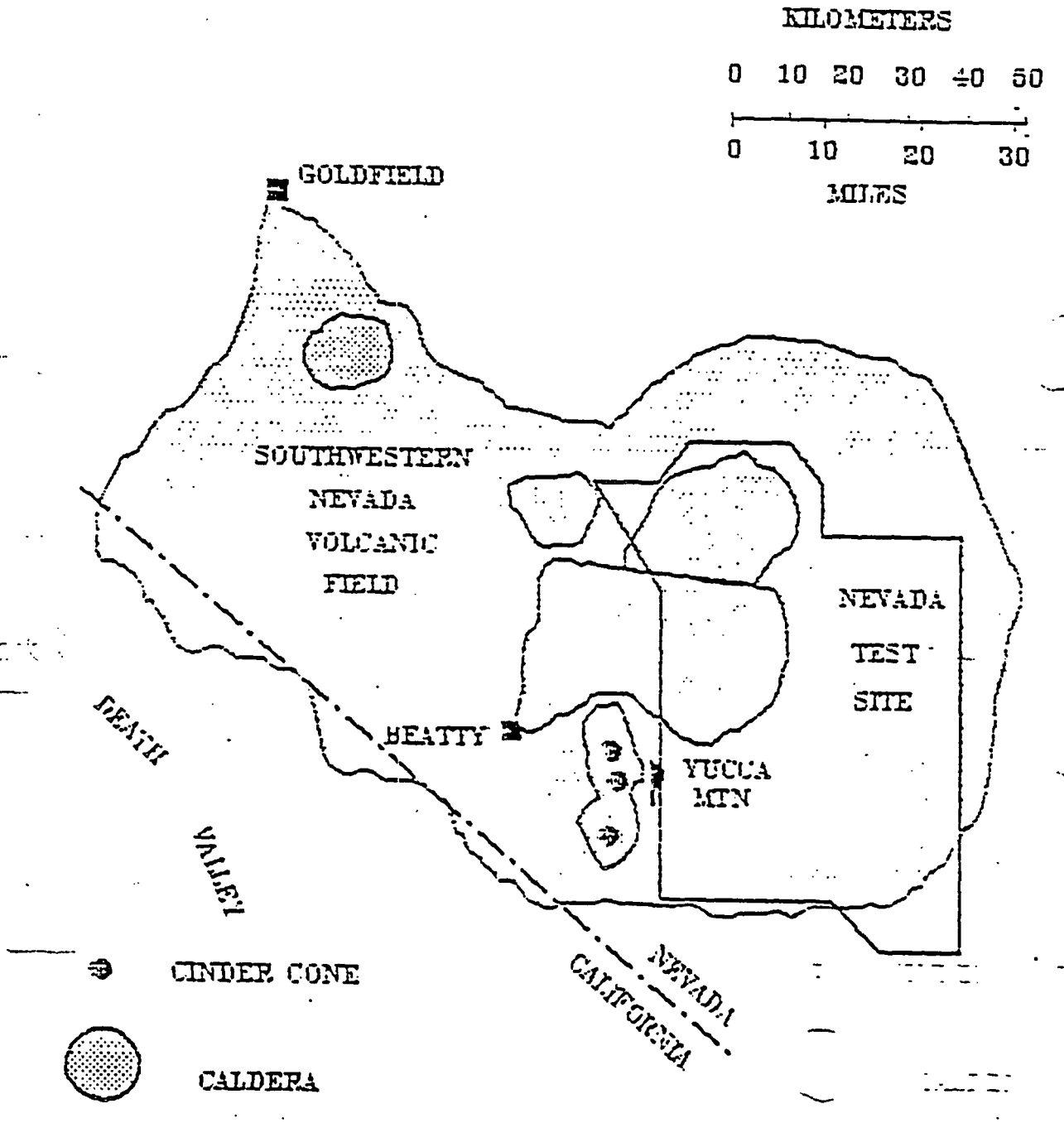
EVIDENCE

- SITE LOCATED WITHIN SOUTHWESTERN NEVADA VOLCANIC FIELD
- SITE LOCATED ALONG DEATH VALLEY-PANCAKE RANGE VOLCANIC BELT
- CENTERS OF BASALTIC VOLCANISM IN CRATER FLAT ADJACENT TO SITE
- YOUNGEST BASALTIC ERUPTION IN CRATER FLAT LESS THAN 20,000 YEARS AGO
- VEIN FILLINGS ENCOUNTERED IN DRILL HOLES AND TRENCHES SUGGEST POSSIBLE HYDROTHERMAL ORIGIN
- ABOVE-NORMAL GROUND-WATER TEMPERATURES SUGGEST GEOTHERMAL SOURCE

CONCLUSION

- VOLCANIC ERUPTION POSSIBLE
- SOME POTENTIAL OF HYDROTHERMAL ACTIVITY

VOLCANIC FIELDS



NATURAL RESOURCES

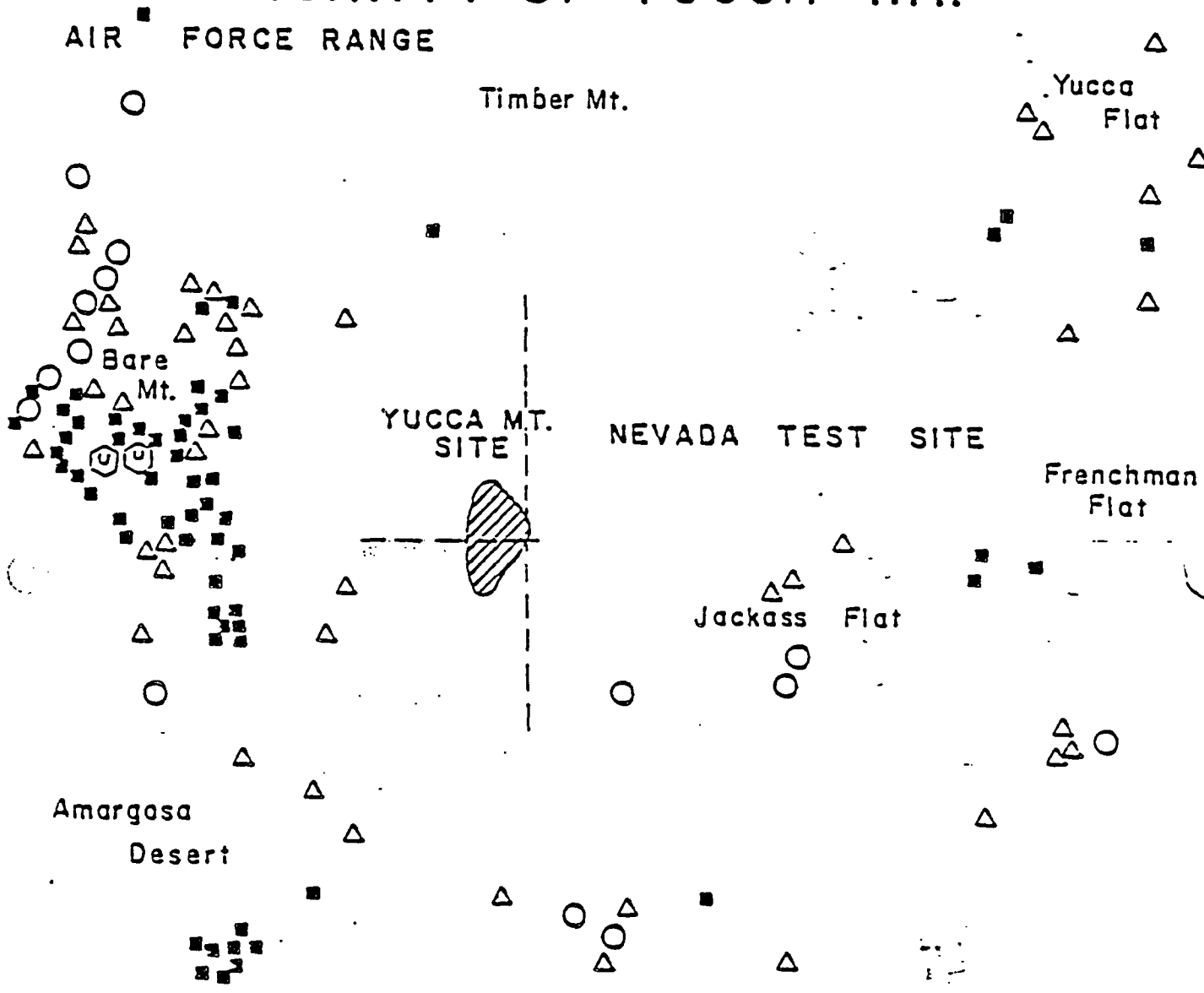
EVIDENCE

- VOLCANIC CALDERAS CENTERS OF MINERALIZATION IN GREAT BASIN
- MINING ACTIVITY PROMINENT IN REGION
- SITE LOCATED ON EDGE OF MINERALIZED CALDERA
- BURIED TUFFS DISPLAY ALTERATION AND SECONDARY PYRITE
- GOLD AND SILVER ENCOUNTERED IN SITE DRILL-HOLE
- HISTORIC PLACER GOLD MINING IN FORTY MILE WASH
- PROJECTION OF OVERTHRUST BELT IN PALEOZOIC ROCKS BENEATH SITE SUGGEST PETROLEUM POTENTIAL
- REGIONAL CARBONATE AQUIFER IS POTENTIAL WATER SUPPLY SOURCE

CONCLUSION

- POTENTIAL FOR EXTRACTABLE NATURAL RESOURCES BENEATH SITE

NATURAL RESOURCE LOCATIONS IN VICINITY OF YUCCA MT.



LEGEND

- ■ BASE & PRECIOUS METALS
- △ INDUSTRIAL MINERALS
- ○ GEOTHERMAL RESOURCES
- (U) URANIUM OCCURRENCES

MILES 0 6 12

KILOMETERS 0 10 20

WATER RESOURCES CENTER - DESERT RESEARCH INSTITUTE

TECHNICAL STUDY PROGRAMS

- REGIONAL GROUNDWATER FLOW AND CHEMISTRY
- UNSATURATED ZONE MOISTURE SAMPLING
- APPLICATION OF FRACTAL MATHEMATICS IN FRACTURE FLOW MODELS
- APPLICATION OF ISOTOPE FLOW MODELS TO ANALYSIS OF GROUND WATER FLOW SYSTEMS
- ORIGIN OF CARBONATE/SILICA VEIN DEPOSITS
- PACKRAT MIDDEN CLIMATOLOGY
- INFLUENCE OF CLIMATIC PATTERNS ON HYDROLOGIC CONDITIONS

areas of disagreement with DOE, principally at mgmt lev(
Most are being addressed by DOE
Not happy w/results
" " with direction DOE's efforts are going.
not so much between Pl. of NV & DOE Conti's who are in good agreement.

NV addressing these more vigorously than DOE
DWM - your objectives more closely in agreement w/NPC than w/DOE

REGIONAL GROUNDWATER FLOW

OBJECTIVE

- TO DEFINE REGIONAL GROUNDWATER FLOW AND HYDRAULIC CONTINUITY BETWEEN YUCCA MOUNTAIN AND ADJACENT AREAS

RATIONALE

- SITE SUITABILITY ISSUE: DEFINE RELATIONSHIP OF YUCCA MOUNTAIN GROUNDWATER SYSTEM TO REGIONAL AQUIFER SYSTEM
- EPA STANDARD (40 CFR PART 191): RELEASE AND TRANSPORT OF RADIONUCLIDES FROM WASTE PACKAGE TO ACCESSIBLE ENVIRONMENT, AND TO CLASS 1 GROUNDWATER SUPPLIES

APPROACH

- COLLECT PERIODIC WATER SAMPLES FROM WELLS AND SPRINGS
- ANALYZE SAMPLES FOR WATER CHEMISTRY
- DEVELOP TIME-SERIES HYDROCHEMICAL MODEL

UNSATURATED ZONE MOISTURE SAMPLING

OBJECTIVE

- TO OBTAIN PORE WATER SAMPLES FROM UNSATURATED ZONE

RATIONALE

- SITE SUITABILITY ISSUE: CHARACTERIZATION OF MOISTURE MOVEMENT THROUGH UNSATURATED ZONE
- EPA STANDARD (40 CFR PART 191): RELEASE AND TRANSPORT OF RADIONUCLIDES FROM WASTE PACKAGE TO ACCESSIBLE ENVIRONMENT
- NRC LICENSING CRITERIA (10 CFR PART 60): GROUNDWATER TRAVEL TIME FROM DISTURBED ZONE TO ACCESSIBLE ENVIRONMENT SHALL BE AT LEAST 1,000 YEARS

APPROACH

- DRILL 200' - 300' BOREHOLE USING ODEX DRILLING METHOD
- INSTALL SUCTION LYSIMETER AND DOWNHOLE SAMPLER
- ANALYZE SAMPLES FOR CHEMISTRY AND ENVIRONMENTAL AND TRACER ISOTOPES

FRACTURE FLOW MODELS

OBJECTIVES

- TO EVALUATE USE OF FRACTAL MATHEMATICS TO CATEGORIZE DEGREE OF IRREGULARITY OF FRACTURES
- TO DEVELOP FLOW MODELS IN FRACTURED MATERIALS BASED ON FRACTAL GEOMETRY

RATIONALE

- SITE SUITABILITY ISSUE; CHARACTERIZATION OF MOISTURE MOVEMENT THROUGH UNSATURATED ZONE
- EPA STANDARD (40 CFR PART 191); RELEASE AND TRANSPORT OF RADIONUCLIDES FROM WASTE PACKAGE TO ACCESSIBLE ENVIRONMENT
- NRC LICENSING CRITERIA (10 CFR PART 60): GROUNDWATER TRAVEL TIME FROM DISTURBED ZONE TO ACCESSIBLE ENVIRONMENT SHALL BE AT LEAST 1,000 YEARS

APPROACH

- REVIEW OF FRACTAL MATHEMATICS THEORY AND APPLICATION OF FLOW IN FRACTURED ROCK
- DEFINE GEOMETRIES OF FRACTURES
- DEVELOP NEW FLOW AND TRANSPORT MODELS FOR FLOW IN FRACTURED ROCK

ISOTOPES IN GROUNDWATER FLOW SYSTEMS

OBJECTIVES

- TO DELINEATE GROUNDWATER FLOW PATHS
- TO ASSESS MIXING PROPERTIES OF FLOW SYSTEMS
- TO DEFINE GROUNDWATER RESIDENCE TIME

RATIONALE

- SITE SUITABILITY ISSUE: DEFINE RELATIONSHIP OF YUCCA MOUNTAIN GROUNDWATER SYSTEM TO REGIONAL AQUIFER SYSTEM
- EPA STANDARD (40 CFR PART 191): RELEASE AND TRANSPORT OF RADIONUCLIDES FROM WASTE PACKAGE TO ACCESSIBLE ENVIRONMENT, AND TO CLASS 1 GROUNDWATER SUPPLY

APPROACH

- SYNTHESIS OF ALL AVAILABLE GROUNDWATER ISOTOPE DATA
- SAMPLING AND ISOTOPE ANALYSIS OF ADDITIONAL POINTS
- CALIBRATE POSSIBLE MODELS WITH ISOTOPE DATA
- ANALYZE AND INTERPRET INTERACTION OF GROUNDWATER FLOW SYSTEMS

CARBONATE/SILICA VEIN DEPOSITS

OBJECTIVE

- TO DEFINE ORIGIN OF CARBONATE/SILICA VEIN DEPOSITS

RATIONALE

- NRC LICENSING CRITERIA (10 CFR PART 60):
  - POTENTIAL CHANGE IN HYDROLOGIC DISCHARGE CONDITIONS THAT COULD AFFECT MIGRATION OF RADIONUCLIDES (COLD WATER SPRING)
  - IGNEOUS ACTIVITY WHICH COULD AFFECT INTEGRITY OF SITE (THERMAL WATER)

APPROACH

- REVIEW FIELD LOGS OF DEPOSITS
- SAMPLE CARBONATE/SILICA DEPOSITS FOR ELEMENT CHEMISTRY, PETROLOGY, ISOTOPE CHEMISTRY, AND MINERALOGY
- SAMPLE ASH FILINGS FOR MINERALOGY, MICRO FOSSIL ANALYSIS, AND AGE DATING
- EXAMINE AND SAMPLE WALL ROCK FOR EVIDENCE OF ALTERATION

INFLUENCE OF CLIMATIC PATTERNS ON HYDROLOGIC CONDITIONS

OBJECTIVE

- TO EVALUATE PAST CLIMATIC PATTERNS AND MAGNITUDES OF VARIATION, AND INFLUENCE ON HYDROLOGIC CONDITIONS

RATIONALE

- SITE SUITABILITY ISSUE: EFFECT OF FUTURE CLIMATIC VARIATIONS AND RESULTING CHANGES IN HYDROGEOLOGIC REGIME ON INTEGRITY OF SITE
- NRC LICENSING CRITERIA (10 CFR PART 60): POTENTIAL FOR CHANGES IN HYDROLOGIC CONDITIONS RESULTING FROM FORESEEABLE CLIMATIC CHANGES
- EPA STANDARD (40 CFR PART 191): RELEASE AND TRANSPORT OF RADIONUCLIDES FROM WASTE PACKAGE TO ACCESSIBLE ENVIRONMENT

APPROACH

- ANALYZE PAST CLIMATIC DATA FOR PATTERNS AND TRENDS
- MODEL WET CYCLES FOR DIFFERENT TIME FRAMES

PACKRAT MIDDEN CLIMATOLOGY

OBJECTIVES

- TO ESTABLISH PAST PRECIPITATION AND VEGETATION AT YUCCA MOUNTAIN
- TO DEFINE PAST CLIMATIC REGIME AT YUCCA MOUNTAIN

RATIONALE

- SITE SUITABILITY ISSUE: EFFECT OF FUTURE CLIMATIC VARIATIONS AND RESULTING CHANGES IN HYDROGEOLOGIC REGIME ON INTEGRITY OF SITE
- NRC LICENSING CRITERIA (10 CFR PART 60): POTENTIAL FOR CHANGES IN HYDROLOGIC CONDITIONS RESULTING FROM FORESEEABLE CLIMATIC CHANGES

APPROACH

- MAP AND SAMPLE PACKRAT MIDDENS ALONG FORTY MILE AND YUCCA WASHES
- ANALYZE SAMPLES FOR VEGETATION COMPONENTS
- RADIOCARBON AGE DATING OF SELECTED SAMPLES
- CORRELATE PLANT ASSOCIATIONS WITH CLIMATIC AND HYDROLOGIC FACTORS
- DEVELOP CLIMATIC HISTORY

MIFFLIN & ASSOCIATES

TECHNICAL STUDY PROGRAMS

- UNSATURATED ZONE DRILLING AND MONITORING
- REGIONAL GROUNDWATER PALEODISCHARGE
- CHEMICAL AND PHYSICAL-CHEMICAL BEHAVIOR OF CLINOPTILOLITE AND VOLCANIC GLASS
- PEDOGENIC OPAL ANALOG

Paleoclimates and Geochemistry

UNSATURATED ZONE DRILLING AND MONITORING - PHASE I

OBJECTIVE

- TO ASSESS MOISTURE TRAVEL MECHANISMS IN UNSATURATED ZONE
- IN PHASE I, ESTABLISH DIRECT MOISTURE METHODOLOGY

RATIONALE

- SITE SUITABILITY ISSUE: CHARACTERIZATION OF MOISTURE MOVEMENT THROUGH UNSATURATED ZONE
- EPA STANDARD (40 CFR PART 191): RELEASE AND TRANSPORT OF RADIONUCLIDES FROM WASTE PACKAGE TO ACCESSIBLE ENVIRONMENT
- NRC LICENSING CRITERIA (10 CFR PART 60): GROUNDWATER TRAVEL TIME FROM DISTURBED ZONE TO ACCESSIBLE ENVIRONMENT SHALL BE AT LEAST 1,000 YEARS

APPROACH

- DRILL HOLES NEAR YUCCA MOUNTAIN USING DRY DRILLING TECHNIQUE
- EMPLACE MOISTURE SENSING INSTRUMENTATION
- MONITOR MOISTURE MOVEMENT

REGIONAL GROUNDWATER PALEODISCHARGE

OBJECTIVE

- TO EVALUATE PAST PLUVIAL CLIMATIC GROUNDWATER CONDITIONS AS AN INDICATOR OF FUTURE GROUNDWATER CONDITIONS

RATIONALE

- SITE SUITABILITY ISSUE: EFFECT OF FUTURE CLIMATIC VARIATIONS AND RESULTING CHANGES IN HYDROGEOLOGIC REGIME ON INTEGRITY OF SITE
- NRC LICENSING CRITERIA (10 CFR PART 60): POTENTIAL FOR CHANGES IN HYDROLOGIC CONDITIONS RESULTING FROM FORESEEABLE CLIMATIC CHANGES
- EPA STANDARD (10 CFR PART 191): RELEASE AND TRANSPORT OF RADIONUCLIDES FROM WASTE PACKAGE TO ACCESSIBLE ENVIRONMENT

APPROACH

- MAP PAST GROUNDWATER DISCHARGE AREAS (SPRINGS AND LAKES) AROUND NEVADA TEST SITE
- ANALYZE PACKRAT MIDDENS FOR PHREATIC VEGETATION
- DEVELOP MODEL OF PAST GROUNDWATER LEVEL MAXIMUMS

CHEMICAL BEHAVIOR OF CLINOPTILOLITE AND VOLCANIC GLASS

OBJECTIVES

- TO UNDERSTAND SORPTION CHARACTERISTICS OF CLINOPTILOLITE WITH RESPECT TO RADIONUCLIDE RETARDATION
- TO ASSIST IN DEFINING UNSATURATED ZONE HYDROGEOCHEMISTRY

RATIONALE

- SITE SUITABILITY ISSUE: CHARACTERIZATION OF MOISTURE MOVEMENT THROUGH UNSATURATED ZONE
- EPA STANDARD (40 CFR PART 191): RELEASE AND TRANSPORT OF RADIONUCLIDES FROM WASTE PACKAGE TO ACCESSIBLE ENVIRONMENT
- NRC LICENSING CRITERIA (10 CFR PART 60): GROUNDWATER TRAVEL TIME FROM DISTURBED ZONE TO ACCESSIBLE ENVIRONMENT SHALL BE AT LEAST 1,000 YEARS

APPROACH

- REVIEW OF THERMODYNAMICS OF VOLCANIC GLASS AND TRANSFORMATION TO ZEOLITE SPECIES
- ANALYZE SAMPLES FOR CATION SPECIES
- COMPARE SAMPLES TO HECTOR, CA CLINOPTILOLITE
- ESTABLISH SPECIES SELECTIVITY AS A FUNCTION OF CATION CONCENTRATIONS IN AQUEOUS PHASE

PEDOGENIC OPAL ANALOG

OBJECTIVES

- TO ASSIST IN GENESIS OF OPAL IN CARBONATE/SILICA VEIN DEPOSITS
- TO ASSIST IN UNDERSTANDING DISSOLUTION OF SILICATE MINERALS IN WEATHERIZING ZONE

RATIONALE

- SITE SUITABILITY ISSUE: CHARACTERIZATION OF MOISTURE MOVEMENT THROUGH UNSATURATED ZONE
- NRC LICENSING CRITERIA (10 CFR PART 60):
  - POTENTIAL CHANGE IN HYDROLOGIC DISCHARGE CONDITIONS THAT COULD AFFECT MIGRATION OF RADIONUCLIDES (COLD WATER SPRING)
  - IGNEOUS ACTIVITY WHICH COULD AFFECT INTEGRITY OF SITE (THERMAL WATER)

APPROACH

- SILICATE RINDS FROM PAH CANYON TUFF WILL BE SAMPLED AND ANALYZED FOR MAJOR, MINOR AND TRACE ELEMENT GEOCHEMISTRY
- VOLCANIC GLASS IN TUFF WILL BE ANALYZED FOR LEACHING ZONE CHEMISTRY
- COMPARE RESULTS WITH CARBONATE/SILICA VEIN DEPOSITS ANALYSES

CENTER FOR NEOTECTONIC STUDIES - UNIVERSITY OF NEVADA-RENO

TECHNICAL STUDY PROGRAMS

- ACTIVE FAULTING AND QUATERNARY GEOLOGY
- REGIONAL TECTONICS
- SEISMOLOGY
- REMOTE SENSING
- NATURAL RESOURCES ASSESSMENT
- TUFF GEOCHEMISTRY
- TUFF-ROCK STABILITY

ACTIVE FAULTING

OBJECTIVE

- TO EVALUATE RECENCY AND FREQUENCY OF FAULT ACTIVITY IN THE SITE AREA
- TO EVALUATE PROBABILITY OF RECURRING FAULT MOVEMENT WITHIN NEXT 10,000 YEARS

RATIONALE

- SITE SUITABILITY ISSUE: EFFECTS OF FUTURE FAULTING OR OTHER TECTONIC EVENTS ON INTEGRITY OF SITE
- NRC LICENSING CRITERIA (10 CFR PART 60): STRUCTURAL DEFORMATION SUCH AS UPLIFT, SUBSIDENCE, FOLDING, AND FAULTING DURING QUATERNARY PERIOD (LAST 2 MILLION YEARS)

APPROACH

- PROCURE LOW-SUN ANGLE PHOTOGRAPHY OF SITE AREA
- ANALYZE LOW-SUN ANGLE PHOTOGRAPHY, VERTICAL AERIAL PHOTOGRAPHY, AND REMOTE-SENSING IMAGERY FOR EVIDENCE OF FAULT ACTIVITY
- EVALUATE FIELD EVIDENCE FOR RECENT FAULTING AND AGE DATING OF FAULT MOVEMENT
- MAP AND AGE DATE QUATERNARY GEOLOGIC UNITS

REGIONAL TECTONICS

OBJECTIVE

- TO EVALUATE THE TECTONIC SETTING, CRUSTAL STRUCTURE, AND SEISMOTECTONIC POTENTIAL OF YUCCA MOUNTAIN REGION

RATIONALE

- SITE SUITABILITY ISSUE: EFFECT OF FUTURE FAULTING OR OTHER TECTONIC EVENTS ON INTEGRITY OF SITE
- NRC LICENSING CRITERIA (10 CFR PART 60): NATURE AND RATES OF TECTONIC PROCESSES OPERATING WITHIN THE GEOLOGIC SETTING WHICH COULD AFFECT THE INTEGRITY OF SITE

APPROACH

- EXAMINE LISTRIC AND DETACHMENT FAULT DOMAINS
- REEVALUATE WALKER-LANE STRUCTURAL ZONE
- STUDY MINE MOUNTAIN STRUCTURAL ZONE
- REVIEW TECTONICS AND STRESS INDICATORS OF DEATH VALLEY FAULT ZONE
- ANALYZE REMOTE-SENSED STRUCTURAL GEOLOGY
- EXAMINE SITES OF HOLOCENE FAULT ACTIVITY
- DEVELOP MODEL OF TECTONIC SETTING AND REGIONAL STRESS

SEISMOLOGY

OBJECTIVE

- TO ASSESS PAST AND PRESENT EARTHQUAKE PATTERNS IN SOUTHERN NEVADA
- TO ASSESS GROUND MOTION FROM NUCLEAR TESTING

RATIONALE

- SITE SUITABILITY ISSUE: EFFECT OF FUTURE FAULTING OR OTHER TECTONIC EVENTS ON INTEGRITY OF SITE
- NRC LICENSING CRITERIA (10 CFR PART 60): EARTHQUAKES WHICH HAVE OCCURRED HISTORICALLY THAT IF REPEATED COULD SIGNIFICANTLY AFFECT SITE

APPROACH

- REVIEW LITERATURE AND EARTHQUAKE CATALOGS
- ANALYZE GEOPHYSICAL SURVEYS AND CRUSTAL MODELS OF SOUTHERN NEVADA
- LINK FEDERAL GOVERNMENT SEISMIC NETWORK IN SOUTHERN NEVADA WITH SEISMOLOGY LABORATORY AT UNR
- DEFINE EARTHQUAKE SOURCE PARAMETERS
- DEFINE NUCLEAR TESTING GROUND MOTION PARAMETERS
- DEVELOP EARTHQUAKE SOURCE MODEL AND ESTIMATES OF INTENSITY, PEAK ACCELERATION, AND EXPECTED DAMAGE PATTERNS

REMOTE SENSING

OBJECTIVE

- TO DEFINE REGIONAL STRUCTURAL SETTING UTILIZING REMOTE SENSING DATA

RATIONALE

- DEFINITION OF REGIONAL STRUCTURAL RELATIONSHIPS WILL ASSIST IN ASSESSING TECTONICS, VOLCANISM, HYDROGEOLOGY, AND NATURAL RESOURCE POTENTIAL

APPROACH

- MULTITEMPORAL LANDSAT THEMATIC MAPPER DATA
- FRENCH SPOT STEREO PANCHROMATIC IMAGERY
- DIGITAL GRAVITY, MAGNETIC, AND TOPOGRAPHIC DATA
- DEVELOPMENT OF REGIONAL STRUCTURE AND LINEAMENT MAPS

MINERAL RESOURCES

OBJECTIVE

- TO ASSESS MINERAL RESOURCE POTENTIAL AT YUCCA MOUNTAIN
- TO ASSESS HYDROCARBON POTENTIAL AT YUCCA MOUNTAIN

RATIONALE

- SITE SUITABILITY ISSUE: POTENTIAL FOR HUMAN INTERFERENCE OF SITE DUE TO PERCEIVED PRESENCE OF EXTRACTABLE NATURAL RESOURCES
- NRC LICENSING CRITERIA (10 CFR PART 60): PRESENCE OF NATURALLY OCCURRING MINERALS, WHETHER IDENTIFIED OR UNDISCOVERED, IN A FORM THAT ECONOMIC EXTRACTION IS FEASIBLE OR POTENTIALLY FEASIBLE IN FORESEEABLE FUTURE

APPROACH

- EXAMINE GEOLOGIC DRILL CORE FOR EVIDENCE OF MINERALIZATION OR ALTERATION ZONES
- REVIEW GEOLOGY AND MINERALIZATION CHEMISTRY OF MINING SITES IN AREA
- DEVELOP MODEL OF MINERAL RESOURCE POTENTIAL
- MAP POTENTIAL HYDROCARBON SOURCE AND RESERVOIR ROCKS
- EVALUATE STRUCTURAL GEOLOGY AND HYDROCARBON MATURATION MODELS
- DEVELOP MODEL OF HYDROCARBON POTENTIAL

TUFF GEOCHEMISTRY

OBJECTIVE

- TO ASSESS CHEMICAL CONDITIONS WITHIN HOST ROCK, CHEMICAL REACTIONS ANTICIPATED, AND SOLUBILITY OF HOST ROCK

RATIONALE

- NRC LICENSING CRITERIA (10 CFR PART 60): NATURE AND RATES OF GEOCHEMICAL PROCESSES WHICH COULD AFFECT THE ABILITY OF THE REPOSITORY TO ISOLATE WASTE

APPROACH

- EVALUATE TUFF GEOCHEMISTRY AND RANGE OF GEOCHEMICAL PROPERTIES ANTICIPATED
- EXAMINE ANTICIPATED MINERAL-SOLUTION REACTIONS, CRITICAL EQUILIBRIUM AND KINETICS OF PHASE CHANGES

TUFF-ROCK STABILITY

OBJECTIVE

- TO ASSESS REPOSITORY HOST ROCK STABILITY
- TO EVALUATE STRUCTURAL INTEGRITY OF YUCCA MOUNTAIN

RATIONALE

- NRC LICENSING CRITERIA (10 CFR PART 60): GEOMECHANICAL PROPERTIES THAT DO NOT PERMIT DESIGN OF UNDERGROUND OPENINGS THAT REMAIN STABLE THROUGH PERMANENT CLOSURE
- FEDERAL AND STATE MINE SAFETY REGULATIONS: PROTECTION OF WORKERS UNDERGROUND FROM CAVE-IN, COLLAPSE, OR ROCK BURST

APPROACH

- DESCRIPTION OF ROCK MASS FEATURES
- CHARACTERIZE ROCK MASS FRACTURES UTILIZING FRACTAL DIMENSIONS
- DEFINE CHANGES IN ROCK MASS FEATURES DUE TO MAJOR DISCONTINUITIES
- DEFINE IN-SITU ROCK STRESS

DEPARTMENT OF GEOSCIENCE - UNIVERSITY OF NEVADA - LAS VEGAS

TECHNICAL STUDY PROGRAM

- REGIONAL VOLCANISM

VOLCANISM

OBJECTIVE

- TO ASSESS POTENTIAL OF VOLCANIC ERUPTION AT OR NEAR YUCCA MOUNTAIN

RATIONALE

- SITE SUITABILITY ISSUE: EFFECT OF FUTURE VOLCANISM ON INTEGRITY OF SITE
- NRC LICENSING CRITERIA (10 CFR PART 60): EVIDENCE OF IGNEOUS (VOLCANIC) ACTIVITY AT SITE SINCE START OF QUATERNARY PERIOD

APPROACH

- STUDY YOUNG VOLCANISM IN TERMS OF REGIONAL STRUCTURAL AND MINERALOGIC SETTING
- MAP VOLCANIC FEATURES, ANALYZE GEOCHEMISTRY OF VOLCANIC ROCK SAMPLES, AGE DATE VOLCANIC FEATURES
- DEVELOP MODEL OF PAST VOLCANIC ACTIVITY

REASONS FOR DEVELOPING PROPOSED REGULATORY POSITION

UP-DATE GUIDANCE TO REFLECT:

- Latest Staff Thinking
- Comments Of DOE/States/Tribes
- Staff Position On Uncertainty

PROVIDE FORMAL GUIDANCE TO DOE

INVITE PUBLIC TO PARTICIPATE IN DEVELOPMENT OF FINAL GUIDANCE

NRC STAFF/CONTRACTOR MEETING ON GROUNDWATER TRAVEL TIME

Began With Draft Statement of Position

- Definition of Pre-Waste Emplacement Conditions
- Definition of Path of Likely Radionuclide Travel
- Definition of Groundwater Travel Time/Velocity
- Statement of Position on GWTT Including Uncertainty

Concluded with Draft of Proposed Regulatory Position

EVOLUTION OF DRAFT GTP TO PROPOSED REGULATORY POSITION

- ADVANCES CONCEPT OF MOVEMENT OF UNIT MASS ALONG MACROSCOPIC FLOW PATH

- PROPOSES ELIMINATION OF CONCEPTS OF DIFFUSION AND DISPERSION

  PROPOSES LIMITING CONCEPT OF TRACER MOVEMENT TO VALIDATING PATHWAYS

- EXPANDS POSITION ON UNCERTAINTY
  - States Position Clearly in Regulatory Position Section
  - Does Not Advance CDF as Method to Reduce Uncertainty
  - Stresses Need to Use Multiple Approaches to Reduce Uncertainty
  - Stresses Need to Identify Sources and Levels of Uncertainty
  - Stresses Need to Identify Methods Used to Reduce Uncertainty
  - Stresses Need to Express the Level of Uncertainty in Calculated GWTT

- ALLOWS MORE FLEXIBILITY
  - Places Greater Burdon on DOE to Develop Methods for Uncertainty Anal.
  - Minimizes Prescriptive Guidance

WHAT NEEDS TO BE DONE

Hydrology Section Staff Review (8/17/87)

Division Level Review

Transmit to Research for Review

Issue Regulatory Position for Public Comment